UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

USING THE BEHAVIOUR CHANGE WHEEL TO

DESIGN AND TEST A LEARNING ANALYTICS

ADOPTION STRATEGY AT A REGIONAL

AUSTRALIAN UNIVERSITY

A Thesis submitted by

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Abstract

Learning Analytics (LA) is an emerging and important field in Higher Education, concerned with using data about students and their learning environments to optimise students' learning experiences. However, to date, many academic staff are not engaging with LA to inform and enhance their teaching practice and course design. This study applied the Behaviour Change Wheel (BCW) to design an implementation plan to enhance individual academics' knowledge of LA, and their competence and confidence in the use of this knowledge, enabling them to understand and enhance students' learning experiences. A set of transferable design principles were developed based upon analysis of the LA implementation plan and its impacts, allowing for adaptation and adoption in broader contexts.

The BCW is an approach developed in the health disciplines, based on 19 frameworks of behaviour change. It is an aid for designing interventions that effect behavioural change, based on the capabilities, opportunities and motivations of the individuals involved. Professional learning and support for academics in the field of Learning Analytics is currently an under-researched area. This study contributes significant insights into how academic behaviour change in the use of Learning Analytics can be effectively supported through professional learning.

The study employed a Design-Based Research (DBR) approach and was conducted in the context of a regional Australian university. Four consecutive phases were included in the study: an analysis of a practical problem (low levels of use of learning analytics by academic staff), the development of a solution to the problem (a BCW implementation plan for learning analytics adoption), the iterative trialling and evaluation of this design, and, finally, reflection, to produce design principles for an implementation plan that could be more widely adapted and adopted. Data collection methods included surveys, interview data, and logs of staff usage of the learning management system and associated learning analytics tools and reports.

Survey results were analysed using descriptive statistical techniques and usage data through simple counts and comparisons. Interview data were coded and analysed using deductive and inductive thematic analysis.

The study has resulted in transferable research outputs including a conceptual framework for adoption of LA, the I Framework, and development of a deep understanding of the barriers, enablers, and motivators for LA implementation. The resulting LA implementation plan was comprised of a mixture of individual consultations and group discussions with associated support resources for facilitators and participants that could be adapted and adopted at other institutions. Participants in this study self-reported that their involvement increased their awareness and use of LA; and commented that the benefits of involvement were the combination of individual support, opportunities to discuss with other staff interested in using learning analytics and the resources made available to them. Findings suggest that incorporating these elements into a long-term implementation plan is likely to result in increased uptake and staff capabilities in the use of learning analytics.

Thesis Certification Page

This Thesis is entirely the work of Hazel June Jones except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor: Associate Professor Marcus Harmes

Associate Supervisor: Dr Nick Kelly

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Student and supervisors' signatures of endorsement are held at the University.

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Finally, to my family – Amy Rachel and Lachlan, thank you for your patience and understanding when I have not always been as available as we would all have liked, and for allowing me to do this for myself. Greg, my confidant, unofficial supervisor, sounding board, cook and much more – thank you from the bottom of my heart.

Table of Contents

List of Figures

List of Tables

Glossary of Terms

Course	The individual units of study, which in other contexts may be referred to as subjects or papers.
Course Examiner	Academic staff members responsible for course design and implementation in specific units of study
Learning Analytics	"[t]he measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (LAK11, 2011, para 5).
Moodle	The Learning Management System used at USQ
MyIT	The IT help site at USQ
MyOpinion	The student course evaluation surveys at USQ
Nudge	Prompts made by academics as a reminder to students to take a voluntary action regarding their learning and could include reminders to complete an activity or engage with an important resource (Dimitrova et al., 2017; Graham et al., 2017).
Playground	A site in the LMS that academics could request where they could experiment with different designs, tools and reports and gain experience without affecting the live course site
StaffDesk	The area of Moodle at USQ dedicated to staff professional development sites
StudyDesk	The USQ version of Moodle for course sites
TeachDesk	A site in StaffDesk in Moodle at USQ dedicated to staff support and development

List of Abbreviations

AD	Academic Development
APEASE	Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/safety, and Equity
BCT	Behaviour Change Technique
BCW	Behaviour Change Wheel
BELA	(Faculty of) Business, Education, Law and Arts
COI	Community of Inquiry
COM-B	Capabilities, Opportunities, Motivations – Behaviour
CPAR	Critical Participant Action Research
DBR	Design-based Research
EDD	Education, Design and Development
eLAT	exploratory Learning Analytics Toolkit
HES	(Faculty of) Health, Engineering and Sciences
HR	Human Resources
ICT	Information and Communications Technology
IT	Information Technology
LA	Learning Analytics
LA-LD	Learning Analytics-Learning Design
LAFP	Learning Analytics Fellows Program
LMS	Learning Management Systems
OALT	Office for Advancement of Learning and Teaching
PCE	Program and Course Enhancement
QILT	Quality Indicators of Learning and Teaching

SET   Student Evaluation of Teaching

STEM   Science, Technology, Engineering and Maths

TAM   Technology Acceptance Model

TEQSA   Tertiary Education Quality and Standards Agency

TPB   Theory of Planned Behaviour

USQ   University of Southern Queensland

Publications from this Research

Several refereed conference papers and presentations have been published based on different elements of the study. I have received two Best Paper Awards at ASCILITE conferences.

2019 Best Student Full Paper for *"Barriers, enablers, and motivations for staff adoption of learning analytics: Insights for professional learning opportunities from an Australian university".*

2016 Best Concise Paper for *"Ethical considerations in the use of student data: International perspectives and educators' perceptions"*

These papers have laid the foundations for journal articles to be written after completion of my doctorate.

Refereed conference papers

Jones, H. (2019). *Barriers, enables, and motivations for staff adoption of learning analytics: Insights for professional learning opportunities from an Australian university*. Personalised Learning, Diverse Goals, One Heart. ASCILITE 2019, Singapore. https://2019conference.ascilite.org/assets/proceedings/ASCILITE-2019-Proceedings-Final.pdf

Jones, H. (2016). *Ethical considerations in the use of student data:International perspectives and educators' perceptions* Show me the Learning ASCILITE 2016, Adelaide, Australia. https://2016conference.ascilite.org/wp-content/uploads/ASCILITE-2016-full-proceedings-Updated-1512.pdf

Conference workshops

Corrin, L., Jones, H. & Colvin, C. (2019). *Professional development for learning analytics: Approaches, challenges and opportunities* ASCILITE 2019

Alhadad, S., Jones, H., Corrin, L. & Colvin, C. (2018) *Integrating learning analytics and learning design: Smooth sailing or a rough journey*. ASCILITE 2018

Blog Posts

Corrin, L, Jones H, Joksimovic, S & Colvin, C. (2020, 5 April 2020). *Professional learning for learning analytics: what can we learn and adapt in response to current events?* https://blog.ascilite.org/professional-learning-for-learning-analytics-what-can-we-learn-and-adapt-in-response-to-current-events

Jones, H. (2020, 23 October 2020) *Insights on the adoption of learning analytics: a reflection from a Best Student Paper award winner.* https://blog.ascilite.org/insights-on-the-adoption-of-learning-analytics-a-reflection-from-a-best-student-paper-award-winner/

Jones H. (2018, 22 February 2018) 'Ethical Use of Student Data in Higher Education – Advancing the conversation'. *Research Ethics Monthly*. Retrieved from https://ahrecs.com/human-research-ethics/ethical-use-student-data-higher-education-advancing-conversation

Doctoral Consortium and Poster Presentation

Jones, H. (2016). *What are the impacts of adopting Learning Analytics in different higher education academic microcultures?* LAK16: The 6th International Learning Analytics & Knowledge Conference, Edinburgh UK April 25-29 http://lak16.solaresearch.org/?page_id=173

Chapter 1 Introduction to the Study

1.1 Introduction

A large portion of learning in Australian higher education is conducted online or in a blended approach, where students access learning both on campus and via online learning platforms. Consequently, the variety, depth and breadth of data available on students, and their interactions with the various components of digital learning environments are also increasing, providing a more comprehensive insight into how learners are engaging with their coursework. Learning Analytics (LA), is defined as "[t]he measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (LAK11, 2011, para 5). LA has grown as a research discipline from its origins in 2011 when it was identified as a combination of data science, human-computer interactions and pedagogy (Siemens, 2012). While academic staff are a key group of stakeholders in the use and application of LA, to date, their use and interpretation of LA has not been a major research focus. Levels of academics' uptake of use of LA have remained low at many institutions, indicating that LA research has not yet translated into practice. This study bridges the research-practice nexus through the development of an LA implementation plan that was trialled at one university and has the potential to be adapted and adopted in other institutions.

The lack of focus on academics' perspectives on LA is a gap in LA research (Colvin et al., 2016; Howell et al., 2018). I identified the need to address this gap through an investigation of the capabilities and motivations for staff at the University of Southern Queensland (USQ) to adopt LA, and the opportunities that LA adoption provided to them for informing their teaching practice. This investigation was grounded in my own experience across 20 years in supporting academics in their teaching practice. USQ was chosen as the context for this study as an institution with a large proportion of fully online courses and an environment where all courses, regardless of modality

of teaching, use the Learning Management System (LMS), in this case, Moodle. Moodle incorporates a wide range of LA tools and reports available to academics. Courses, in the USQ context are the individual units of study, which in other contexts may be referred to as subjects or papers.

This thesis provides analysis and evaluation of a design-based research (DBR) project that I undertook to support and encourage academic staff at USQ to build their capabilities in using LA to inform and enhance their teaching practice and course design. This was achieved through the design, development and trialling of a suite of professional learning opportunities and resources. This research investigated the conditions that are needed for successful LA adoption through development of an implementation plan which built on many of the positive aspects of current frameworks and bridged some of the identified gaps. Discussion throughout this thesis will refer to implementation of LA, rather than adoption or intervention as:

> Implementation is preferred as a more general term that also includes ongoing learning analytics use as a sustained activity incorporated into habitual learning practices… Learning analytics implementation design is then defined globally as the purposeful framing of activity surrounding how analytic tools, data, and reports are taken up and used as part of an educational endeavour. (Wise & Vytasek, 2017, pp. 151-152)

The study has resulted in the creation of a set of transferable design principles to support LA implementation that may be adapted and adopted by other higher education institutions to support their academics in harnessing LA for enhanced learning and teaching. A theoretical contribution of this study is the in-depth qualitative investigation of academics' motivations to use LA and the supports and opportunities they perceive would empower their use. The insights from the investigation, accompanying research, and interpretation have led to the development of a conceptual framework for implementation of LA and contribute to the growing body of LA literature on academics' adoption of LA, through application of a behavioural change framework, known as the Behaviour Change Wheel (BCW) (Michie et al., 2011). The BCW is a theoretical framework, developed

in the health and medical disciplines, that is capable of adaptation to other context and provides a pragmatic approach to designing an intervention to change a specific behaviour. In this study the behaviour to be changed is academics' engagement with LA and the intervention is the LA implementation plan.

1.2 Background and Significance

Academic staff at universities have for many decades used information about their students, including demographic information, prior academic results, and attendance and interaction in face-to-face classes, to inform their teaching practice. The traditional approach to using information, and indeed the traditional information itself, ranged from a simple headcount in traditional face-to-face lectures and observation of student body language during classes, through to analysing the grade distribution of final results. Following the expansion of online learning environments in recent years, the field of LA has emerged, adding another dimension to the information universities collect about students and the learning environments provided for them. Universities use their LMSs for many components of students' learning, such as assessment submissions, accessing resources, and networking with peers. Every "click" and interaction that a student has in the LMS is automatically recorded. The data from these interactions can be collated into a range of reports that staff can access, analyse, and interpret to gain insight into student engagement.

However, LA goes beyond providing a log of interactions; it is also the interpretation of this information and consideration of how these data link to the learning that is occurring (Lodge & Lewis, 2012). A more holistic understanding of students and the various ways in which they approach their learning can be created through combining click data with other data from the LMS and other available sources. These sources of information can include student access to learning support, use of the library site, and involvement with extra-curricular and co-curricular activities. The learning opportunities provided to students, through course design and teacher interaction with the site and their students, can be considered through use of

LA data obtained from the LMS (Lockyer et al., 2013). This study was designed to investigate academics' knowledge and use of this data, barriers to more widespread uptake and how staff capabilities and confidence in using data from the LMS might be improved.

To engage deeply with LA in their role as educators, academics require appropriate knowledge, skills, motivations, and time. None of these are easy to acquire given the complex work context of the modern academic, where they are also expected to conduct research in their discipline area, continually improve their curriculum and teaching practice, contribute to university activities, and engage with their profession and the wider community (Saroyan & Trigwewll, 2015). Lack of access to data in an easily useable format can further exacerbate the lack of use (Bichsel, 2012; Klein et al., 2019). Developing an understanding of the reasons academics choose to engage, or not engage, with LA, is an important first step in increasing levels of use. Use of behaviour change theories is one approach that has proved effective in educational technology adoption (Buchanan et al., 2013) and is the approach chosen for this study.

Ongoing support and training need to be provided to empower increased awareness and uptake, and therefore effect a change in behaviour towards using LA. Opportunities to connect with like-minded colleagues is another important aspect of support, to build networking opportunities and a sense of community, and promote peer learning and sharing of practice (Gunn et al., 2017; Rehrey et al., 2018). This study brings together all these components to investigate an effective professional learning approach to empower academics to engage with LA. This research combined professional learning opportunities and support resources to introduce staff to the range of data and information that is available to them through LA (in the context of a specific regional university) that they could use in their teaching practice and course design. The processes of, and motivations for, engaging with professional learning is further explored in Chapter 2.

1.2.1 Research Gap the Study is Addressing

Through this study, I addressed the socio-cultural aspects of academics' implementation of LA, which is often overlooked, or given low levels of importance in current implementation frameworks which have a focus on the technical aspects of "how to" and "to what end". In this study, the socio-cultural aspects include consideration of the people who are involved in LA implementation: their beliefs and attitudes towards adopting LA; and the specific culture in which they work, such as the extent to which a supportive environment in which a strong learning and teaching culture exists, or an individualist environment in which research is given priority. Gaps in the LA research surrounding mindful innovation, intentional implementation design, consideration of human and social elements of implementation, and evaluation of impact have been identified by several authors including Fritz & Whitmer (2017), Jones et al.(2013), Klein et al. (2019) and Wise & Vytasek, (2017). More recently a systematic review of the efficacy of learning analytics interventions in higher education recommended that "more research into the implementation and evaluation of scientifically driven learning analytics is needed to build a solid evidence base for the feasibility, effectiveness and generalizability of such interventions" (Sønderlund et al., 2019, p.2594). This research contributed to this body of evidence through investigation of the conditions that are needed for successful LA implementation and development of an implementation plan which built on many of the positive aspects of current frameworks and bridged some of the identified gaps. A more detailed discussion and synthesis of the extant literature is included in Chapter 2.

Literature on successful implementation of educational technologies and LA informed the format and content of the professional learning opportunities developed in the study. There are numerous studies of implementing educational technologies in universities (e.g. Englund et al., 2017; Ensminger et al., 2004; King & Boyatt, 2014). The findings from these, including academic perspectives and professional development approaches, are applicable to LA as this field is considered an important trend in technology-enhanced learning, as evidenced through inclusion in the annual NMC

Horizon Reports every year since 2011 (e.g. Johnson et al., 2015). Within the literature, there are also examples of unsuccessful implementation of educational technologies, and it appears the sector has been slow in learning from these pitfalls (Castro, 2019; Gautreau, 2011). This study focussed on the people involved, and understanding the competencies and motivations of staff, along with the opportunities for development that are available in the unique context of these participants in this university at this particular time to overcome such pitfalls. There is potential for other higher education institutions to adopt and adapt this approach to develop an implementation plan that will suit their own context.

The literature also reports on a wide range of implementation frameworks for LA that have been developed over the last eight years that explore the different dimensions of implementation. Many of the earlier frameworks had their origins in data science with an emphasis on the data and "how to" and "to what end". Many of these early frameworks also adopted an institutional approach and considered that one model would be appropriate for a wide range of contexts (Greller & Drachsler, 2012; Siemens, 2013; van Harmelen & Workman, 2012). There has been a trend since 2014 which is accepted and built on in this study for the human and socio-cultural aspects to be included in implementation frameworks, and for more research to take on a qualitative approach (Colvin et al., 2015, Gunn et al., 2017). One recent example of an institutional approach is the SHEILA (Supporting Higher Education to Integrate Learning Analytics) framework (Falcão et al., 2020; Tsai et al., 2018) that focuses on policy development. Whilst one of the key components of this framework is consideration of the behaviour that needs to be changed, the framework does not offer any practical suggestions on how the behaviours can be changed. The results and outputs of this study will provide a pragmatic solution that will support institutions to enact their LA implementation policies. Further discussion of these frameworks, and how they have informed development of my own conceptual framework, is included in Chapter 2.

Using the BCW as the theoretical framework also added a distinct perspective to the study. Whilst an extensive review of the literature revealed that many

hundreds of projects across the fields of health and medicine have used the BCW to design interventions in the few short years since its development in 2014, there are very few, if any, published accounts of this being used in the higher education context. Within the health and medical fields, the BCW has been shown to be a successful approach to changing behaviour through systematic and structured development of complex and scalable interventions, such as the one developed through this study (Loft et al.,2017, Vallis et al., 2018). The limited examples of use of the BCW in higher education cover diverse topics including its use to improve data management of researchers (Wolski & Richardson, 2015) and design and evaluation of student engagement activities (Wilson et al., 2019). Hence, this study is an important endeavour to enhance the use and implementation of this framework in higher education.

1.2.2 Stakeholders

In addition to the primary stakeholders of this study, namely the participants and other academic staff, there were several other groups of stakeholders who could benefit from this research, both within USQ and more broadly at other institutions:

- students: the purpose of using LA, as demonstrated in the original definition above is to optimise students' learning and this notion will need to remain at the forefront of all endeavours in LA;
- academic developers and educational designers: the group who are charged with provided professional learning and support for academics. They will also need the knowledge and skills to understand LA implementation and a practical, easily adoptable and adaptable approach to training and building staff capacity. Whilst LA is context specific the approach can be more generic;
- institutions: continual improvement of learning and teaching is a major focus of many institutions, especially in Australia, where funding and reputation are reliant on such measures as QILT data, as discussed in more detail in Chapter 2; and

- LMS and LA tool designers and developers: to engage deeply with LA, academics will need to have easy access to relevant data and the outcomes from this study, particularly the perception from academics on what could be included will be able to be shared with major companies and developers.

As a result of all of these factors, the study will be important for academic support staff and Learning and Teaching Centres as well as institutions and academic staff who are interested in improving learning and teaching through effective implementation of LA. With the context of a pragmatic bottom-up approach to implementation of LA, this research has the potential for impact across universities, especially those that are at the early stages of LA implementation.

1.2.3 Personal Motivation

This study grew from my passion for working with, and supporting, academic staff with all aspects of their learning and teaching that I have developed over the last 20 years working in academic support roles across eight higher education institutions. The motivation for this study developed from numerous formal and informal conversations with academics across these institutions, and in a variety of contexts around what LA is, and how it can help enhance learning and teaching. Their questions and concerns focussed on what data was available to them, how they could interpret this information in their unique context, and how they could use LA as a valid and reliable layer of evidence to help them to become more reflective in their practice. Academics were also interested in reducing some of the fear of "relying" on student evaluations of courses and teaching for evidence of teaching effectiveness.

Over my career I have developed a teaching philosophy of placing the learner at the centre of the learning, be this the academic staff with whom I work, or their students. This approach has influenced the approach to this study and the development of an adoption strategy for LA. At the heart of my work is a desire to ensure students receive an engaging and relevant learning experience to empower them to develop a passion for their field that they

can take with them into the workplace. I lead and mentor academic staff to become effective and data-informed teachers who also adopt a student-centred philosophy. In the context of this study, staff were the participants and the new knowledge and skills centred on how to use the information available about their students and their learning environments that they have access to through the Learning Management System (LMS).

In summary, this research was concerned with developing an approach to professional learning for academics that would empower them to engage with LA to inform and enhance their teaching practice, and hence have a positive impact on the learning experience of their students. The approach catered for the diversity of backgrounds and motivations of staff, through an implementation plan that included individual consultations and group discussions, supported by a resource site that allowed for sustainability, scalability, and implementation in a variety of contexts.

1.3 The Research Approach

In designing this study, I adopted a design-based research (DBR) approach and used the Behaviour Change Wheel (BCW) (Michie et al., 2011) as a theoretical framework. Further, this research was founded on the literature from three different areas: LA frameworks and implementations; professional learning for academic staff; and the uptake of educational technologies by individuals and institutions. Each of these components are outlined in the following sections and the relationships between them are outlined in Figure 1. Combining these different components offers a distinctive perspective of LA implementation that will add to the body of knowledge in all of these areas.

Figure 1

Context of this Study
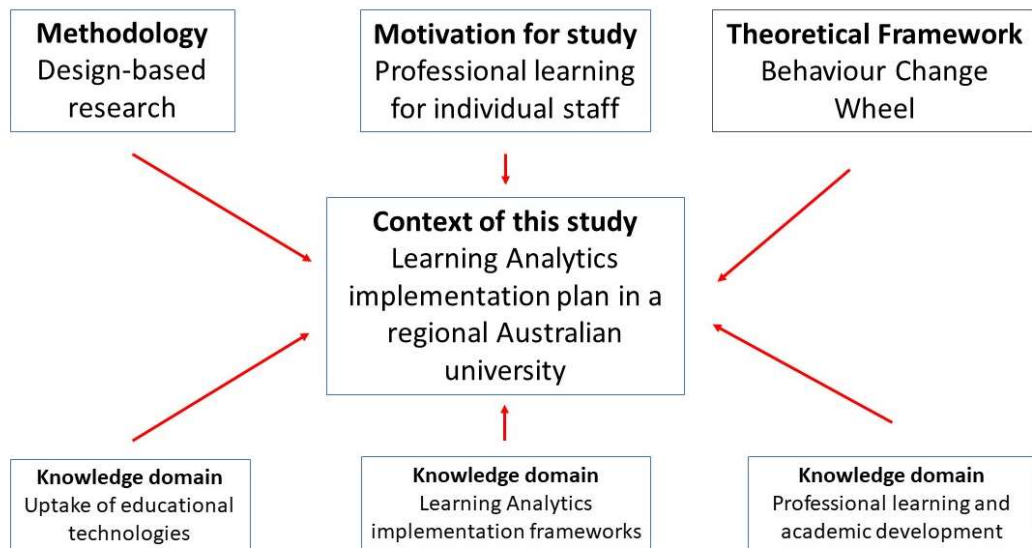
1.3.1 Design-based Research Approach

DBR is a methodology for understanding how, when, and why educational innovations work in practice. DBR methods aim to uncover the relationships between educational theory, designed artefact, and practice (Wang & Hannafin, 2005). This study adopted the DBR approach of Reeves (2006), involving four interrelated phases as shown in Figure 2. The arrows indicate that it is possible to revisit any of the Phases after completion of Phase 4 to refine the problem, solution method and/or design principles if needed.

Figure 2

The Four Phases of Design-based Research (adapted from Reeves, 2006, p. 59)

Refinement of problems, solutions, methods, and design principles
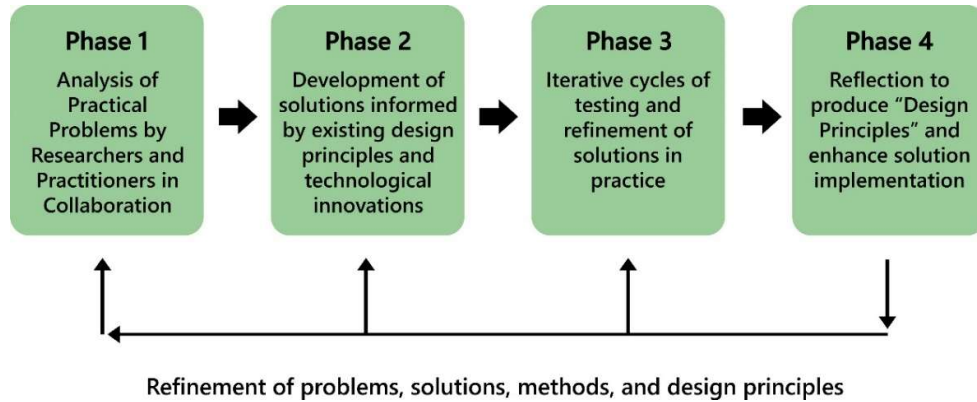
A brief overview of the four phases of this study are provided below to provide an introduction of the application of DBR, with more detailed discussion of each of these provided in Chapter 3: Methodology and Methods.

Phase 1 of this study involved initial data gathering to identify enablers, barriers and motivations for academic staff adopting LA to inform what components needed to be included in an effective implementation plan. There were four separate, though connected, stages for this phase:

1. An extensive literature review;
2. A survey disseminated to all academic staff at the university;
3. Paired interviews conducted over a period of 16 months with eight academics; and
4. Data extracted from the LMS for all courses across the university (approximately 800 each semester).

Phase 2 of this study involved development of draft design principles to support creation of an implementation plan, which were informed by Phase 1 findings and the BCW.

Phase 3 of this study involved iterative trialling of a Learning Analytics Implementation Plan.

Phase 4 of this study involved reflection on data analysis from the previous phases to produce a LA implementation plan and transferable design principles that allow effective adaption and implementation in other similar contexts where there is a desire to implement LA.

The specifics of how Reeves' approach to DBR was adapted in each of the four phases of this study are further developed in Chapter 3.

1.3.2 Behaviour Change Wheel

In this study I investigated the implementation of LA through the lens of behaviour change theory, and specifically the BCW (Michie et al., 2014). In this study the behaviour investigated was increasing academics' use of LA at USQ. Before an intervention can be developed, it is important to understand the capabilities and motivations of the intended participants, as well as the opportunities afforded to them to encourage a change of behaviour. In the BCW framework, these aspects are considered through the central hub of the wheel, the COM-B model, which is a model of the relationships between Capability, Motivation and Opportunity (COM), and Behaviour (B) as shown in Figure 3 (Michie et al., 2014). For this study, the capabilities, motivations and opportunities of academic staff at USQ were determined from analysis of the Phase 1 results.

Figure 3

COM-B Model (from Michie et al. (2014, p. 62))
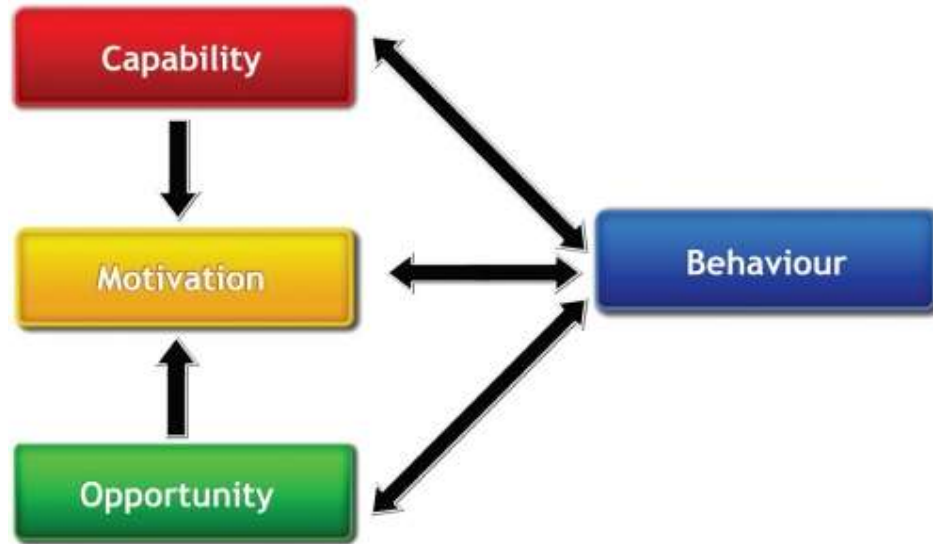
The COM-B model sits at the inner core of the BCW and leads to development of an intervention plan that involves selection and use of an appropriate mix of intervention functions and behaviour change techniques (BCT). Working through the steps of the BCW process led to determination of appropriate intervention functions and BCTs to include in an effective implementation plan.

The BCW includes nine intervention functions which are defined as "broad categories of means by which an intervention can change behaviour" (Michie et al. 2014, p.109). These nine functions are education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling and enablement. Behaviour change techniques are specific strategies or actions that can be used as mechanisms of change for chosen intervention functions. Some examples of BCT that were used in this study include goal setting, skills training, and instruction on how to use LA. The BCW also has a further layer of consideration of policies that could support the delivery of the intervention. Whilst influencing policy is beyond the scope of this research, discussion of this step is included in the implications section of the final chapter of the thesis. The relationships between the COM-B

Model, intervention functions, and policy categories are outlined in Figure 4. More detailed descriptions of how the COM-B Model and BCW were applied to this study are provided in Chapter 7.

Designing a LA implementation plan by working through the stages and steps of the BCW is a pragmatic and novel approach and a process that could be followed by other researchers and institutions to create an effective LA implementation plan for their context. Whilst the LA implementation plan and draft design principles developed in this study were generated for and from the specific USQ context they are also able to be adapted and adopted in other contexts and this study hence will make a significant contribution to the LA field.

Figure 4

The Behaviour Change Wheel (from Michie et al., 2014 p. 18)
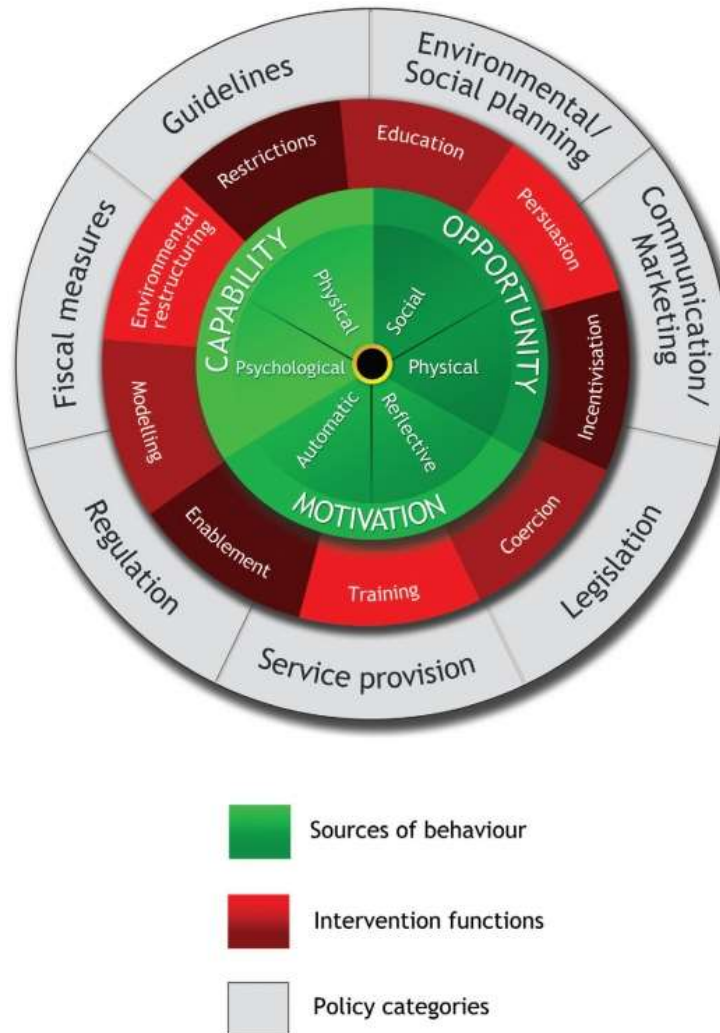
1.4 The Research Context

1.4.1 University of Southern Queensland

The study was undertaken at USQ, a young Australian regional university, which became a university in 1992 following establishment as an institute of higher education in 1967. USQ currently has two faculties: the Faculty of Business, Education, Law and Arts; and the Faculty of Health, Engineering and Sciences; both with six schools. In 2015, when the study first commenced, USQ had a total student population of 28203, with 70.2% of these studying externally (online) and a further 16.4% in blended mode, involving online and on-campus study. These figures indicate the importance

of the online environment at USQ (University of Southern Queensland, 2015). Ethics approval was received for the study from the USQ Human Ethics Committee (H15REA229). Ethics documentation is included in Appendix A.

Online study at USQ is facilitated through the Learning Management System (LMS), Moodle, which is an open source platform. For many students studying in the online mode, this is the main avenue of contact and communication with the university and teaching staff, and all students including those studying face to face, have access to course sites within the LMS. In this study, LA were limited to the use of data extracted from the LMS. This restriction was relevant for several reasons:

- all courses taught at the institution are required to have a presence in the LMS (in the USQ context a course is a single unit of study);
- most subjects are offered through a blended learning approach or in a fully online mode; and
- staff are familiar with Moodle, even if not with all its capabilities.

A centralised organisational unit, which has undergone several restructures and renamings during the course of this research, provides learning and teaching support at USQ. The Office for Advancement of Learning and Teaching (OALT) provided this support at the time of writing. From late 2019 there have been two main areas to provide support and advice to academic staff: the Program and Course Enhancement (PCE) team, who are responsible for providing support and advice for all course and program design and delivery; and the Academic Development (AD) team, who build "academic capacity to adopt and refine contemporary approaches to learning and teaching, and thereby enhance the student learning experience" (USQ staff intranet, 2019). Late in 2016, as part of a major restructure, the position of Manager, Learning Analytics was also created, reporting directly to the Director, OALT. The main responsibility of this position is to "Provide in-depth advice, training and support to USQ academics and the wider University community in the use of learning analytics to enhance educational effectiveness of their teaching and learning practice" (USQ, nd). The creation

of this position indicates an awareness by the university of the importance of LA and a willingness to support staff in developing the necessary skills and knowledge to use LA effectively.

1.4.2 Consultation and Collaboration with Academics

A major component of DBR is the consultation and collaboration with participants as this provides valuable insights from those who are most closely connected to the unique context of the courses in which they teach (Herrington et al., 2007; Reeves, 2006). In the context of the research, the participants were academic staff with a teaching role at USQ, who identified as having an interest in the study and using LA to inform their teaching practice. Details of the participant recruitment processes are included in Chapter 3. Each participant brought their own unique combination of context, background, experience and motivations, and their unique insights provided valuable input into the design and focus of the study.

1.5 Research Aim and Research Questions

This was a rich, qualitative study, which aimed to explore the design and trialling of an implementation plan for LA. The aim was to be responsive to the particular context of individual academics to support them to engage with Learning Analytics to inform and enhance their teaching practice. An overarching question which was focused through a number of sub-questions guided this research:

What are the requirements and characteristics of an effective LA adoption strategy in a regional Australian university?

1. What do academics identify as the barriers and enablers to the implementation of LA in their teaching practice?
2. Which aspects do academics who are engaging in a LA adoption strategy identify as enhancing their implementation of LA?
3. How is the LA adoption strategy effective in stimulating and supporting the academics' usage of learning analytics?
4. What are the transferable design principles that underpin an effective LA adoption strategy?

1.6 Organisation of the Thesis

The remainder of this thesis is organised in the following manner:

Chapter 2: Literature Review commences with a review of the literature regarding implementation of LA. Discussion then shifts to lessons that can be learnt from the uptake of educational technologies, and behaviour change models with an emphasis on the BCW. An overview of professional learning and academic development in the context of academic staff at higher education institutions is then provided and the chapter concludes with an introduction of the conceptual framework for the study.

Chapter 3: Methodology and Methods introduces the design of this DBR study within the theoretical framework of the BCW, adopting a pragmatic approach. Discussion of the philosophical and theoretical frameworks adopted in the study, and participant recruitment are included, and the chapter concludes with discussion of the choice of data and methods of data analysis.

Chapters 4, 5 and 6 discuss the initial data gathering components of Phase 1 with each chapter focussing on one of the inter-connected components of this phase. The data collected and gained through the three components provide complementary insights that inform a set of draft design principles.

Chapter 4: Phase 1: Initial Data Gathering - Survey provides details of the survey instrument developed, and analysis of the results from the survey. The chapter concludes with a comparison of the results of this survey with the Academic Level survey (West, Heath, et al., 2016, West, Huijser, et al., 2016)

Chapter 5: Phase 1: Initial Data Gathering - Interviews provides a discussion of the Phase 1 participant interviews, and deductive and inductive thematic analysis of the main themes that emerged from these interviews.

Chapter 6: Initial Data Gathering - Log Data of staff interactions provides discussion of the analysis of staff usage of their course sites and provides a comparison of usage of LA reports at the institutional level. The chapter concludes with discussion of ways in which these types of reports can be used.

Chapter 7: Phase 2: Draft Design Principles and applying the Behaviour Change Wheel to develop a Learning Analytics Implementation Plan first provides a summary of the Phase 1 results reported in Chapters 4, 5 and 6, and compiles a list of draft design principles. An overview of the BCW is then provided followed by a discussion of how this framework was applied in this study. The chapter concludes with an outline of the resulting LA implementation plan.

Chapter 8: Phase 3: Trialling of Implementation Plan with Expert Group and Iteration 1 first provides an overview of the insights from the workshop held with an expert group and then analyses the results from Iteration One of the trial of the LA implementation plan. Modifications to the plan following this iteration are also outlined.

Chapter 9: Phase 3: Trialling of Implementation Plan Iteration 2 provides further discussion of Phase 3, with a focus on the results and analysis from Iteration Two. Comparison of results from the two iterations are also provided with discussion of further modifications to the implementation plan.

Chapter 10: Phase 4: Discussion and Conclusion presents the key findings and details of the original contribution to knowledge of the research, bringing each of the phases together through discussion of the success of the implementation plan, confirming how successfully the research questions have been addressed and making recommendations for use of this approach and implementation plan at USQ and other institutions.

Chapter 2: Literature Review
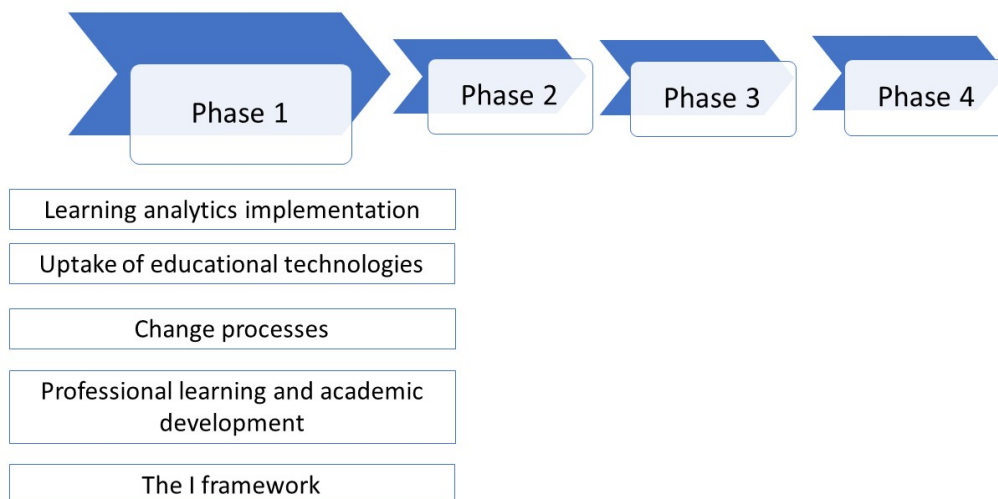
2.1 Introduction

The purpose of this chapter is to provide a theoretical foundation for this Design-based research (DBR) study. The study sits at the intersection of four areas of knowledge: Learning Analytics (LA) implementation frameworks, the uptake of educational technologies, change processes with particular emphasis on the Behaviour Change Wheel (BCW) as a framework for structuring behavioural change, and professional learning and academic development, as outlined in Figure 1 (Chapter 1). In order to address the Research Question, this literature review first discusses implementation strategies for LA that have been adopted worldwide, including those at the institutional level. LA is a relatively new field, with the first international conference occurring in 2011. As such, throughout this chapter, early research is considered to be any research that was published between 2011 and 2015 and recent research anything published since 2015.

The lessons learned from implementation of other educational technologies are also considered in this review as this is a field that has a longer history and similar concerns to LA implementation. Change management is also discussed with a focus on behavioural change, as an understanding of these

processes will assist in development of an effective LA implementation plan. Academics' implementation of LA is a core issue for this study and hence a discussion of effective professional learning is also included. These discussions are situated within the context of higher education learning and teaching.

The higher education context in Australia is also subject to the policy and guidance from the federal government. From 2020, the Australian Government have introduced performance-based funding for learning and teaching (Wellings et al., 2019). One performance measure included in the new funding model is student experience, which will be measured by student satisfaction with teaching quality. This will be measured through responses to the annual Quality Indicators of Learning and Teaching (QILT) surveys (qilt.edu.au). If academics can use LA effectively to enhance their students' experience, this is likely to impact positively on their QILT rankings and hence contribute to on-going funding, in addition to improved learning for the students.

2.2 Learning Analytics Implementation

The potential of effective use of LA to improve learning and teaching in higher education has been widely recognised (Clow, 2012; Long & Siemens, 2011; Siemens et al., 2013, p. 327). In practice though, this promise is only slowly being recognised and realised by academic staff (Howell et al., 2018). This section will consider the main reasons that are presented in the literature for adopting and implementing LA in higher education institutions, implementation strategies and frameworks, and the benefits and challenges of implementing LA.

2.2.1 Reasons for Implementation.

Drivers for LA implementation in higher education institutions can be grouped into three main areas: student learning experience, learning design and curriculum improvement, and teacher performance. The ways in which each of these drivers have been discussed in the LA literature are now discussed.

The student learning experience has been discussed as a major impetus for implementation of LA (Drachsler & Greller, 2012, Falcão, 2020). Grouped under this reason are issues including improving student retention through identification of students at risk; predicting and improving student success; and providing new insights into learner behaviours and learning. Improving student retention is a priority in many institutions and LA data can be used to identify students at risk of failure and assist academics to implement interventions to support students and minimise these risks (Buerck & Mudigonda, 2014; van Harmelen & Workman, 2012; West, Huijser, et al., 2016). A broader approach of using LA to build understanding of learner behaviours and learning and teaching practice has also been identified (Colvin et al., 2016; Drachsler & Greller, 2012; Gasevic et al., 2015; San Diego et al., 2012). This broader approach was identified as having greater potential to lead to more sustainable implementation of LA and hence will be the approach adopted through this study (Colvin et al., 2016).

Identifying good practice in learning design and supporting curriculum improvement are motivations for implementing LA discussed in the literature. These approaches include improving the quality, effectiveness, and efficiency of the learning processes and identifying current pedagogical practice, determining any improvements needed and evaluating the outcomes of implementing those improvements (Greller & Drachsler, 2012; San Diego et al., 2012; van Harmelen & Workman, 2012). A related motivation is building staff capabilities in pedagogical and curriculum areas. Aspects of teachers' performance that have been discussed in the literature include developing teachers' reflective practice; ways of providing proactive feedback to students; and identification of effective and non-effective teaching practice (Drachsler & Greller, 2012; West, Heath, et al., 2016).

A common thread through the literature is that the data should not be considered in isolation and that context needs to be considered, otherwise innovation in learning and teaching may be limited (Greller & Drachsler, 2012; Howell et al., 2018). It will be important to allow for some personalisation and contextualisation of support in the LA implementation plan in this study to meet the different approaches and motivations of

participants. Understanding the reasons individual staff wish to engage with LA will be an important first step as this will help set relevant and realistic goals (Gunn et al., 2017). The plan will also need to integrate LA into discussions of pedagogy and curriculum design to enable staff to recognise the benefits for them and their students from engaging with LA. The benefits for students include a more effective and engaging learning experience, and for staff, the benefits include a better understanding of their students and the ways in which they approach their learning and interaction with the LMS which can lead to more efficient and effective practices. Further discussion on the benefits of engaging with LA are included in Section 2.2.4. Combining these elements will ensure the plan is able to be scalable and generalised both within the university and more broadly to other institutions (Ferguson et al., 2014)

2.2.2 LA Implementation Strategies and Frameworks.

Globally, a range of frameworks and implementation strategies have been developed to assist institutions in effective take up of LA. Early frameworks focused on process and the technical aspects of capturing, accessing, cleaning, visualising and working with available data, and were aimed at an institutional level and strategy development (Ferguson et al., 2014; Greller & Drachsler, 2012; Sclater & Bailey, 2015; Siemens, 2013). These frameworks often had a key outcome of improving student retention (van Harmelen & Workman, 2012; West, Heath, et al., 2016). As LA has its roots in computing, Big Data and data mining, many of the early frameworks had a focus on workflow of the data, including what information could be collected and considered, and how this could be used (Ferguson et al., 2016). As these early institutional and top-down implementation strategies tended to be driven by central ICT units who did not engage with academic staff or seek their input, a disconnect resulted between the intended and actual use of LA and the perspectives of stakeholders, such as academic staff were not included. (Clow, 2012, Ferguson et al., 2016). This disconnect was potentially further impacted by the lack of easy access to data from Learning Management Systems (LMS) (Beer et al., 2014). As the field has evolved, the focus has (slowly) shifted and more recent strategies and frameworks focus on

learning: what does the data tell us about learning and how can this be used for enhancement of learning design and student experience?

Three main types of representations of frameworks were identified in the literature: cyclical, where the process is continual and iterative; linear, where each step builds on the previous in a unidirectional manner; and combination, including elements of both of these. A cyclical process is portrayed in several of the process focussed frameworks and models (Clow, 2012; Siemens, 2013), whilst some frameworks, with a process, inputs or outcomes focus, have adopted a more linear approach with defined steps or stages (Campbell et al., 2007; Colvin et al., 2017; West, Heath, et al., 2016). Some process focussed frameworks have combined cycles and stages (Dron & Anderson, 2009; Elias, 2011). Whilst some of the process focussed models only include processes (Campbell et al., 2007; Dron & Anderson, 2009; Siemens et al., 2013), others include consideration of stakeholders, including learners, academics and the institutions (Clow, 2012; Elias, 2011) and resources such as computers and programming to process the large amounts of data (Elias, 2011). The importance of different dimensions is discussed by Greller & Drachsler (2012), who outline a framework consisting of six critical dimensions: stakeholders, objectives, data, instruments, external limitations and internal limitations that can be implemented at multiple levels within an institution.

Some frameworks, particularly those at the institutional level, provide a theoretical and policy driven lens. For example, the SHEILA (Supporting Higher Education to Integrate Learning Analytics) framework was developed "to assist with strategic planning and policy processes for learning analytics" (Tsai et al.,2018, p. 5). Three of the domains of the SHEILA framework (Dimension 3: Identify Desired Behaviour Change, Dimension 4: Develop Engagement Strategy and Dimension 5: Analyze Internal Capacity to Effect Change) (Tsai et al. 2018) link directly to the approach being taken in this study, with this study building on these principles to develop a pragmatic approach to change the identified behaviour though increasing staff capabilities.

Other frameworks have a more practical approach focusing on how LA can be used and the links between the technical and human components of LA implementation (Greller & Drachsler, 2012; van Harmelen & Workman, 2012). Whilst the theoretical and policy-based frameworks will inform the design and development of the LA implementation plan in this study, the focus of the plan will be on a practical implementation at an individual academic level and the plan will be mainly informed from the learnings of the frameworks with a practical approach, some examples of which are now discussed.

The exploratory Learning Analytics Toolkit (eLAT) is one early example of a strategy that focussed on helping academics "to self-reflect on their technology-enhanced teaching and learning scenarios and to identify opportunities for interventions and improvements" (Dyckhoff et al., 2011). One concern with this tool is that data is de-identified, meaning staff are not able to identify or provide any support to specific students. An alternative approach is offered by the IRAC framework (Information, Representation, Affordances and Change) which aims to "improve the analysis and design of learning analytics tools and interventions" (Jones et al., 2013, p. 446). Whilst this framework has a focus on design and development of LA tools, there are learnings that will be applied in this study to ensure that relevant data (information) is made available to academics in a format that is easy to understand (representation) and that will lead to academics using the data (affordances). If issues are found in any of these areas, changes will be recommended to USQ and/or Moodle as appropriate.

A user-centred approach, which places the academic as the focus, was developed by Beer et al. (2014), who discuss three paths for institutional implementation of LA of 'doing it to', 'doing it for' and 'doing it with' teachers, and suggest a balance of the three is the most effective approach. According to the authors "'Do it to' describes the top-down, techno-rational and typical approach to ICT adoption in higher education" (Beer et al., 2014, p. 246). 'Doing it for' refers to development of applications of technology to LA and associated professional learning by staff and external software providers, which often occur with no consultation with academics and are

only effective for a small proportion of academics. The 'do it with' approach involves working with academics in the context of their course site and the "current reality of L&T" (Beer et al., 2014, p. 247) and helping academics to change their practice and thinking as needed.

The teacher is also central in the Learning Analytics for Learning Design Conceptual Framework (Bakharia et al., 2016). In this framework, five different types of LA data (temporal, comparative, tool specific, cohort dynamics and contingency) are compared to provide information to an academic relative to the specific learning and teaching context. The teacher is then supported to implement changes to their course design and/or teaching practice based on the insights provided. A specific open-source software (the Loop tool) has been developed by the authors to provide these types of insights to academics, however this has not yet been implemented at USQ. The conceptual approach though will inform the development of the LA implementation plan in this study and staff will be introduced to the different types of LA data and supported to implement interventions in their course based on insights from the analysis of the data.

Amongst the exponents of practical approaches, including those discussed above, there is agreement that the LA process includes several steps. The steps in the LA process in this context involve taking the raw data provided in log reports and other formats, analysing and interpreting that data to form actionable insights, devising and implementing an intervention and evaluating the effectiveness of the intervention. The process also involves providing support for academics to engage with all steps of the process. It is important in this multi-step process to begin with a specific question, for example, "How can I encourage more students to engage in the online discussion forums?" or "Is there any correlation between time spent in the LMS and student grades?" (Corrin et al., 2013; Jones et al., 2013; Olmos & Corrin, 2012). The next step adduced from the more practical literature is to determine what data is available to address that question and how this can be accessed. The data then needs to be analysed and interpreted so that actions can be put in place to effect change. Finally, evaluation needs to occur to determine what effect, if any, these actions had, how the whole process

worked, and what changes could be made moving forward. If necessary, the whole cycle can be repeated at a more granular level and/or to continue the cycle of improvement (Gasevic et al., 2015; Siemens, 2013).

What is common across the frameworks and models is the importance of action or intervention as part of a "closing the loop" process and situating all projects within the specific institutional context. As Jones et al. (2013) note, "If institutions are going to successfully harness LA to address the challenges facing the higher education sector, then it is important to move beyond slavish adoption of the latest fashion and aim for mindful innovation" (p. 446). This study will provide one example of this mindful innovation by building on the ideas in these frameworks to design, develop, trial and evaluate a multi-step LA implementation plan to support individual academics to investigate a question of their choosing about their course.

2.2.3 The I Framework

Prior to undertaking this study I developed a conceptual framework that brings together many of the aspects discussed in the previous sections: the I Framework (Jones, 2015). The I Framework was designed as a practical, ground-up approach to LA implementation for individuals or small groups. The framework consists of a series of questions that would be beneficial to discuss when commencing LA implementation. The I Framework was built on aspects of many of the above frameworks and situates the cyclical process of LA within a specific institutional context. Institutional context is presented as the foundation of the framework building on the frameworks that have an institutional focus and in recognition of the importance placed in LA frameworks on institutional policies and guidelines (Gasevic et al., 2015; Hrabowski III et al., 2011; Macfadyen et al., 2014; Tsai et al., 2018). The institutional context in the I Framework includes the policies and strategic directions that have been set for implementation of LA. This context also incorporates the support structures, including technologies and/or data warehouses. Academics need to have an awareness of this context to ensure they are following the parameters set by their institution. Academics follow through the implementation framework by considering the following

questions and taking appropriate actions at each of the steps. Further details of each step are included in an early conference presentation of mine (Jones, 2015), and the links between each step are outlined in Figure 5:

Impetus: Who will be driving the implementation and what are the specific questions to be addressed?

Input: What data is available to address the question, who has access to this information and how do staff access this in a format that is easily analysed?

Interrogation: How is the data going to be analysed and interpreted and who will be responsible for this? Who will be provided with the results of the interrogation?

Intervention: What actions are planned as a result of the interrogation and who will be responsible for taking those actions?

Impact: How successful was the process of implementation and what was the impact of interventions?

Whilst the framework is initially sequential, it can be considered as an iterative process and any step can be revisited and process refined following reflection at each step. For example, if an intervention was found not to be successful during the impact step, an academic could choose to revise any of the initial impetus question, and the data used to address that question, their interrogation of the data, or the intervention itself.

Figure 5

The I Framework
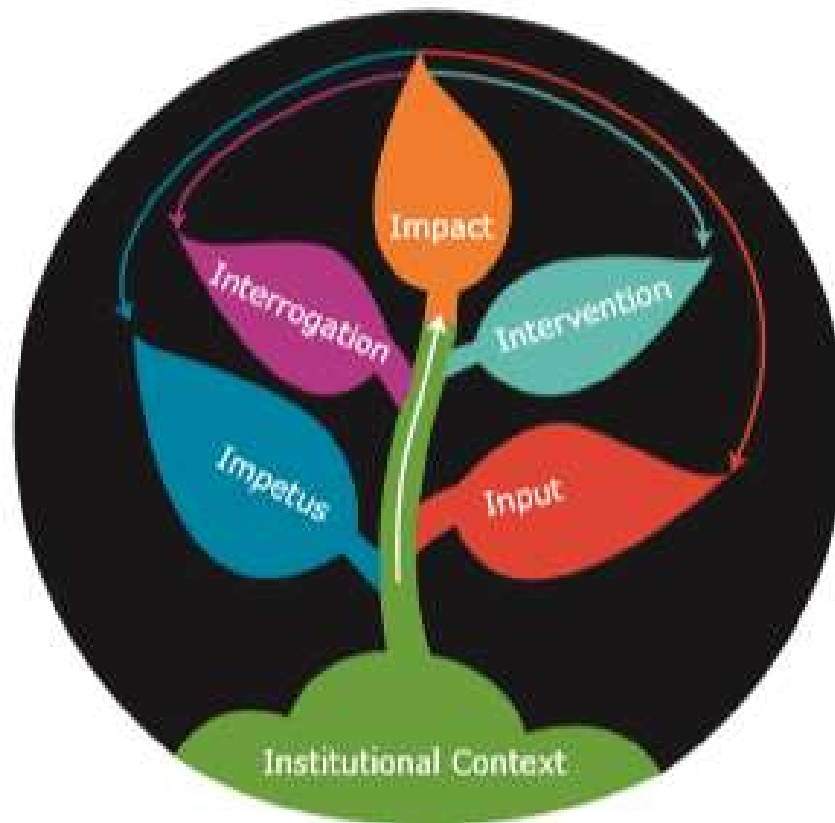
The value of this type of approach has been affirmed in recent literature. For example, Gunn et al. (2017) used a similar series of questions in their workshops while Howell et al. (2018) reported that academics want an approach to LA implementation that starts with a question about learning and then considers what data will address that question and how to interpret that data. The lack of interventions resulting from LA insights or consideration of their impact in use of LA has been noted as a concern (Fritz & Whitmer, 2017), and the I Framework provides one approach to address those concerns through inclusion of those steps in the framework, and guidance on how to undertake those steps. This framework will inform the development of the LA implementation plan through this study and be used guide interview questions with participants.

2.2.4 Benefits and Challenges.

The benefits that staff can obtain through engaging with LA are closely aligned to the reasons for implementation and have been reported from the student, institutional or teacher perspective. Benefits in this context are advantages gained through engagement and take the format of improved practice, improved learning and teaching environments, enhanced knowledge and skills, all of which can lead to greater levels of satisfaction for staff and students. Many of the benefits identified in the literature cross two or more of these perspectives however, this study focused on the teacher perspective.

From a teacher's perspective, the main benefits of using LA have been reported as including identifying aspects of curriculum that result in greatest interaction and progress from students (Dawson et al., 2008; Hilliger et al., 2019; Konstantinidis & Grafton, 2013), and self-reflection which helps to identify areas for improvement in curriculum design and pedagogy (Corrin et al., 2013; Dawson et al., 2008; Greller & Drachsler, 2012; Ifenthaler & Yau, 2019; Siemens, 2013; van Harmelen & Workman, 2012). The changes to curriculum design and pedagogy that result from LA insights can be implemented either for the current offering of a course, providing immediate benefit for staff and student, or longer term, meaning the benefits will not be realised until future offerings of the course. Both approaches have merit and implementation will depend on the level of change required and time available for staff. Realisation of these benefits though will need behaviour changes for students and staff, as well as institutions ensuring appropriate action is taken as a result of insights from LA (Sønderlund et al., 2019). This study will focus on staff behaviour change.

The linkages between LA and learning design (LD) have also been widely discussed in the literature with LA being shown to be a valuable tool to inform and evaluate LD (Lockyer et al, 2013). As discussed in Section 2.2.2, the Learning Analytics for Learning Design Conceptual Framework (Bakharia et al., 2016) is one framework developed to promote these linkages and enable academics to evaluate different aspects of their LD. Learning analytics have been shown to support LD decisions if they are "collected from

multiple data sources, modes, or learning settings; embedded in teachers' everyday practice; and a regular part of student's learning processes" (Mangaroska & Giannakas, 2019). The second of those components, e"mbedding in teachers' everyday practice" is a key aspect of the LA implementation plan in this study.

Whilst the linkages between LA and LD are considered as a benefit of using LA, they also present a challenge for researchers in resolving how learning is actually measured and whether some of the data measured is an accurate proxy for learning and then how to transfer the learnings from the research to teaching practice (Ferguson & Clow, 2017; Lodge et al., 2017; Wise & Cui, 2018). Collaborations between multidisciplinary teams within and across institutions has been offered as one approach to overcoming these challenges and a series of guiding principles have been recommended (Wise & Cui; 2018, pp.1805-1806):

1. Ground Analysis in Theory.
2. Characterize the Context Richly.
3. Justify Choice of Data and/or Features.
4. Make Sense of High-Level Patterns using Low-Level Data.
5. Present Analytics Results Connected to Learning Processes.
6. Appraise Scope / Boundaries of Applicability.
7. Consider Theoretical Implications.

The main pragmatic challenges facing the effective implementation of LA cover a range of socio-technological aspects. Technical and technological issues with the adoption and utilisation of LA by teaching academics have been identified as data quality and difficulty in accessing relevant student data in a format that can be readily analysed and interpreted (Ferguson et al., 2014; Macfadyen & Dawson, 2012). Sociological aspects of LA implementation that impact on academics' use have been reported as including building staff capabilities and skills regarding using LA as well as pedagogy and curriculum design, and concerns about privacy, ownership and ethical use of data (Ifenthaler & Yau, 2019; Macfadyen & Dawson, 2012; Sclater & Bailey, 2015; Siemens, 2013). Lack of involvement of stakeholders due to low levels of knowledge of benefits of LA and what that involvement

entails has also been acknowledged as a continuing challenge (Hilliger et al., 2019).

Discussions of ethical use of data have been prominent in the literature and included in several frameworks (Corrin et al., 2019; Drachsler & Greller, 2016; Hilliger et al. 2018, Tsai et al., 2018). These discussions and frameworks though have mainly been aimed at the institutional level and provided recommendations for policymakers. Building staff awareness of the importance of using student data in an ethical manner is an on-going concern to build students' trust in LA and ensure that data is appropriately collected and interpreted and ensuing interventions are relevant and effective (Pardo & Siemens, 2014; Slade & Prinsloo, 2013). Conversations and training on ethical use will be an important component to include in the implementation plan developed in this study.

The emphasis on technical aspects of implementation, rather than the cultural and human factors, including behavioural change, has been noted as a barrier to successful implementation (Ferguson et al., 2014; Macfadyen & Dawson, 2012). For example,

> Clearly, learning analytics researchers face a significant challenge, since their primary focus is on issues such as the development and testing of algorithms and visualizations. When they develop analytics that can support learning and teaching, few analytics projects will have the capacity to undertake an ethnographic study of institutional culture or a review of recent thinking on change management. Few will have team members with experience of writing a research report that compels its audience to action. Yet the learning analytics community needs to investigate these issues and to engage its audience, if it is to achieve its aim of optimizing learning and the environments in which it occurs. (Ferguson et al., 2014, pp. 124-125)

This study will consider ways in which academic staff (the audience) can be engaged through an implementation plan that focuses on these human factors, whilst not neglecting the technological concerns.

2.2.5 The Role of ICT in LA Implementation

As much LA involves analysis of data from an LMS and other online environments, the role of information and communications technology (ICT) is an important aspect to consider. Processes include the extraction of data, cleansing of data and manipulation to a form that is readily usable by academics, through to the analysis and possible visualisation of the data (Corrin et al., 2013; Klein et al., 2019; Kovanovic et al., 2015). The continuum of use ranges from simply downloading the log data from the LMS into an Excel spreadsheet and manually examining the information through to large and sophisticated data warehouses that collate information from a range of institutional systems, manipulate the data and automatically provide specific analyses and visual representations of the data (Hrabowski III et al., 2011; Konstantinidis & Grafton, 2013). Log data in the context of this study refers to spreadsheets extracted from the LMS that includes information of every action taken by staff and students. Details recorded in the log data include name and unique identifiers for the person taking an action, date and time of the action, and nature of the action. This study relies on manual processes for data extraction from the LMS and manipulation and analysis of this data, due to the lack of any relevant data warehouse within the institution.

2.2.6 Lessons from Educational Technology Implementations.

Implementation of LA can also be informed by the insights gained from research into successful implementation of educational technologies. For many years, higher educational institutions have been implementing educational technology innovations, with varying degrees of success. Factors that have been reported as having positive impact on success include empowering and engaging staff through inclusive and collaborative approaches; the provision of professional development and suitable infrastructure and technology frameworks; and policy and planning strategies (Campbell et al., 2007; Ertmer, 1999; Gosper et al., 2010; Lawson et al., 2015; Scott, 1999). Professional development is considered a key factor as successful implementation of any educational technology relies on competence of academics in aspects of the how, when and why of use (Englund et al., 2017, Cuesta Medina, 2018). It is the focus on the human

factors and ways in which these are linked to the technical aspects of educational technology implementation that have been attributed as impacting on success (Castro, 2019, Cuesta Medina, 2018). Technologies which utilise and enable educational data analysis can also contribute to the improvement of learning and teaching processes and it is these types of technologies which will be important aspects of LA implementation (Castro, 2019).

Many common barriers to implementations have been reported and the lessons learned from these innovations cover the full socio-technological range. These barriers include issues that can be grouped into three main categories: lack of professional development, staff resistance, and institutional constraints. Lack of time and the lack of reward have also been noted as significant factors that limit educational technology uptake (Bates & Poole, 2003; Zhou & Xu, 2007). The learnings from this body of research are that engaging staff through provision of professional development and opportunities to collaborate with peers will be important factors in developing an effective LA implementation plan.

The LA implementation will also draw on my own previous research into barriers to engaging in online teaching through development of the PESTER plan for supporting staff to transition to online teaching (Jones, 2008). This plan included six stages of successful implementation of initiatives aimed at increasing staff uptake of online teaching:

1. Planning and promotion: of initiatives to engage staff and explain why that approach is relevant to them.
2. Education: of what is involved in the initiative.
3. Support: to undertake the transition to online learning.
4. Training: in the skills required to effectively adopt online teaching.
5. Encouragement: to be involved through provision of a nurturing environment.
6. Recognition and reward: both informal and formal for successful transition.

These steps and approaches are also applicable to LA implementation and the design of the plan developed in this study will link mainly to Steps 2 to 5 in the following ways:

- Education on the benefits of engaging with LA;
- Support to develop their skills and knowledge of LA tools and reports;
- Training in how to access, analyse and interpret data and determine appropriate actions to take as a result of that interpretation; and
- Encouragement to engage with LA through development of a positive, collegial community.

2.2.7 Links to LA Implementation

Many of the elements identified as being important factors for successful LA implementation are similar to those noted above for implementation of different educational innovations as this will help ensure that LA "make sustained and meaningful contributions to learning and teaching" (Beer et al.,2014, p.242). Involvement of all relevant stakeholders at all stages of implementation is considered an important aspect of LA implementation and measure of success, as it is these different groups of people who will interpret this data and make meaning of the data for their different context. (Beer et al., 2014; Gasevic et al., 2015). Whilst the different groups of stakeholders can include students, senior management, IT support staff and academics, this study will focus on academics a group of stakeholders who have to date received little attention in the LA literature, as discussed in Section 1.2.1 Integration with educational research on effective institutional practice is considered important to provide links between the data and impact on learning as it is in this way that LA will be able to transform educational practice (Gasevic et al., 2015). Strong leadership (Hrabowski III et al., 2011) and involvement of stakeholders can also contribute to development of a positive LA culture and implementation of appropriate policies (Gasevic et al., 2015; Macfadyen et al., 2014) which are needed for adoption, and successful long-term implementation of LA.

Additional barriers to those noted above in Section 2.2.6 for the uptake of educational technologies that are included in the literature for LA

implementation include lack of relevant skills such as managing, analysing and interpreting data. This is a barrier that can be minimised through development of staff skills (Gunn et al., 2017; Rehrey et al., 2019).

Difficulty accessing relevant and timely data is a further barrier which can be overcome through provision of appropriate infrastructure that enables staff to easily access and interpret data(Gunn et al., 2017; Klein et al., 2019, Macfadyen & Dawson, 2012; West, Heath, et al., 2016). An understanding of learning design and pedagogical intent of using specific tools and activities are also important components for successful LA implementation (Bakharia et al., 2016; Gasevic et al., 2015; Gunn et al., 2017). The ways in which frameworks embody assumptions such as "who is defining the measures, to what ends, what is being measured, and who gets to see what data?" are also an important consideration (Buckingham Shum & Ferguson, 2012, pp. 18-19).

As the focus of this study is on individual academics and their use of LA, some of these aspects, notably strong leadership and implementation of policies are beyond the scope of this study, although it is acknowledged that these will be important aspects of any attempts to adopt LA on a wider scale. This study will also work within the institutional constraints of data availability and accessibility. Learnings that will be incorporated into the LA implementation plan include involving representatives from the stakeholder group of academics, working towards a positive LA culture and building staff skills in all aspects of using LA. Providing support and training to access and interpret relevant data will also be important components of the implementation plan.

2.3 Change Processes

To enable constructive change in teaching practice, an understanding of how change occurs within an organisation and how individuals respond to change, needs to be developed (Scott, 1999). The approach to change that was adopted in this study was behaviour change, where behaviour is defined as

anything a person does in response to internal or external events. Actions may be overt (motor or verbal) and directly measurable or, covert (activities not viewable but involving voluntary muscles) and indirectly measurable; behaviours are physical events that occur in the body and are controlled by the brain. (Davis et al., 2015, p. 327)

Whilst much of the work in behaviour change has come from health disciplines, it can be adapted to education and professional learning. The following section expands on the specific approach adopted in this study.

2.3.1 Behaviour Change

Behaviour Change theories have been used in many fields to explain why people adopt certain behaviours. In the context of this study, the behaviour being considered was the way in which academics engaged with LA to inform and enhance their teaching practice. The need to enact change to behaviour for LA implementation has also been recognised through the LA literature (Ferguson et al., 2014; Tsai et al., 2018). This study addressed the need for LA implementation strategies to "surprise and compel, and thus motivate behavioural change" (Macfadyen & Dawson, 2012, p. 161).

The Theory of Planned Behaviour (TPB) (Azjen, 1985, 1991), is an early behaviour change theory that has been widely used to describe how a person's intention to perform a behaviour is influenced by their attitude towards that behaviour. In the TPB, intent to change behaviour is also linked to a persons' perceptions of the importance significant others place on that behaviour and change (subjective norm), and amount of control they believe they hold to change that behaviour (perceived behavioural control). Their level of perceived behavioural control is influenced by their skills, time and ability to perform the desired behaviour. Whilst originally developed in the psychological field, this theory has been adopted and tested across a wide range of fields, including education and information technology. Examples of the use of TPB in higher education include examination of the willingness of academics to use social networking sites to engage with their peers (Dermentzi et al., 2016); investigation of students' attitudes towards use of ICT (Siragusa & Dixon, 2009); and the comparison of impact of

entrepreneurship education in different discipline areas (Maresch et al., 2016).

In the context of this study, it will be important to build understanding of how important academics believe it is to engage with LA, whether that import is influenced by others including their colleagues and senior management, or is internally driven and the skills, time and ability they perceive they have to engage with LA to ensure that the implementation plan is relevant and effective.

An alternative model that can be used to explain why staff choose to adopt, or not adopt LA, is the Technology Acceptance Model (TAM) as developed by Davis (1989). This model was originally developed to test the perceived ease of use and user acceptance of information technology and has a particular focus on the uptake of information systems. TAM also considers similar elements to TPB by considering how the perceived usefulness and ease of use affect attitudes and intentions, however this model does not consider the role of external influences, or an individual's perceived control over performing a behaviour. In the context of staff in a discipline within a university, context may be a factor as may time factors and skill levels and hence need to be considered. The perceived usefulness and ease of access of LA are notions that will be discussed with participants in this study through the survey and interviews in addition to other factors that may impact on their uptake of LA.

2.3.2 Behaviour Change Wheel

There is evidence to suggest that it is the intentions and beliefs of the staff (Ajzen, 1991) and the support and encouragement provided by the institution that will lead to positive change in pedagogy and learning and teaching culture (Scott, 1999). As noted in Chapter 1, the Behaviour Change Wheel (BCW) has been developed by Michie and colleagues as an effective and informed method for implementing a change in behaviour. This approach has gained widespread appeal across the public health and medical disciplines with the original article (Michie et al., 2011) being cited over 4000 times, according to Google Scholar. With such a vast array and diversity of research that has implemented the BCW it is difficult to select articles for review and synthesis and most articles focus on the use of the BCW for

specific interventions in unique contexts, with little critique or systematic review of the BCW available. Hence the discussion here focusses on articles that had a context on staff development and training and those in the higher education field.

Vallis et al. (2018) in their discussion of development of a professional learning programme based partly on the BCW identified a range of enablers to successful implementation which are similar to those identified in the LA and educational technology fields: "leadership and managerial support; resources; a team culture that embraces behaviour change; behaviour change peer leaders; supervision, mentorship, monitoring and evaluation; community of practice supporting ongoing learning" (Vallis et al., 2018, p. 76), suggesting that at least some of these components in the implementation plan developed in this study would be likely to lead to successful implementation and behaviour change. The main benefits of using the BCW identified by Loft et al. (2017), included its support to take a complex question and develop a intervention through a pragmatic, step-wise approach.

Limited examples of use of the BCW in higher education were available and had a focus on student engagement (Wilson et al., 2019) and data management practices of researchers (Hickson et al., 2016, Wolski & Richardson, 2015). A comparative approach was adopted by Wilson and colleagues who mapped elements of the BCW against guidelines on student engagement and found that they were generally able to match these, although they had difficulty in matching confidence directly to any of the COM-B components. A limitation of this study was also that they did not apply the BCW in practice. An adaptation of the COM-B model was developed in investigations of data management practices of researchers, to include attitudes as an additional component of the COM-B model (Hickson et al., 2016, Wolski & Richardson, 2015). However, as these researchers only used the COM-B model and not the full BCW, it was not considered appropriate to use this version in this study.

As noted in Section 1.3.2, behaviour change techniques (BCT) are the practical ways in which the BCW can be enacted. A systematic review of use

of BCTs for technological support for healthcare professional practice found that *instruction on how to perform the behaviour* was the most commonly used and effective BCT (Keyworth et al., 2018), suggesting this would be an effective strategy in this study due to the focus on technological support.

Within the health psychology field, there has been some contention regarding the usefulness of the BCW, with Ogden (2016a) debating that the general nature of the approach reduces its validity. However, it is that generalisability that other authors believe are one of the model's strengths and one of the reasons it was chosen for this study (Abraham, 2016; Ogden, 2016a, 2016b; Peters & Kok, 2016). The limited reports of uptake of the BCW for evaluation of pedagogical approaches in the higher education sector, have indicated that this is an effective approach (Wilson et al., 2019; Wolski & Richardson, 2015).

This study thus contributes to the literature by demonstrating how the BCW is applicable in Higher Education for the uptake of LA. Further details of the rationale for using the BCW are included in Chapter 3 and the ways in which the BCW was implemented are discussed in Chapter 7.

2.4 Professional Learning Approaches

Professional learning is a key component of academic development and of this study. The preferred definition of professional learning used to inform this research was: "activities and processes that academics engage in to ameliorate their academic performance and the impact of their performance on student learning" (Saroyan & Trigwewll, 2015, p. 93). Whilst a range of other terms are also used in the literature to describe these types of activities, including academic development, professional development and capacity building, I have chosen this terminology as it emphasises the importance of academics engaging deeply with ongoing learning opportunities that are centred on developing knowledge, strategies, and skills that lead to improvements in student learning. Professional learning can incorporate formal and informal opportunities and moves beyond one-off workshops. Conversely, academic development is seen more as the discipline or field in which professional learning occurs (Saroyan & Trigwewll, 2015; Sutherland,

2019), with a focus on workshops and other formal events that occur away from the academic's normal workspace. Professional development can also refer to formal one-off events such as workshops or webinars which have a focus on delivering content (Webster-Wright, 2009). The long-term benefits of these single events have been shown to be much less than on-going professional learning which is more concerned with enhancing the learning of participants and can include a combination of small group sessions, individual support, peer learning, and self-help resources (Timperley, 2011; Van Schalkwyk et al., 2015).

The need for staff to engage with professional learning and maintain currency with innovations in educational technology and pedagogical approaches is also important from a regulatory perspective. In the Australian Higher Education sector, quality assurance is regulated by the Tertiary Education Quality and Standards Agency (TEQSA), and these standards are articulated through the TEQSA Higher Education Standards Framework (Threshold Standards) (2015). Of particular interest for this study is Domain 3: Teaching and the accompanying Guidance notes, which state in part:

> The Standards concerning the capability of teachers (including contemporary knowledge, continuing scholarship and relevant teaching skills) presuppose continuing professional development of teaching staff if a provider is to meet and continue to meet the Standards, although the Standards do not specify how this might be achieved. (TEQSA, 2017, p. 2)

The importance of professional learning and capacity building of academic staff has also been considered in recent LA literature with several authors noting that it is through such activities that a change in teaching and learning culture will be cultivated (Baer & Norris, 2017; Gunn et al., 2017; Rehrey et al., 2018; Wise & Vytasek, 2017). It has also been noted that this professional learning needs to include elements that will build staff competence in accessing, interpreting and implementing LA (West et al., 2018), providing a link to several of the steps of the I Framework. Building capacity in the use of current systems and preparing staff for use of future developments has also been noted as an important component (Ferguson et al., 2016). A successful

Learning Analytics Fellows Program (LAFP), which involved a year-long program of support and opportunities to research into LA, has been proposed as one approach to providing ongoing support (Rehrey et al., 2018; Rehrey et al., 2019), whilst a one-off workshop for staff promoting practical applications of the LA-LD framework was an outcome of a national study in New Zealand (Gunn et al., 2017). These approaches will all inform the development of the LA implementation in this study which will include elements from each approach. For example, adaptation of the workshop developed by Gunn and colleagues and extension of the plan over a considerable period as proven to be successful in the LAFP, are elements that will be included in the plan's design. The LA implementation will be designed to include "appropriate up-front guidance, ongoing support, diverse examples, and time for instructors and students to integrate this new form of feedback into their practice" (Wise & Vytasek, 2017, pp. 156-157), which are considered as essential elements for professional learning for academics engaging with LA.

The importance of ongoing support and professional learning opportunities in digital literacy has also been noted and applies equally to LA:

> what is missing (from professional development regarding digital literacy) is a deep intellectual and experiential engagement with underlying concepts. To address this challenge requires a shift in mindset from the deployment of individual trainings to a continuous process of exploration and definition especially because of how rapidly technologies evolve. Additionally, for universities to progress in this area, there needs to be greater institutional support and leadership from the presidential level down to the departmental level. (Johnson et al., 2014, p. 22)

Providing this continuing professional development through a sustained program which allows staff to integrate LA with discussions about pedagogy and course design will help to ensure that implementation plan developed in this study will result in behaviour change and the uptake of LA by academics will increase.

2.4.1 Social Learning

Learning with and from others is an important aspect of professional learning as this can help build knowledge and capabilities of both the individual and the group (Wenger et al., 2011). This study considered social learning from the perspective of two definitions: "a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks" (Reed et al., 2010, p. 6) and "A pragmatist social learning perspective emphasizes both learning as acquisition through experience and inquiry, and learning as development of identities and socialization through individuals' capacities to both adapt and change" (Brandi & Elkjaer, 2011, p. 33). Together these definitions encapsulate the notion of individual academics building their own and each other's knowledge in a synergistic manner that can lead to changes for themselves and the wider university and align well with the aims of this research. Social learning opportunities where participants can network and learn with and from each other will be an important component to include in the LA implementation plan in this study.

2.4.2 Evaluating the Value of Professional Learning

The literature shows that a robust examination of evaluation of the impact or value of professional learning is a further aspect that needs to be given consideration (Moya et al., 2019; Phillips et al., 2012; Saroyan & Trigwewll, 2015; Timperley, 2011). The impact of professional learning has been considered in business contexts with Kirkpatrick's framework being one model for measurement of impact that had been adopted widely and adapted over the last six decades (Alliger & Janak, 1989; Kirkpatrick & Kirkpatrick, 2016). The original model developed by Don Kirkpatrick has been modified recently by his children and cites four levels of impact: reaction, learning, behaviour and results (Kirkpatrick & Kirkpatrick, 2016). In the educational field, Kirkpatrick's ideas have been adapted to focus on value, rather than impact, through development of a "framework for promoting and assessing value creation in communities and networks" (Wenger et al., 2011, p. 5). It is this lens that will be applied in measuring success of the professional

learning in this study. The value creation framework includes five cycles of value which are linked through a complex and non-linear relationship:

1. Immediate value – the activities and interactions of the professional learning having value in and of themselves.
2. Potential value – knowledge capital that can be realised and include five aspects: human capital, social capital, tangible capital reputational capital, and learning capital.
3. Applied value – changes in practice.
4. Realised value – performance improvement.
5. Reframing value – redefining success.

This framework has been reported as providing a useful measure of educators' perceptions of the value of participation in online communities and gaining insights into activities and tools that support the different levels of value creation (Booth & Kellogg, 2014, McKellar et al., 2014). Benefits were reported included enjoyment of engaging in collegial discussions (immediate value) through to changing practice through adaptation of ideas from other members of the network (applied value) (Booth & Kellogg, 2014). The ability of the value creation framework to empower researchers to discover the impact of participation in networked learning opportunities means it is a suitable approach to adopt as one measure of success of this study through matching of the ways in which participants report on the value of their participation with the different levels of the framework.

2.5 Chapter Summary

This chapter has provided a review of four areas of study: LA implementation frameworks, the uptake of educational technologies, change processes with particular emphasis on the BCW, and professional learning and academic development. The aim of the chapter was to situate this study at the intersection of these four areas to provide a strong theoretical foundation on which to undertake the research. The focus of LA implementation frameworks was found to have evolved from initial considerations of the available data and processes to collect, cleanse and analyse, to approaches that also included human and sociological factors. Lessons from uptake of

educational technologies that were found to be transferable to LA implementation ranged from the need to consider technical issues through to building staff capabilities in technical, pedagogical and curriculum design.

In summary, the learnings from this literature review are that an effective LA implementation plan that will likely result in behaviour change and increased awareness and uptake of LA needs to begin with building knowledge of staff motivations. The plan needs to be situated within the specific context of the institution in which it is being implemented and includer professional learning opportunities targeted at individuals and small groups. This capacity building should include integration of LA knowledge and skills with pedagogical and curriculum design matters. Easy access to relevant data and support to analyse and interpret that data in order to develop interventions are also important considerations and the plan should also include evaluation of those interventions and the value of the professional learning provided. The importance of integrating these different aspects through intentional design was also noted in the LA context:

> Intentional implementation design is essential, not optional, for learning analytics adoption. If we wish to avoid the fate of too many promising technologies that never made a real impact on education, research into the interplay of human and technological elements influencing analytics use is a critical area for attention in the field moving forward". (Wise & Vytasek, 2017, p. 157)

This study will build on many of the positive aspects of current LA frameworks to develop a pragmatic LA implementation plan that can be utilised by individual academics while being situated within the particular policies and imperatives of the institution. Change processes will be considered and the study will adopt the BCW to design and develop a LA implementation plan that focusses on the professional learning of individual academics. This deliberate and considered approach will fill a gap in the literature through contribution of a novel and effective LA implementation plan for the specific USQ context that will also be able to be adopted and adapted in other institutions.

Chapter 3: Methodology
and Methods
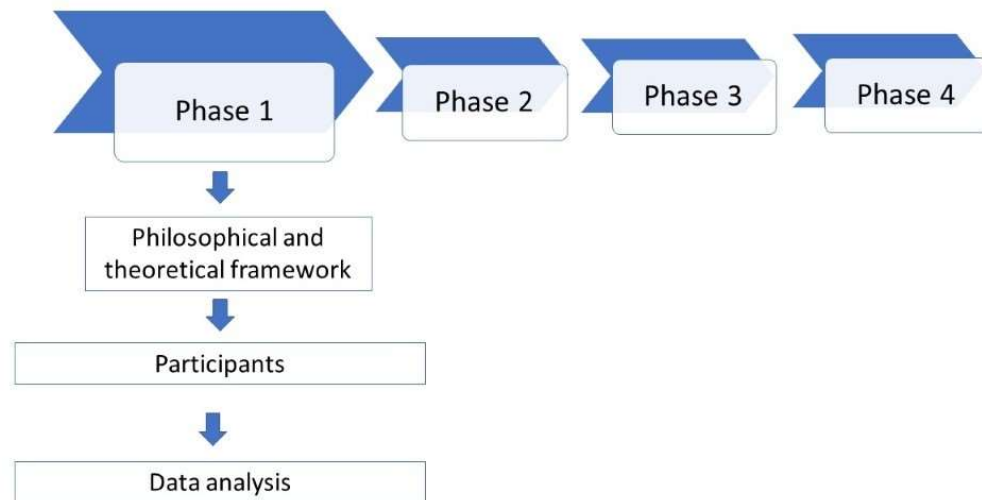
3.1 Introduction

The overarching aim of this exploratory qualitative study was to investigate
the requirements and characteristics of an effective Learning Analytics (LA)
adoption strategy in a regional Australian university. This task was achieved
by addressing the four research sub-questions:

1. What do academics identify as the barriers and enablers to the
   implementation of LA in their teaching practice?
2. Which aspects do academics engaging in a LA adoption strategy
   identify as enhancing their adoption of LA?
3. How is the LA adoption strategy effective in stimulating and
   supporting the academics' usage of LA?
4. What are the transferable design principles that underpin an effective
   LA adoption strategy?

To address this aim and these questions, it was first necessary to build a deep
understanding of the complex context of the study, including the

stakeholders involved, and in particular, academic staff and their reasons for engaging, or not engaging, with LA. I adopted a design-based research (DBR) approach to focus on the design and trial of an effective implementation plan with the narratives formed from working with participants informing the development of the specific elements of the plan. The implementation plan also needed to address the diverse capabilities and motivations of staff. Hence, I adopted an approach founded in behaviour change theories, using the Behaviour Change Wheel (BCW) to investigate what interventions would be most likely to succeed in the specific context. My background in working with academics in supporting them through professional learning and discussions of course design also influenced the decision to adopt a pragmatic approach.

This chapter first discusses the philosophical and theoretical frameworks used in this study and outlines pragmatism, DBR and BCW. It then explains how and why the connections between these created a novel approach to supporting academics to adopt LA to inform and enhance their teaching practice. The specific research methods adopted for each of the DBR phases and their various components are then discussed, followed by discussion of participant recruitment and data sources. The chapter concludes with an explication and justification for the approach to data analysis.

3.2 Philosophical and Theoretical Frameworks

The philosophical approach adopted in this study aligned with a Connectivist approach (Anderson & Dron, 2011; Siemens, 2007). In approaches informed by connectivism, knowledge is seen as evolving, and generated through the interaction of different sets of perspectives within networks (AlDahdouh et al., 2015; Downes, 2008, 2019). These networks have three types of nodes, two of which are internal to a particular person (neural and conceptual) and one external.

> In the neural level, the network consists of neurons connected by neuron's axon and dendrites (Stufflebeam, 2008). In the conceptual level, the network consists of concepts, ideas and thoughts connected by conceptual links like similarity and positive correlation. In the

external level, the network consists of people, books, websites, programs and databases connected by internet, intranet or direct contact. (AlDahdouh et al., 2015, p. 4)

The concepts involved in this study include LA and connecting this to each participants' understandings of, and approach to, teaching and course design. In this study, those different perspectives belong to the academics participating in the study and myself as the researcher. The connections in the network are between participants and the researcher as well as between participants. The new knowledge that will be built through this study is regarding the enablers that will promote academics' engagement with LA and the design principles and components that will need to be included to develop an effective LA implementation plan. The networks and knowledge building occurred within a specific institution which was a component of the external level of knowledge through the policy and guidelines that support teaching practices.

Participants in this study were a diverse group of academics; diverse in terms of disciplinary backgrounds, teaching experience and their prior engagement with LA; each having a unique view of their role as a "teacher" alongside their role as researcher, expert in their field and academic. Each participant also brought different backgrounds and experience in higher education with some being long serving academics, close to retirement (two retired shortly after their participation), to others who had recently transitioned from industry and were in their first year of teaching in higher education. Hence the implementation plan needed to be generalisable enough to be relevant for all whilst allowing for some personalisation to cater for their different capabilities and motivations for engaging with LA. Further details of the participants and the recruitment process are outlined in Section 3.3.

Explaining different perspectives was important to enable participants to appreciate the existence of alternative views to their own which could lead to a change of behaviour; which in this study was using LA to inform and enhance their teaching practice. Conversely, the experience of observing and working with participants had the potential to change my perspective as the researcher, leading to more appropriate decision-making. The institution's

perspective was espoused through their vision and mission statement, strategic plans and policy and procedural documents, and framed the context for discussions between myself and participants.

Knowledge building for participants during this study was achieved through offering suggestions of the range of data and reports participants could access, and approaches to using and interpreting the data they could adopt to make changes to their teaching practice and/or course design, whilst always allowing them to make independent decisions. Providing new information on all available options, rather than directing them to limited options, helped to ensure that participants could explore and consider their own reality. When applicable, they were directed to relevant institutional documentation to provide further context and ensure awareness of their responsibilities.

The Community of Inquiry (COI) model (Garrison et al., 1991), which emphasises the importance of social, cognitive and teaching presence in online learning environments, was used as a framework for working with participants throughout this study. I adopted this approach when opportunities for professional learning arose with participants to model good practice and build trust and rapport. I then recommended and guided them to adopt these approaches in their teaching. Similarly, I included Active Learning strategies in professional learning activities to support staff to identify ways they could adopt this approach to connect with their students (Bonwell & Elson, 1991). In the context of this study, the support was aligned to empowering staff to measure the effectiveness of their teaching approach and any changes implemented.

Deep learning, and knowledge construction, occur more freely when the "learners" take actions in a social context as part of that development, and habits are formed (Kivinen & Ristelä, 2002). These ideas also align with the theory of situated cognition as espoused by Brown et al. (1989) who note that knowledge is developed in a specific social, cultural and physical context within which it is learnt. These were important considerations in this study, with participants being provided with opportunities to learn with and from others, form the habit of engaging with LA through different touchpoints, and chances to practice using LA tools and reports. The knowledge that

I brought to this study included my knowledge of LA, educational design, and academic development, built up from 20 years' experience. Each participant brought their own knowledge, experience and background built within the culture and history of their discipline as well as the broader university culture. In terms of the external level of knowledge, there was an extensive body of literature available regarding LA, educational technology implementation and professional learning that I and the participants could draw upon to enhance our own knowledge.

Knowledge constructed through a DBR research study can be considered on several levels: design knowledge in the form of design principles, practical outputs in the form of designed artefacts, societal outputs in the form of professional learning of the participants; and contributions to the theoretical knowledge of the field (Alghamdi & Li, 2013; Barab & Squire, 2004; Herrington et al., 2007; Reeves, 2006). In the context of this study, the intended design knowledge included the design principles for a LA implementation plan for individual academic staff. The practical outputs were an online support site and associated resources created to develop staff capabilities, and the societal outputs were increased knowledge and skills of participants in using LA to inform and enhance their teaching practice. Additionally, there were the knowledge and skills that I as the researcher, gained through the research process. A further outcome from this study was building knowledge that could contribute in a meaningful way to the fields of LA and professional learning in higher education. This included knowledge of educational practices regarding LA implementation as well as strategies designed to improve those practices.

Building these different levels of knowledge and realisation of these outcomes will also contribute to solutions to the research questions in the following ways:

- Identification and discussion of the range of barriers and enablers improved both researcher and participant conceptual knowledge;
- Synthesis of each participant's unique perspectives of LA contributed to development of an effective LA implementation plan and transferable design principles; and

- Transfer of knowledge of LA from the researcher to participants and between participants supported their usage of learning analytics.

3.2.1 Qualitative Methodology

A qualitative methodology was deemed most appropriate for this research as this allows inductive investigation of a complex problem through analysis of different data sets (Creswell, 2009; Silverman, 2016). In this study, the problem centred on developing a LA implementation plan and the data sets included survey responses, transcripts of interviews and log reports of staff usage of course sites within the LMS. Whilst the overall approach was qualitative there were some elements of quantitative analysis, particularly for the survey results and log reports from the LMS.

The initial data collection phase consisted of a survey of academic staff at USQ, a series of semi-structured interviews with four pairs of academics from across USQ and log data reports of staff usage with course sites in the LMS. The purpose of the initial survey in the study was to gain insights from a broad cross-section of teaching staff at USQ to create a snapshot of the enablers and barriers to adoption as well as the beliefs, motivations and capabilities of staff regarding adopting LA, and the supports they believed they would need to adopt LA. In addition to the reasons discussed in Section 1.1, USQ was chosen as the site for this study as I was an alumni and member of the USQ community. As such I had an understanding of the context in which learning and teaching occurred and had built up a degree of trust with staff in the institution, both of which are considered important components of qualitative research (Savenye & Robinson, 2005).

Descriptive statistics were used to analyse this data to allow comparisons of the importance of different factors staff believed were important for their use of LA. Interviews were then conducted to gain more in-depth information on the responses received through the survey.

Capturing the narratives of these different perspectives provided a depth to the findings that is not possible through quantitative data alone. This was achieved by adding the contextual layer of each participant's course design,

teaching practice and background knowledge and skills. This study adopted an approach that considered the perceptions and needs of the primary stakeholders whilst offering practical outcomes that could be more widely adopted and adapted. Building this level of understanding in participants was important to ensure that the LA implementation would be relevant and effective in changing their approach to adopting LA. For all these reasons a pragmatic approach was chosen as a relevant research paradigm, and the following section provides a detailed description of this paradigm and how it was applied in this study.

3.2.2 Pragmatic Paradigm

A pragmatic paradigm was adopted for this study due to its focus on gaining a coherent understanding of the world, addressing real-world issues through use of a range of methods and a range of data sources and analysis techniques. These descriptions of pragmatism have grown from its roots in the philosophy of Peirce, Dewey, James, and Rorty (Barab & Squire, 2004; Clarke & Visser, 2019; Feilzer, 2010; Hammersley, 2012; Morgan, 2014). These philosophers also agree pragmatism has both a philosophical approach and a practical basis. Pragmatism is considered a means to resolve the long-running divides between positivism and constructivism, realism and idealism, and qualitative and quantitative approaches (Badley, 2003; Morgan, 2014; Onwuegbuzie & Leech, 2005). Adopting a pragmatic paradigm allows a researcher to consider the learning environments in which they are working and work to enhance them through development of a deep understanding of how they work and how that impacts their students' experiences (Phillips et al., 2012). Pragmatism has thus been proposed as the most appropriate paradigm for e-learning research (Guba & Lincoln, 1994; Hammersley, 2012; Phillips et al., 2012). A pragmatic approach to research allows a researcher to choose a variety of appropriate methods and data analysis techniques to most effectively investigate a real-world problem, with the freedom of not being tied to any one ontological or epistemological approach. In doing so, this enables the researcher to focus on applying appropriate research methodologies and methods and drawing on elements from a range of philosophical approaches.

This study adopted an approach which recognises that context is an important consideration when engaging with LA. Whilst analysis and interpretation of data are specific to a particular context, the processes undertaken to determine appropriate analysis techniques and then interpret those analyses can be generally applied. As an example, patterns of student engagement with a specific resource can lead to different interpretations: is a student who accesses *Resource A* multiple times highly engaged, or very confused? The interpretation will depend on a range of factors, including the institutional setting, the questions being asked, available data and pedagogical approach (Knight et al., 2014), and the academic's knowledge of their course and students is another prime factor in the way data is interpreted. The ways in which LA are promoted and explained to academics are also generalisable. Building an understanding of why different participants come with different ideas about LA and the benefits of engaging with this was an important aspect of this study, as was uncovering the similarities and differences in participants' experiences and beliefs. These findings informed the commonalities of support needed in the intervention whilst the differences informed the personalisation that was important to include to cater to those differences.

The perspective and approach adopted here are endorsed by the findings of recent research which noted that a pragmatic approach:

> afforded the opportunity to tailor the research to address the specifics of the context, the lack of published research in the area as well as to the participants' needs. It also promoted the autonomy required to focus on the research question and continually query and reflect on the choices made; how they affected the data collected and how closely they matched the aims and objectives of the research. (Clarke & Visser, 2019, p. 463)

Proponents of pragmatism assert that a pragmatic approach allows freedom of choice of methodology and methods to determine the most effective inquiry strategies (Clarke & Visser, 2019; Hammersley, 2005). This freedom of choice is simultaneously considered by others as a criticism of pragmatism as they believe this points to a lack of rigour (Clarke & Visser, 2019;

Hodkinson, 2004). Despite these criticisms, this approach was appropriate for this study given the reasons above: namely that this allowed investigation of a real-world problem through a range of methodologies and methods. An applied research approach is needed to complement a pragmatic methodology, and a Design Based Research (DBR) approach was considered as a suitable fit (Anderson & Shattuck, 2012).

3.2.3 Design-based Research

DBR is an approach to educational research that grew from design research ideas and the work of Brown (1992) and Collins (1992) "with the intent of producing new theories, artefacts, and practices that account for and potentially impact learning and teaching in naturalistic settings" (Barab & Squire, 2004, p. 2). DBR is a relatively new approach to research, developed specifically for the field of education, with a focus on translating educational research into improved practice. A DBR approach was adopted for this study as a cogent match to the pragmatic nature of the research, affording an opportunity to develop new theoretical knowledge and practical solutions to a real-world question.

Different authors have outlined their interpretations of the key characteristics of a DBR study and these are summarised in Table 1 (Anderson & Shattuck, 2012; Barab & Squire, 2004; Reeves, 2006; Wang & Hannafin, 2005). Whilst there are slight differences in descriptors, the key themes are:

- combining theory and practice to develop a set of design principles that are both applicable to the specific context of the study and adaptable to other situations;
- involvement in an intervention conducted in real-world educational settings;
- collaborative approach to design with participants;
- adoption of mixed methods of research; and
- an iterative approach to the intervention.

Table 1

Characteristics of a DBR Study

Characteristic	Examples from literature
Pragmatic Solutions enhance practice in the context in which they were designed as well as being adaptable in other contexts	The value of theory is appraised by the extent to which principles inform and improve practice (Wang & Hannafin, 2005). Integrating known and hypothetical design principles with technological advances to render plausible solutions to these complex problems (Reeves, 2006). applicable to the specific context being studied and also be adaptable to other situations and contexts (Anderson & Shattuck, 2012).
Real-world context Solutions are designed and developed in and for real educational settings	Focusses on understanding messiness of real-world practice (Barab & Squire, 2004). Design is conducted in real-world settings and the design process is embedded in, and studied through, design-based research (Wang & Hannafin, 2005). Situated in a real educational setting(Anderson & Shattuck, 2012).
Co-created and iterative Solutions are co-created with research participants through an iterative process	Participants are not "subjects" but instead are treated as co-participants in both the design and even the analysis (Barab & Squire, 2004). Processes are iterative cycles of analysis, design, implementation, and redesign (Wang & Hannafin, 2005). Addressing complex problems in real contexts in collaboration with practitioners (Reeves, 2006).
Varied Solutions are developed through mixed methods of research	Involves flexible design revision, multiple dependent variables (Barab & Squire, 2004). Mixed research methods are used to maximize the credibility of ongoing research (Wang & Hannafin, 2005). Using mixed methods (Anderson & Shattuck, 2012).

Throughout this study, the definition of intervention was understood, as in the BCW: "An activity or co-ordinated set of activities that aims to get an individual or population to behave differently from how s/he or they would have acted without such an action" (Michie et al., 2014, p. 234). Design principles are the "evidence-based heuristics that can inform future development and implementation decisions" (Herrington et al., 2007, p. 4095) that include detailed procedures that will enable future researchers to determine which insights they can build on, adapt and adopt in their own specific context.

The intervention in this study was an implementation plan for encouraging staff to use LA effectively. Whilst an overarching qualitative approach was adopted for the study, this remained aligned with a DBR approach as multiple data sources, of both qualitative and quantitative nature were used. A qualitative approach to DBR, as adopted in this study is also an approach that has been used in other PhD studies in education (Burke, 2017; Mantei, 2010; Parker, 2015). An iterative approach was adopted to the intervention, with two main iterations following on from input from a group of staff with learning and teaching expertise. Changes were made to the first iteration based on feedback from this expert group and to the second iteration based on feedback from participants in the first iteration. Feedback from both those groups and participants in the second iteration informed the final design principles.

I considered DBR as the most appropriate approach rather than Action based Research or Critical Participatory Action Research (CPAR) due to the focus on the design of an implementation plan that has a strong theoretical underpinning that would be of use in the context of USQ, and moreover, be able to be adopted and adapted in other universities (Barab & Squire, 2004). There are many similarities between these three approaches, all of which have a strong presence in educational research and are considered as applied research due to their practical nature in a real-world setting. Action Research (McNiff & Whitehead, 2010; Zuber-Skerritt, 1992) and CPAR (Kemmis et al., 2014) both have a focus on the participants and the perspectives of the participants, and their journeys are important components of this study.

This study followed the specific DBR approach of Reeves (2006), as outlined in Chapter 1, which categorises the research process into an adoptable and sequential process involving four phases:

1. Phase 1: Analysis of practical problems by researchers and practitioners in collaboration;
2. Phase 2: Development of solutions informed by existing design principles and technological innovations;
3. Phase 3: Iterative cycles of testing and refinement of solutions in practice; and

4. Phase 4: Reflections to produce design principles and enhance
    solution implementation.

The application of this approach is summarised in Figure 6 and a detailed
explanation of how the four phases of his approach were applied to this study
follows. Although Reeves referred to this as design research in his original
publication, subsequent publications with other authors (see for example,
Herrington et al. (2007)), refer to DBR and this has been widely adopted
throughout the literature since then.

Figure 6

Application of DBR to this Study (adapted from Reeves, 2006)
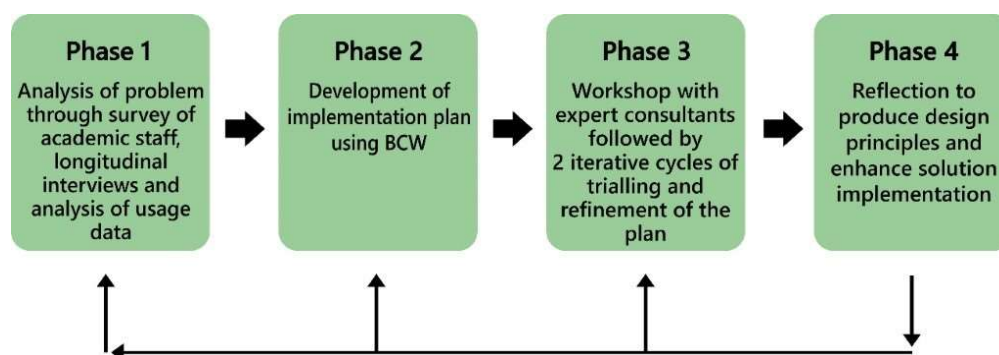
Phase 1

1. Phase 1 involved developing an understanding of the problem in context
    and addressed sub-questions 1 and 3 of the research question. This was
    achieved through both a broad and deep investigation of the knowledge
    and use of LA tools within the LMS of teaching academics at USQ; the
    motivations that led staff to engage with these; and the types of support
    they felt they needed to enable this engagement. This phase involved
    initial data gathering to identify the enablers and barriers for academic
    staff adopting LA to inform the components needed to be included in
    an effective implementation plan. There were four distinct, though
    connected stages for this phase: An extensive literature review,
    including relevant aspects of educational technology, LA
    implementation, and frameworks; professional learning for academics,

and behaviour change theories to gain insights into effective implementation;

2. A survey disseminated to all academic staff at the university. The survey explored levels of staff knowledge and use of the tools and reports in the Moodle StudyDesk (the LMS USQ uses) that are related to LA; the barriers and enablers for implementation of LA; and their motivations for adopting (or not adopting) LA;

3. Paired interviews conducted over a period of 16 months with eight academics, who had self-identified as already engaging with LA, in groups from four disciplines across the university. Two of these disciplines were from areas broadly defined as sitting within STEM and two from HASS. The focus of these sessions was discussion with participants about their current practice and plans for using LA to address a specific question or aspect of their teaching practice or course design, as determined by them at the first interview. Their progress through investigation of these questions was followed, providing insights into their motivations for adopting LA as well as more in-depth information regarding barriers and enablers.

4. Data were extracted from the LMS for all courses across the university to triangulate usage reports with staff perceptions of use, as provided in the survey and interviews. Detailed log reports of staff interaction with the LMS were also analysed for courses in which the eight academics were involved. This analysis provided additional insights that informed draft design principles to be included in an implementation plan.

Analysis of these four components was used to consolidate knowledge of the problem in the context of USQ.

An additional output from Phase 1 was the development of the I Framework, a conceptual framework that grew from a synthesis of the literature and the insights from Phase 1, as was explained in more detail in Chapter Two. The I Framework links the various stages of LA implementation, from considering a question (impetus), through selection of data (input), analysis and interpretation of that data (interrogation), the actions undertaken as a result

of the interrogation (intervention) to evaluating the success of those actions (impact), all of which occur within a specific institutional context.

Phase 2

The findings from Phase 1, in conjunction with the BCW, informed Phase 2 of this study, which involved the development of a LA implementation plan and draft design principles. This phase specifically addressed sub-question 4 of the research question. Use of educational technology is an important component of this phase of a DBR study and in this study the technology was the LA tools and reports within the LMS.

Phase 3

Phase 3 of this study involved iterative trialling of the proposed solution: a LA Implementation Plan and addressed the research sub-questions. This trialing began with a workshop with seven staff from the Office for Advancement of Learning and Teaching (OALT) at USQ. This group were invited to participate, based upon their expertise in supporting learning and teaching across the university. They provided valuable constructive feedback and suggestions on the design and applicability of the draft implementation plan, which was then refined before more in-depth trialling. Two iterations of the trial occurred during Semesters One and Two, 2019 respectively, each over a period of 20 weeks, with amendments made to the plan for the second iteration based on the experiences and feedback of participants in the first iteration. These trials involved six and seven participants respectively and involved working with each participant to implement LA, following the steps of the implementation plan which were developed using the BCW. Each participant chose a particular question regarding their course design, teaching practice, or student experience to investigate, and sessions consisted of provision of support and discussion of their progress and experience working through the processes and using LA.

There were two distinct though interconnecting components of this Phase – the intervention itself and the associated research. The intervention adopted the specific methodology of the BCW, in which I worked closely with academics to support and enable them to engage deeply with LA, implement

an action, and evaluate the success of this; all based around a question of their choosing relevant to their specific context. The intervention involved:

- group discussions to provide general support, increase participants' capabilities and enable group support and social learning opportunities;
- individual consultations, discussing what was and was not working for them and their students and providing support for investigation of participants' current and past course sites in the LMS; and
- a support site that provided participants access to a range of resources and opportunities for collaboration.

The research component of this Phase was concerned with investigation of the effectiveness of the implementation plan, as measured by the participants' engagement with the different components of the intervention, their responses in sessions, and any changes they made as a result of the intervention.

Phase 4

Phase 4 of this study involved reflection on data analysis from the previous phases to produce design principles that theorise an effective approach to LA implementation at USQ, and importantly, allow their effective adaptation and adoption in related contexts considering a LA implementation plan. This phase included the development of a guide and associated workshop plan for academic support staff and recommendations for ongoing support for more widespread implementation at USQ.

3.2.4 Theoretical Framework – Behaviour Change Wheel

The Behaviour Change Wheel (BCW) was deemed the most appropriate theoretical framework to investigate the research question and sub-questions, as it is founded on a range of motivational and behavioural change theories that focus on human and social factors (Michie et al., 2014). The BCW provides a practical approach to designing an intervention that considers the capabilities of participants regarding a targeted behaviour, their motivations for changing that behaviour, and the opportunities that enabled them to make that change. In this study, the target behaviour was

engaging deeply with LA to inform and enhance their teaching practice. The BCW provides a strong theoretical framework for designing an intervention for LA adoption as it is a synthesis of 19 frameworks of behaviour change and draws on 83 theories of behaviour and behaviour change, giving it a solid theoretical foundation. The BCW provides an intervention design process that involves three broad stages:

- Stage 1: Understanding the problem in behavioural terms, identifying the target behaviour and what needs to change;
- Stage 2: Identifying intervention options; and
- Stage 3: Identifying Behaviour change techniques and model of delivery for these.

Whilst the components can be considered at individual, group or population level, this study focused on the individual level. Further discussion of all these components, and data collected to determine their application in this study, are presented in Chapter 7. The outer layer of the BCW, as shown in Figure 4 (Chapter 1) represents seven policy categories which can be developed and used to support the intervention. This outer layer is considered outside the scope of this study, due to the focus on individual staff and perceived lack of influence on development of institutional policy and guidelines within the timeframe of the study. Reference to these, however, will be made in the Recommendation section of this thesis.

The links between DBR and the BCW as applied to this study are outlined in Figure 7. Whilst there are direct links between Phase 1 of the DBR approach and Stage 1 of the BCW and similarly between Phase 2 of the DBR approach and Stages 2 and 3 of the BCW, there are no comparative Stages of the BCW to Phase 3 and 4 of a DBR approach.

Figure 7

Comparison of DBR and BCW as Applied in this Study
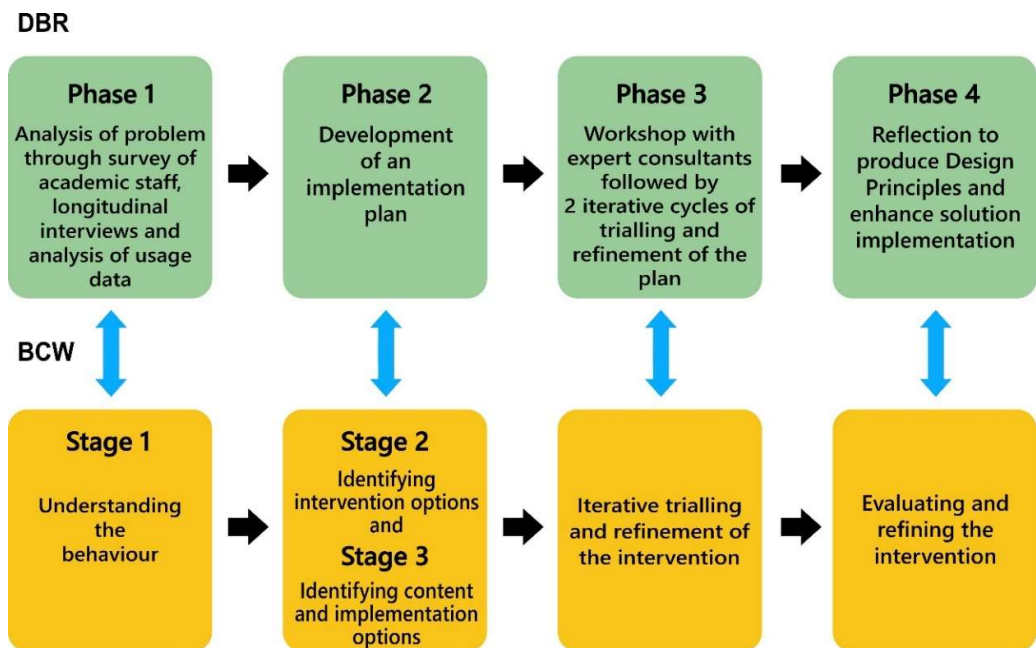
These sections explained the methodology chosen for this study and the rationale for adopting a DBR approach with the BCW as the theoretical framework within a pragmatic paradigm. This is a suitable methodology for this study as all three of these approaches promote using a range of methods and integration of multiple data sources to find a practical solution to a complex issue in a real-world context. Figure 8 summarises these approaches and indicates their similarities and linkages. The remaining sections of this Chapter provide details of the different data sources used throughout this study and how these were analysed.

Figure 8

Linkages Between the Theoretical and Conceptual Approaches in this Study
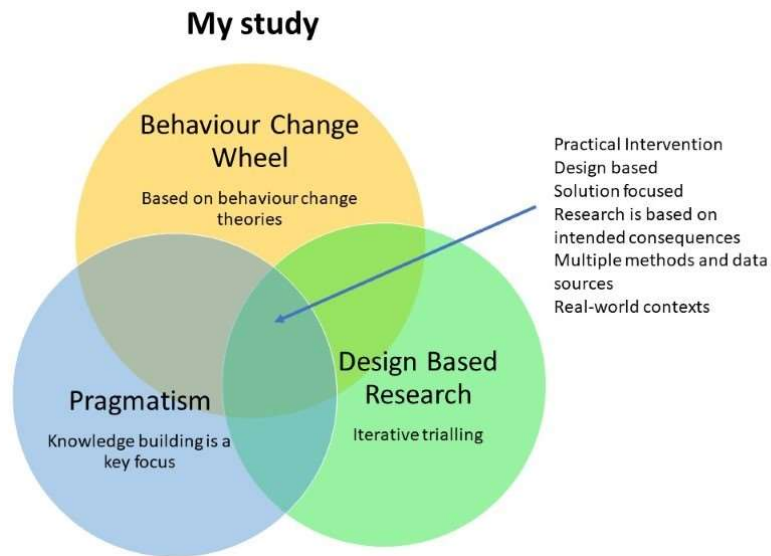
3.3 Participants

Participants in this study comprised academic staff across USQ engaged in learning and teaching, and the professional and academic staff who support them (in the expert group). Each of them brought different perspectives to the study regarding the usefulness of LA to inform and enhance their teaching practice, based on their work and life experiences; skills and knowledge; and motivations for engaging in this study and with LA.

Additionally, each participant had different levels of capacity to learn about LA and to adopt changes to the teaching practice. The challenge in this study was to bring all these aspects together to inform a set of design principles. An important consideration was the recognised bias within participants, due to their self-selection into the study. The recruitment approach meant that participants held a positive attitude towards the importance of teaching and a desire to improve themselves and the learning opportunities they provided for their students, as evidenced by their willingness to participate in this study.

3.3.1 Phase 1

Survey

Survey respondents were academic staff from across USQ who had a teaching role. Invitations to complete the survey were distributed in accordance with university protocol and processes, via email sent by the Head of the Academic Division. Whilst the survey was distributed to all teaching staff, it was anticipated that responses would only be received from staff responsible for convenorship of a course who had an interest in teaching, and at least some basic knowledge of LA, and 68 valid and complete responses were received.

Discipline groups

The initial invitation for discipline groups to participate in Phase 1, the initial data gathering stage of this study, was sent through email invitations to the Executive Deans of the two faculties at USQ. Disciplines at USQ are broad subject areas rather than organisational units such as schools or departments. Four groups each with two staff were recruited with two groups from each faculty (USQ currently has two faculties, one broadly STEM based, and one focussed on business, law education and some humanities and social sciences), resulting in representation from across USQ, and a total of eight participants. Selecting participants in this way enabled the gathering of rich, in-depth data which was also in keeping with a qualitative approach.

3.3.2 Phase 3

The Expert Group

An invitation to contribute to the group was sent to all members of the Educational Design and Development (EDD) team and the Professional Learning Consultants in OALT. The EDD team work closely with academics on Course Design and Development and the Professional Learning Consultants provide a range of professional learning opportunities regarding Learning and Teaching. As such they were able to provide different but complementary feedback and advice on the trial implementation plan. Eight staff members participated in the workshop and four provided feedback.

Individual Participants

Staff who participated in the piloting of the USQ Analytics Tool in 2017 were invited, by direct email, to be participants for this Phase. The USQ Analytics Tool was developed by the university to provide a new level of LA data in StudyDesk sites, and those involved in the pilot had provided feedback on the usability and effectiveness of the tool. As such they were considered people who had shown an interest in using LA to inform and enhance their teaching practice. They were also likely to have ongoing interest in receiving support to investigate their courses and inform and enhance their teaching practice. Allocation of each participant to a specific iteration was based on their preference of semester, their teaching allocations and workloads. A total of 13 staff participated, six in the first iteration and seven in the second, and three of them had also participated in Phase 1 of the study.

3.4 Data Sources

In keeping with a pragmatic approach and DBR methodology, a number of qualitative and quantitative data sources and associated analysis techniques were used throughout this study, with different sources of data being used in each Phase of the study (Collins et al., 2004; Herrington et al., 2007). The choice of data was made to gain perspectives of staff at both broad and deep levels through a staff survey and interviews respectively and complementing these data with actual staff usage data from log reports extracted from the LMS.

3.4.1 Phase 1 Survey

The initial survey in Phase 1 was designed to obtain a broad snapshot of academics' knowledge and use of LA at USQ. Developed specifically for this study, the survey aimed to investigate:

- academics' knowledge and use of the LMS and LA tools;
- their perceptions of the importance of different aspects of the LA process and benefits of using LA;
- factors that impacted on their levels of knowledge and use; and

- factors that impacted on their motivation to adopt LA.

The survey specifically addressed sub-questions 1 and 4 of the Research Question, namely

1. *What do academics identify as the barriers and enablers to the implementation of LA in their teaching practice?*

4. *What are the transferable design principles that underpin an effective LA adoption strategy?*

Questions in the survey addressed the five relevant components of the COM-B model, which forms the central elements of the BCW. Demographic information was also collected to allow investigation of comparisons across faculties, and any patterns depending on academics' experience at USQ and in higher education and the academic level of their role. The research of West, Heath, et al. (2016) influenced the questions regarding knowledge and use of the LMS and LA tools, and demographic questions. In their study, West and colleagues conducted a survey of academics and learning and teaching support staff across Australia and New Zealand, to ascertain how staff were using, or thinking about using LA, with a focus on student retention. Adapting relevant questions from their survey allowed for comparison of results and staff perceptions, linking this study to wider research. The motivation questions were developed using the Theory of Planned Behaviour (Azjen, 1985), which is one of the theories on which the BCW has been developed. Further details of the survey design are provided in Chapter 4.

Qualtrics software was used to create the survey, and I consulted the university's Statistical Consulting Unit and academic staff with statistics expertise to confirm the wording of the questions and response types. Most of the questions were Likert type or semantic differential scales on 5-point scales and there was one free response question. Due to time constraints no pilot survey was undertaken.

3.4.2 Participant Interviews

Following the survey, Phase 1 paired interviews were held over a period of 12-18 months with each of the four discipline groups. The survey results

informed the development of questions that were posed to participants in these interviews, which took the form of semi-structured interviews with an aim of developing a deep knowledge of participants' capabilities, opportunities and motivations regarding using LA. Each interview lasted for a maximum of one hour and the same open-ended questions were used with each group to allow for comparison across the groups. The interviews were a combination of face to face and video sessions by Zoom as participants were based on different campuses. All interviews were audio-recorded and transcribed by an external transcription service. An example of an interview transcription is provided in Appendix B.

For Phase 3, both group and individual sessions were held, with one focus group session held with the expert group and three focus group sessions and three rounds of individual consultations/interviews scheduled for each of the main iterations. The sessions followed the same format and approach as in Phase 1 and were similarly recorded and transcribed. The focus of these sessions was on how participants progressed through the stages of the implementation plan and provided opportunities for them to raise any concerns or questions. These sessions were also used to build capabilities of participants through knowledge-sharing and training in how to access, analyse and interpret data for their courses.

Research conducted during these phases was based around the research questions of this study, with stimulus questions reworded from the main aims, asking participants:

- What do you consider the enablers and barriers to you adopting learning analytics?
- What opportunities and supports do you feel you need to use learning analytics to inform and enhance your teaching practices that promote student learning and engagement?
- What do you consider are the benefits from adopting learning analytics and how will you measure your own success?

These questions were posed during each initial focus group session and again at the end of the intervention through a final survey.

3.4.3 Participant Data from the LMS

Log data related to staff use of, and interaction with, the LMS was collected for courses where the participants were the Course Examiners, along with data on the opportunities they had provided for students in their courses through the choice of resources and activities. At USQ, Course Examiners are the academic staff members responsible for course design and implementation in specific units of study. This data was used in both Phase 1 and Phase 3 to build a picture of the different approaches to teaching practice and course design, and interaction with LA tools and reports. Additionally, for Phase 3, data was extracted from the Support site created as part of the implementation plan, on participants' use of that site. Institutional level usage data of staff interaction with the LMS was obtained for each semester in which the research was conducted. This included data for all reports and tools that relate to LA and was aggregated at the school level.

3.5 Data Analysis

A multi-modal approach to data analysis was adopted, incorporating descriptive statistical analysis of survey responses, deductive and inductive thematic analysis of transcriptions of participant interviews and counts and comparisons of log data from the LMS. Integrating qualitative and quantitative methods of data analysis in this manner enabled me to use the strengths of both approaches to build a deeper understanding of the research questions and was consistent with a pragmatic approach (Cresswell, 2009). Five different purposes have been identified for combining data, namely triangulation, complementarity, development, initiation and expansion (Greene et al., 1989). The main intent in this study was complementarity which is defined as seeking "elaboration, enhancement, illustration, clarification of the results from one method with the results from the other method" (Greene et al., 1989, p. 259). The ways in which this was achieved will be further expanded in Chapters 6 and 9.

3.5.1 Survey

Descriptive statistical analysis of the responses to each of the questions was undertaken, with an aim of summarising and describing the responses, and

providing a snapshot of staff knowledge and use of LA and motivations for using these in their teaching practice. Mean, median and modes were reported to measure the central tendency of responses and standard deviation to describe the spread of results. The analysis used formulae embedded in Excel, with results from complementary questions being combined and compared to investigate patterns as well as outliers.

3.5.2 Participant Interviews

Deductive and inductive thematic analyses were conducted on the interview transcripts in Phases 1 and 3. Deductive thematic analysis is related to the specific research questions and can provide a detailed analysis of a specific component of the data. In an Inductive thematic approach by contrast, themes are generated from within the data, providing additional insights (Braun & Clarke, 2006). Deductive analysis related to the research questions including considerations of the barriers and enablers to implementation, along with the participants' perceptions of LA and the supports they indicated they would need to adopt. Analysis of those interviews was also conducted through the lens of the COM-B model to gain insights into their current levels of capability regrading LA use, motivations for adopting, and opportunities they felt were available and needed to adopt LA. The inductive analysis focussed on any emerging themes and ideas from the interviews to ensure participant perspectives and experiences were richly understood. NVivo software was used to code themes and conduct these analyses.

3.5.3 Log Data

Log data relating to staff interaction with the LMS were extracted and analysed on several levels as outlined below, and detailed in Chapter 6, to investigate the different patterns of interactions of participants. Analysis began with simple count of clicks and number of sessions to determine the total time on site, and this was then broken down from a temporal perspective to determine which days and time an academic was active on the site. Areas, types, and levels of activity were also analysed to gain insights into how each academic engaged with their site. For example, did they spend most of their time interacting with students, creating content or in the

process of assessment and was their engagement visible or invisible to students?

Data analyses were conducted manually using the sort and filter functions in Excel and creating Pivot tables. This allowed similarities and differences in patterns of use between participants to be considered and appropriate ways to present the information to staff to be determined.

Insights from analysis of the log data informed solutions to all of the research questions as they:

- confirmed, or otherwise, staff perceptions of barriers and enablers;
- complemented staff perceptions of aspects of LA implementation plan;
- provided information on effectiveness of the support site and how involvement in the implementation plan impacted participants' use of LA; and
- highlighted how the implementation plan impacted on participants' LA use and informed the final design principles.

Individual reports based on the results of these analyses were produced for each participant and used as a stimulus for discussion during interviews to elicit participant feedback as to whether these reports:

- provided any new insights for them on how they engage with the course sites;
- confirmed or contradicted their understanding of how their course had been designed;
- confirmed or contradicted their understanding of how they had interacted with the LMS during that semester; and
- provided impetus for any change in relation to their course design and/or teaching practice.

An exemplar report is included in Appendix C.

3.5.4 Activity Reports

Simple counts and comparison at school and faculty levels were undertaken for institutional level usage data, using activity reports extracted from the

LMS. Activity reports were analysed through simple counts and comparisons to indicate the number of times each tool and report related to LA were accessed and average use per course was calculated. The results were compared across the duration of the study to discover any changes in patterns and levels of engagement. The insights from these analyses informed each of the research questions in similar ways to the log data as discussed in the previous section.

3.5.5 Combining the Different Data Analyses

The different data sources and analysis techniques used throughout this study are outlined in Figure 9. As noted above, these various data sources and analysis strategies were combined and synthesised with a complementarity intent. The broad and deep perceptions of staff, provided through survey responses and interviews respectively, complemented and elaborated on the actual usage data obtained through analysis of log data and activity reports, thus providing a richness of analysis that would not have been possible using only one source of data or analysis technique.

Synthesis of Phase 1 data provided insights that addressed all of the research sub-questions and informed the design and development of the implementation plan in Phase 2, whilst synthesis of data from Phase 3 provided further insights into the research sub-questions and informed the development of the final design principles and recommendations.

Figure 9

Data Collection Tools and Data Analysis Techniques
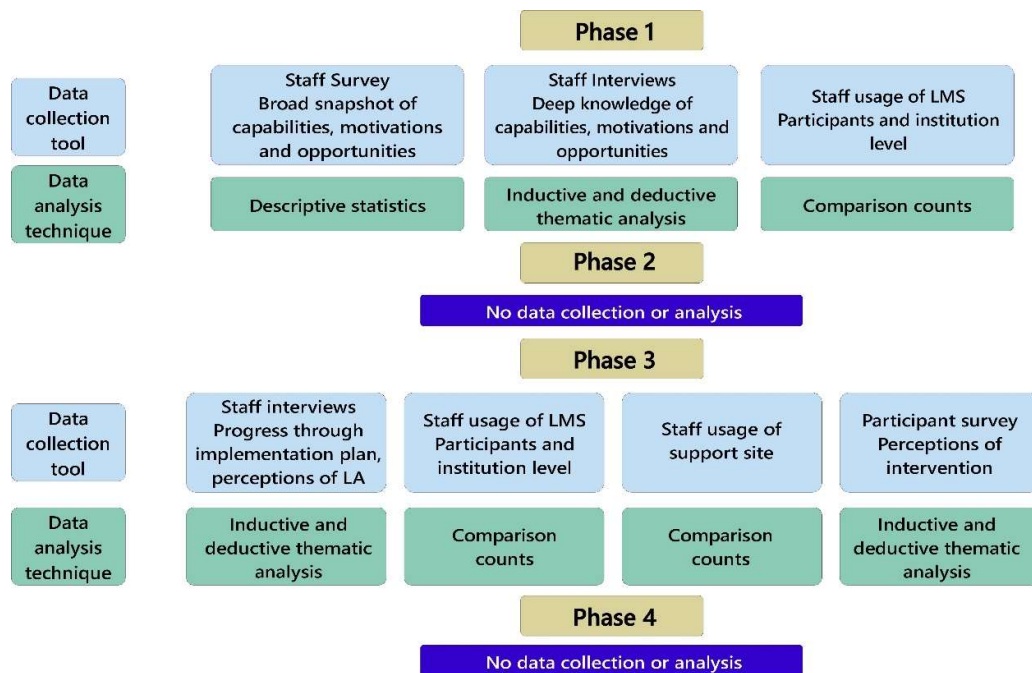
3.6 Chapter Summary

This chapter has explained and justified the overall qualitative research approach adopted in the study, together with the methodology employed to conduct the study. It has explained how the four-phase DBR approach and use of the BCW are logical fits with a pragmatic approach. An overview has also been provided of the data collected during the various phases of the project, of participant recruitment processes, and the approach taken to data analysis.

The chapter has also described how each of the research sub-questions were addressed in each phase of the study. The barriers and enablers to LA implementation (research sub question 1) were investigated in Phases 1 and 3 of the study through the survey and thematic analysis of participant interviews and focus group sessions, with log data confirming, or otherwise, staff perceptions. Phase 2 of the study brought these insights together to develop draft design principles (research sub-question 4) and the LA implementation plan using the BCW as the theoretical framework. The

elements of the LA implementation plan that participants perceived enhanced their initial uptake of LA (research sub-question 2) and continued use of LA (research sub-question 3) were investigated through thematic analysis of individual and focus group sessions in Phase 3, with insights complemented by analysis of log data reports of staff usage with the LMS. Design principles were amended and affirmed in Phase 4 based on insights from Phase 3 data (research sub-question 4). Table 2 provides an overview of the ways in which the different data sets in Phase 1 and Phase 3 addressed each of the research sub-questions.

Table 2

Relationship between Research sub-questions and data-sets

Research Sub-Question	Data sources	Ways in which data addresses the research questions
RQ 1: What do academics identify as the barriers and enablers to the implementation of LA in their teaching practice?	Phase 1 Staff survey Phase 1 Staff Interviews	Responses provided staff perceptions of current barriers and enablers
	Phase 3 Staff Interviews Phase 3 Final survey	Responses provided staff perceptions of current barriers and enablers and effectiveness of aspects of the implementation plan that minimised barriers and enabled uptake
	Phase 1 Log Data	Data provided insights that confirmed, or otherwise, staff perceptions of barriers and enablers
	Phase 3 Log Data	Data provided insights that confirmed, or otherwise, staff perceptions of barriers and enablers
RQ2: Which aspects do academics who are engaging in a LA adoption strategy identify as enhancing their implementation of LA?	Phase 3 Staff Interviews Phase 3 Final survey	Responses provided staff perceptions of what would be needed to enhance their implementation of LA and the effectiveness of different aspects of the implementation plan
	Phase 3 Log Data	Data provided insights that complemented staff perceptions of aspects of LA implementation plan
RQ 3: How is the LA adoption strategy effective in stimulating and supporting the academics' usage of learning analytics?	Phase 3 Staff Interviews Phase 3 Final survey	Responses provided staff perceptions of how involvement in the implementation plan impacted participants' use of LA
	Phase 3 Log Data	Data provided insights on effectiveness of the support site and how involvement in the implementation plan impacted participants' use of LA
RQ 4: What are the transferable design principles that underpin an effective LA adoption strategy?	Phase 1 Staff survey Phase 1 Staff Interviews	Responses informed the development of draft design principles in Phase 2
	Phase 1 Log Data	Data informed the development of draft design principles in Phase 2
	Phase 3 Staff Interviews Phase 3 Final survey	Responses informed the development of final design principles in Phase 4
	Phase 3 Log Data	Data provided insights on how the implementation plan impacted on participants' LA use and informed the final design principles

Chapters 4, 5 and 6 will analyse the results from data collected through Phase 1 of this study and Chapter 7 will explain how those results informed Phase 2, the development of the draft design principles for the implementation plan, following the steps of the BCW process to explain the implementation plan.

Chapter 4 Phase 1: Initial Data Gathering - Survey
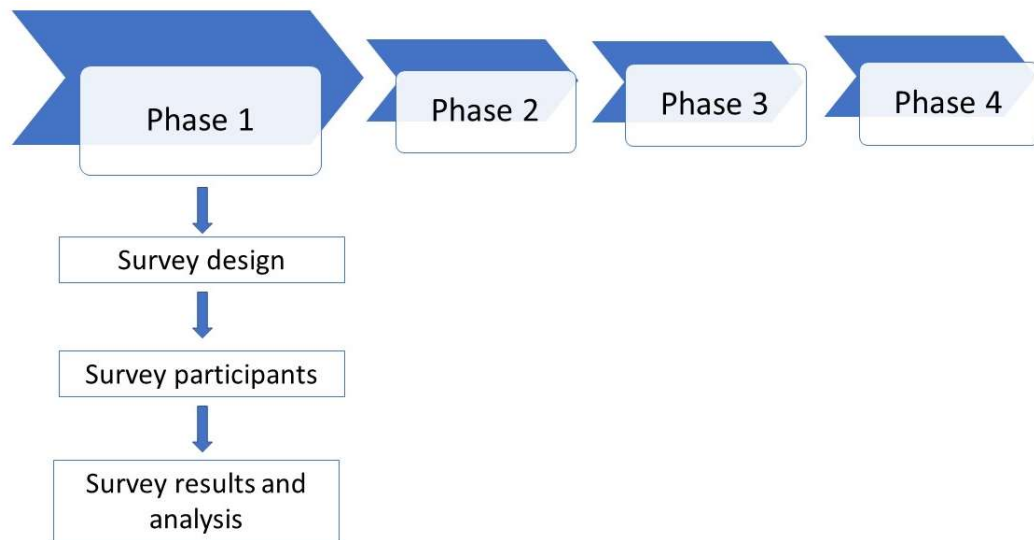
4.1 Introduction

Phase 1 of this study (understanding the problem in context), involved the analysis of three inter-related components: an online survey, participant interviews, and staff usage of the Learning Management System (LMS). This Chapter will focus on the first of these components: an online survey of academic staff at the University of Southern Queensland (USQ) to determine current levels of knowledge and use of Learning Analytics (LA) tools and reports within the LMS. The survey also asked which factors most influenced staff knowledge and use of LA. A series of in-depth interviews followed the survey with academics who self-identified as either already having engaged with LA, or those who expressed an interest in using LA. The interviews helped to gain a deeper understanding of the issues raised in the survey results. To complement and triangulate data from these two components, data were collected and analysed from staff usage of the LMS. The insights from these analyses informed sub-questions 1 and 4 of the research question, namely:

1. What do academics identify as the barriers and enablers to the implementation of LA in their teaching practice?

4. What are the design principles that underpin an effective LA adoption strategy?

Findings arising from the analysis of interviews and log data are discussed in Chapters 5 and 6 and the results from each of the Phase 1 components are compared in Chapter 7, which also includes discussion of the development of an LA implementation plan following the Behaviour Change Wheel (BCW) framework. Figure 10 outlines the connections between these chapters.

Figure 10

Overview of Connections between Chapters 4 to 7
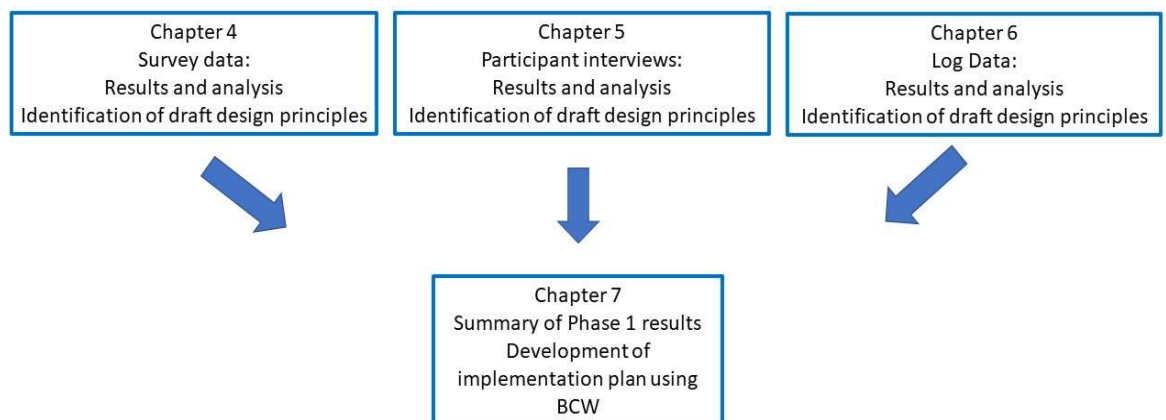
Data analysis for Phase 1 included:

1. Descriptive statistics from the survey of academic staff;
2. Deductive and inductive thematic analysis of participant interviews regarding their knowledge and use of LA to inform and enhance their teaching practice; and
3. Staff usage of LMS.

Whilst the depth and rigour of the first phase of this research goes beyond that which is commonly expected for a Design-based Research (DBR) project, this occurred because initially a Critical Participatory Action Research (CPAR) approach was adopted for this study (Kemmis et al., 2014, p. 153).

However, the research approach was changed to a DBR approach (Reeves, 2006) during the early stages of the first interviews. The change was made as the commitment from participants to be involved in a CPAR study was extensive and unlikely to yield thorough engagement. Further, the possibilities afforded by DBR to focus on the design principles and the development of an implementation plan for LA were likely to have wider appeal and has the potential to be adopted and adapted by other universities wanting to increase the uptake of LA amongst their academics. Helpfully, the rigorous findings from an extensive exploration of the problem in context in Phase 1 also provided details of the motivations of academics for adopting LA. This chapter will focus on the survey, providing an overview of the survey design and sampling, analysis of the results, and discussion of how these addressed the research questions and informed the development of draft design principles.

4.2 Survey Design

The survey explored levels of staff knowledge and use of the tools and reports in the LMS that are related to LA and their motivations for adopting LA. The survey was designed specifically for this research study and the USQ context. Questions regarding demographics and knowledge and use of the LMS and LA tools were influenced by the research of West and colleagues who were granted an Office of Learning and Teaching Grant from the Australian Government to investigate use of LA for retention (West, Heath, et al., 2016; West, Huijser, et al., 2016). The motivation questions in this survey were developed using the Theory of Planned Behaviour (TPB) (Azjen, 1991), which is recognised in a range of disciplines, including education. A copy of the survey is included in Appendix D.

4.2.1 Links to LA for Retention Academic Level Survey

As noted above, several of the questions in this survey were either used directly from, or adapted from, questions in the Academic Level survey developed by West and colleagues (West, Heath, et al., 2016; West, Huijser, et al., 2016). This was considered appropriate as this was a recent, major Australian study that had sought input from academic staff across

universities. As their focus was on using LA for retention and current practices there were some questions that needed to be modified for this study which had a more general approach to use of LA and a focus on what would be needed to enable academics to adopt LA moving forward. Some of the questions in the West survey related to the LMS were generic as a range of platforms were in use across Australian universities. As this study was focused on the Moodle platform additional questions related specifically to knowledge and use of specific LA tools and reports in the USQ version of Moodle were developed and included. Details of the links between this survey and questions from the West survey are provided in Table 3.

Table 3

Links to Academic Level Survey – LA for Retention

Question	Source
Do you have a teaching role at USQ	Adapted from West et al. Q 7
Broad teaching activities in LMS	Direct from West et al. Q 9
Level of knowledge	Created specifically for this survey for USQ context
Level of use	Created specifically for this survey for USQ context
Level of confidence	Adapted from West et al. Q 7
Level of interest- sources of data	Adapted from West et al. Q 28
Level of interest - reasons for use	Adapted from West et al. Q 7
Factors impact knowledge	Influenced by West et al. Q 28 & 29
Factors impact use	Influenced by West et al. Q 28 & 29
Opinion on LA	Created specifically for this survey for USQ context
Importance of accessing data	Adapted from West et al. Q 29
Importance of support	Adapted from West et al. Q 29

4.2.2 Links to TPB Studies

The TPB describes how a person's beliefs influence their attitudes which in turn affect their intention to adopt and perform a behaviour. This theory was considered appropriate for this study as it provided a means of examining the factors that influence staff to adopt LA. TPB is also one of the theories on which the BCW has been developed, making it appropriate for this project.

As explained in Chapter 2, the TPB describes how a person's intention to adopt and perform a behaviour is influenced by their attitudes towards that behaviour, their intent to change the behaviour, perceptions of the importance significant others place on that behaviour and change, and amount of control they believe they hold to change that behaviour. A standard format of questionnaire was developed by the original authors and that questionnaire, and examples from in higher education and educational technology use studies that have adopted the TPB were used as the basis for the behaviour change questions in this survey (Fishbein & Azjen, 2009; Siragusa & Dixon, 2009). For this study the behaviour being examined was adopting LA.

4.3 Survey participants

The target participants for the survey were academic staff at USQ who had a teaching role and thus able to provide insights on use of LA from a learning and teaching perspective. This resulted in 68 valid respondents. Their results for the first section of the survey have been included in the overall analysis. A check of responses was undertaken to see if there were any respondents who had answered the same response to all questions, and none were found, to help ensure the likelihood that all responses were genuine and validate the legitimacy of the responses.

Data obtained from Human Resources at USQ indicated there were a total of 420 teaching staff, comprising teaching only, and teaching and research continuing academic staff at the time the survey was administered. Thus the 61 respondents who were continuing staff represented 14.5% of the target population. Whilst this was a low response rate, it was higher than other staff surveys in higher education, for example West et al. (2016), who report 353 responses from across all Australian and New Zealand universities. Whilst the number of responses from casual and fixed term staff was small, their voice was important as they undertake a large proportion of teaching at USQ and their responses were included in all analyses.

The potential for bias was recognised, given that staff who had an interest in, or focus on, learning and teaching were more likely to respond than those

who were research-focussed. This potential bias was held in mind when analysing results.

4.3.1 Demographic Information of Respondents

A series of questions collected respondents' demographic information, and these were compared with data for the university staff numbers as shown in Table 4.

Most respondents were at Level B, with relatively even numbers at Levels C and D/E. There were only three responses from Level A academics which is not surprising as most staff with responsibility for development and coordination of a course are employed at Level B or above, as per university policy. A comparison of this distribution with actual staff numbers, as obtained from Human Resources, shows similar distributions with a slight under-representation of Level C staff: 26.5% of respondents compared with the target population of 30.2%. Conversely there was an over-representation from staff at Level D and Level E: 25% of respondents compared with the target population of 20.7%. The percentage of respondents at each length of experience was very similar to the percentages for each length of service interval for the target population. Table 4 also shows the distribution of responses based on length of service in the higher education sector. This does show a bias in responses from staff who are very experienced in the higher education sector, with over 75% having nine or more years' experience. The university does not collect this data so no comparison could be made with the target population. In terms of years of service at USQ, and in higher education, the highest proportions were for >10 years' service; 41.2% at USQ (compared with 37.4% of all staff) and 69.1% in higher education.

Table 4

Comparison of Demographics: Survey Respondents and Staff Numbers (n=68)

		Survey Respondents		Staff Numbers		Survey Respondents as % of staff numbers
		n	*%*	*n*	*%*	
Academic level	A (Associate Lecturer)	3	4.4	19	4.5	15.8
	B (Lecturer)	30	44.1	187	44.6	16.0
	C (Senior Lecturer)	18	26.5	127	30.2	14.2
	D (Associate Professor) or E (Professor)	17	25.0	87	20.7	19.5
	Total	*68*	*100*	*420*	*100*	
Length of service (HE)	0-2 yrs	2	2.9	n/a	n/a	n/a
	3-5 yrs	4	5.9	n/a	n/a	n/a
	6-8 yrs	10	14.7	n/a	n/a	n/a
	9-10 yrs	5	7.4	n/a	n/a	n/a
	>10 yrs	47	69.1	n/a	n/a	n/a
	Total	*68*	*100*			
Length of service (USQ)	0-2 yrs	12	17.6	74	17.7	16.2
	3-5 yrs	10	14.7	64	15.2	15.6
	6-8 yrs	12	17.6	77	18.3	15.6
	9-10 yrs	6	8..8	48	11.4	12.5
	>10 yrs	28	41.2	157	37.4	17.8
	Total	*68*	*100*	*420*	*100*	

Details of the academic units in which respondents taught are included in Appendix E.

For *In what modes do you teach?,* three staff responded *Online only*, five *on-campus only* and 60 *a combination of online and on-campus*. This was again an expected result as all courses are required to have an online presence; the

majority of courses at USQ are offered both on-campus and online; and all study experiences (e.g. enrolling, accessing course materials and readings) are mediated by online tools. Overall, this data indicates that the respondents were a representative cross-sample of USQ teaching staff coming from most of the constituent schools and units and having a similar demographic pattern to the teaching staff population.

4.4 Survey Results and Analysis

The results from each of the survey questions are provided below, with an indication of how these results provide answers to the research questions. The first section of the survey considered use and knowledge of LA, the second section looked at individuals' motivations to engage with LA, and these are considered in separate sections below. The following sections analyse the responses for each of the questions and discuss which aspects of LA use were of most concern for respondents, thus providing insights into potential draft design principles for the implementation plan.

4.4.1 Knowledge and Use of Reports and Tools

Responses to *What broad teaching activities do you conduct within the Learning Management System? Please select all responses that apply*, suggested that most respondents use the LMS for a variety of reasons, with over 80% indicating they used the LMS for each of the survey options, as outlined in Table 5. The most popular use was *provision of learning materials and resources* and the lowest use was for *assessment feedback* and *learning focused interactions between students*. Forty-seven respondents (70.1%) noted they used the LMS for all these activities, suggesting that most respondents know about many of the affordances of the LMS and use these in their teaching. Each of the options related to one of three of the four main categories of use of an LMS of content, assessment or discussion (administration not included) (Macfadyen & Dawson, 2012). It is noted that there was one respondent who said they did not use the LMS for teaching but also responded that they used the LMS for all of the broad teaching activities listed – their responses have not been included in Table 5 as it was not clear whether or not they did use the LMS.

Table 5

Teaching Activities in LMS (n=67)

Response	*n*	%
I don't use the Learning Management System for my teaching	4	6.0
Provision of learning materials and resources	58	86.6
Assessment submission	55	82.1
Assessment feedback	54	80.6
Learning focused interactions between myself (or other lecturers/tutors) and students	57	85.1
Learning focused interactions between students	55	82.1
Other - please list	6	9.0

Comments provided in response to *Other* category for *What broad teaching activities do you conduct within the Learning Management System?* were:

- general cohort communication;
- tracking student interaction;
- feedback data from students;
- internship project work;
- provision of other resources and information on professional activities; and
- links provided to outside websites.

Two of these comments: *tracking student interaction* and *feedback data from students* are directly linked to LA, indicating that there were at least some staff who had started to consider LA data as an important component of the LMS.

Based on these observations, an implementation plan that promotes ways in which academics can take advantage of the full affordances of the LMS is likely to be effective. My interpretation of this was that the following design principle would be important to include in a LA implementation plan:

- build staff knowledge of the benefits of using the LMS for student discussion.

The next two questions asked staff to indicate their level of knowledge and use of each of the following LA tools and reports available within the LMS as indicated in Tables 6 and 7. The tools and reports included in these questions were those in the LMS which provided data regarding students' interaction with the LMS. These questions were presented as 5-point Likert type questions. The responses to these questions indicate that the reports with highest levels of knowledge are *Participants:* a report which provides details of all students and their last access to the course, and *Gradebook*, which collates students' results for each assessment task administered through the LMS. These were both easily accessible reports with *Participants* located in the top-level left-hand navigation of all pages, whereas other reports were accessed through the top navigation bar and could be several layers deep. The navigation paths for these reports are further explained in Appendix F.

Table 6

Knowledge of LA Tools and Reports (n=68) (adapted from Table 1, (Jones, 2019, p. 152))

Tool/Report	Likert Scale					Statistics		
	1	**2**	**3**	**4**	**5**	**Mean**	**SD**	**Med**
Participants	2	1	8	8	49	4.5	1.0	5
Gradebook	2	0	6	21	39	4.4	0.9	5
Course participation	4	2	17	23	22	3.8	1.1	4
Quiz results	8	9	5	17	29	3.7	1.4	4
Activity report	6	2	17	24	19	3.7	1.2	4
Communications	14	1	9	17	27	3.6	1.5	4
Quiz responses	10	8	7	16	27	3.6	1.5	4
Quiz statistics	13	11	4	17	23	3.4	1.6	4
Log data	14	6	16	18	14	3.2	1.4	3
Activity completion	13	10	17	10	18	3.1	1.5	3
Statistics	12	9	22	11	14	3.1	1.3	3
Progress bar	17	11	20	10	10	2.8	1.4	3
Engagement analytics	19	7	25	10	7	2.7	1.3	3

Key : 1=I don't know anything about this, 2= I have seen this but know nothing about it, 3= I have seen this and have a vague understanding of this, 4= I have a moderate understanding of this, 5= I have a good understanding of this

Table 7

Use of LA Tools and Reports (n=68) (adapted from Table 1, (Jones, 2019, p. 152))

Tool/Report	Likert Scale					Statistics		
	1	**2**	**3**	**4**	**5**	**Mean**	**SD**	**Med**
Participant list	3	10	5	22	28	3.9	1.2	4
Communications	16	7	5	7	33	3.5	1.7	4
Gradebook	3	23	14	17	11	3.1	1.2	3
Course participation	17	23	9	8	11	2.6	1.4	2
Activity report	17	25	6	14	6	2.5	1.3	2
Quiz results	17	26	11	11	3	2.4	1.2	2
Quiz responses	21	26	7	11	3	2.3	1.2	2
Quiz statistics	27	22	7	10	2	2.1	1.2	2
Log data	29	21	9	5	4	2.0	1.2	2
Activity completion	31	19	9	6	3	2.0	1.2	3
Engagement analytics	38	16	8	3	3	1.8	1.1	1
Statistics	37	21	8	1	1	1.6	0.9	1
Progress bar	47	14	5	1	1	1.5	0.8	1

Key:1=I have never used this, 2= I use this 1-5 times per semester, 3= I use this once a month, 4=I use this 2-4 times a month 5=I use this at least once a week

(Highlighted cells indicate mode for each report or tool)

Results suggested that the level of staff knowledge about the listed reports then rapidly decreased as the level of detail of the reports increased. The lesser-known reports and tools were also those which were more difficult to access and/or required input from the academic to set up. Overall, the ratings were lower for use of each of the reports and tools than for knowledge of the same reports and tools. For example, 57 of the 68 respondents indicated they had moderate or high levels of understanding of the Participants report whilst only 50 respondents indicated they used this report more than once a month. The difference between knowledge and use was even more marked for the lesser known and used reports. For example, whilst 17 respondents indicated they had moderate or good levels of knowledge of the Engagement Analytics report, only six respondents indicated they used this more than once a month. Whilst there were some minor changes in the order of rankings for the use of reports, compared to knowledge, there were still indications that it was the high level, easy to access reports that were more regularly used. These results suggested that knowledge of reports and tools alone does not mean that staff would adopt LA and it is thus important to also consider other factors. These factors were considered through further

questions in the survey and informed the development of questions to be raised during the ensuing staff interviews.

Based on these observations, an implementation plan that provides training and support on how to access all reports and the insights that can be gathered through their use was likely to be effective. My interpretation of this was that the following design principle would be important to include in a LA implementation plan:

- provide training and support for staff on how to access all LA reports and tools in the LMS and the purpose of each of these.

Staff were also asked to indicate their level of interest in using a range of sources of data within the LMS to inform their teaching practice, and responses to this question are outlined in Table 8. These responses indicated that while most staff already used the Gradebook and other easily accessible level reports, such as whether or not a student has accessed the LMS, the level of use of more detailed reports and data was much lower, with one third or less of respondents accessing half of the types of reports. There was though, considerable interest in using LA for a wide variety of reasons, with 74% of respondents indicating an interest in information about which resources and activities students were not engaging with. Respondents were least interested in information about the time they spent in the LMS.

Table 8

Level of Interest in using Data from the LMS (n=68)

	I am not interested in this		I am interested in trying this		I already do this	
	n	%	*n*	%	*n*	%
Resources and activities that students do not engage with	2	2.9	50	73.5	16	23.5
Number of times each week students use the LMS	11	16.2	42	61.8	15	22.1
Amount of time students spend in the LMS	11	16.2	40	58.8	17	25.0
Students who have not accessed particular resources or activities	5	7.4	35	51.5	28	41.2
Amount of time you spend in the LMS	20	29.4	34	50.0	14	20.6
Cohort results for individual questions in quizzes	14	20.6	33	48.5	21	30.9
Number of discussion forum posts from each student	14	20.6	32	47.1	22	32.4
Students who have not accessed StudyDesk	2	2.9	24	35.3	42	61.8
Content of discussion forum posts	7	10.3	24	35.3	37	54.4
Individual student results in quizzes	9	13.2	22	32.4	37	54.4
Student results in gradebook	2	2.9	15	22.1	51	75.0

These insights suggested that providing education on the benefits of use of the data, could increase the number of staff interested in using that data. One example of this is with the detailed quiz reports, including information on individual student results, and cohort responses. Whilst 54.4% of respondents reported that they already used the individual results, only 30.9% have used the cohort results. This was one of the reports that had high levels of non-interest (20.6%). This could be in part due to those respondents not using quizzes at all in their courses, or it could also indicate that staff were not aware of the information included in that report and the benefits of using that information.

These observations affirmed the insights from the previous questions that an implementation plan that provides training and support on how to access all reports and the insights that could be gathered through their use was likely to be effective.

Building on this question, staff were asked to indicate their level of interest in a range of reasons for using student data from the LMS to inform their teaching practice; results are summarised in Table 9. *Checking student engagement* was the reason most respondents noted as a use of student data with 41.2% of respondents noting they already used data in this way and a further 55.9% interested in trying. Similar levels of interest or use were noted for six of the other seven options listed in this question. These responses suggested that motivation to use is high and does not need to be a focus of the implementation plan. The exception was the question on predicting student success; whilst this had the second highest level of interest it also drew relatively high numbers of respondents who were not interested in using (16.2%). This could indicate a wariness of the predictive power of LA or a focus on the more tangible options which mentioned *checking* or *improving*. This was another aspect of use of LA that was used to inform questions during the ensuing interviews to elicit a deeper understanding of what insights could be gained into staff usage of LA.

Table 9

Reasons for using Student Data (n=68)

	I am not interested in this		I am interested in trying this		I already do this	
	No	%	No	%	No	%
Improve student retention	3	4.4	49	72.1	16	23.5
Predict student success	11	16.2	48	70.6	9	13.2
Identify students at-risk	1	1.5	44	64.7	23	33.8
Improve teaching practice	2	2.9	42	61.8	24	35.3
Improve course design	2	2.9	41	60.3	25	36.8
Check student use of resources	3	4.4	40	58.8	25	36.8
Check student progress	1	1.5	40	58.8	27	39.7
Check student engagement	2	2.9	38	55.9	28	41.2

There were similarities and synergies across the responses for the two questions shown in Tables 8 and 9, with the high levels of interest in reports regarding student use and interaction aligning with the focus on student retention and success.

Based on these observations, an implementation plan that includes training and support in the different types of use of LA data in the LMS and which contextualises LA in discussions on student retention and success, was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- provide professional learning opportunities and support on the benefits of each of the reports available and ways these can be used to inform teaching practice;
- contextualise these opportunities and support around the areas of student retention and success; and
- provide resources/support on how to access and use the different reports available.

4.4.2 Confidence in Ability

The next question in the survey asked staff to rate their level of confidence in their ability to undertake a range of tasks, using a 5-point scale from *strongly disagree* to *strongly agree*. The tasks included *accessing data, interpreting*

91

student data and *implementing appropriate action based on that interpretation.* Whilst approximately half (51.5%) of respondents agreed or strongly agreed that they were *confident in accessing data*, only 42.6% had similar responses regarding ability to *interpret data* and 44.1% regarding ability to *take appropriate actions*. There were also approximately a quarter of respondents who indicated they neither agreed nor disagreed with each of the statements and there are different inferences that could be drawn from these responses. For all three questions there was a positive skew with more respondents agreeing or strongly agreeing than disagreeing or strongly disagreeing. These results are detailed in Table 10. These results are in line with the previous questions on knowledge and use of LA and together indicate that whilst there was knowledge of tools and reports available, academics were not engaging with the full affordances of LA through the analysis and interpretation of data, due partly to lack of confidence. Building confidence in use through capacity building in accessing, analysing, and interpreting data were thus areas to consider in a LA implementation plan.

Table 10

Confidence Levels (n=68)

I am confident in my ability to:	Likert score									
	1		2		3		4		5	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
access appropriate student data from the LMS	3	4.4	15	22.1	15	22.1	27	39.7	8	11.8
interpret student data extracted from the LMS	3	4.4	19	27.9	17	25.0	20	29.4	9	13.2
implement appropriate actions based on interpretation of student data	4	5.9	21	30.9	13	19.1	20	29.4	10	14.7

Further analysis showed that most respondents had the same level of confidence for each of the statements with six respondents noting they strongly agreed with all statements: 12 agreed across all statements, seven were neutral across all statements, 12 disagreed with all statements and three strongly disagreed with all statements.

Based on these observations, an implementation plan that adopts a holistic approach to building confidence by including training and support in all aspects of LA use would be beneficial as respondents generally reported low levels of confidence across all of these areas. My interpretation of this was that the following design principle would be important to include in a LA implementation plan:

- build knowledge, skills and confidence across all aspects of accessing and interpreting student data, and implementing appropriate actions.

4.4.3 Barriers to Implementation

For the questions investigating factors that impacted current knowledge and use of LA as shown in Table 11, 88.2% of respondents noted time constraints as an issue impacting knowledge and 83.8% as an issue impacting their use. *Lack of training* was noted by 66.2% as an issue affecting knowledge and 61.8% affecting use, indicating it was a more significant factor than *Lack of*

support which was only noted by 45.6% of respondents regarding knowledge and 44.1% for use. *Lack of institutional guidelines* was the least noted factor with 30.9% citing this as a factor affecting their knowledge and 27.9%, use. For those respondents who only noted one barrier to knowledge and use, *Time constraints* was the most cited response (11 of 15 respondents). All four options were noted as barriers for building knowledge by 16 respondents, with 13 of those also noting all five factors as barriers to use.

Table 11

Barriers to Building Knowledge and Use of LA (adapted from Jones (2019, p. 152)) (n=68)

	Knowledge		Use	
Barrier	**n**	**%**	**n**	**%**
Time constraints	60	88.2	57	83.8
Lack of training	45	66.2	42	61.8
Lack of support	31	45.6	30	44.1
Lack of institutional guidelines	21	30.9	19	27.9
Lack of knowledge			41	60.3

Based on these observations, an implementation plan that allocates time for implementing LA in academic workloads and builds staff knowledge and skills through provision of training and support to academic staff was likely to be effective. The nature of this training and support were areas requiring further clarifications that evolved from this question, to be included in the interview questions. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- support staff to make more efficient and effective use of time;
- include training and support in accessing and interpreting data, and implementing actions resulting from those interpretations; and
- recognise the time needed to engage in these processes through a formal and formally recognised part of academic training.

4.4.4 Enablers and Support

The survey also investigated the importance of various aspects of accessing student data in the LMS and results are detailed in Table 12. Respondents noted *Being able to easily access the data in a format I can use* as the most important aspect of accessing data with 83.8% rating this as extremely important and a further 14.7%, rating this as moderately important. All aspects of access and support noted in this question were rated highly, with over 80% of respondents rating each aspect as either moderately or extremely important. *Access to professional development for accessing data* had the lowest number of respondents rating this as moderately or extremely important (80.9%). Comparing this to the importance of having *support for accessing data* (90.2%) suggests that staff would prefer to have the data delivered to them rather than learning how to access the data. Whilst all but one respondent noted that being able to *access the data in a format they can use* was extremely or moderately important, having graphical representations of the data was not considered as important (85.3%). It is noted that a 4-point Likert scale was used for this and the following question as there was no clear mid-point or neutral response (Chyung et al., 2017).

Table 3

Importance of Aspects of Accessing Student Data (adapted from Table 4,

(Jones, 2019, p. 153) (n=68)

	Not at all important		Slightly important		Moderately important		Extremely important				
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*Mean*	*SD*	*Median*
Being able to easily access the data in a format I can use	0	0	1	1.5	10	14.7	57	83.8	3.82	0.42	4
Knowing what student data is available	0	0	4	5.9	23	33.8	41	60.3	3.54	0.61	4
Having access to consolidated information from a number of sources and systems about my students	2	2.9	5	7.4	21	30.9	40	58.8	3.46	0.76	4
Having support for accessing data	0	0	6	8.8	24	35.3	38	55.9	3.47	0.66	4
Having support for analysing and interpreting data	1	1.5	8	11.8	27	39.8	32	47.1	3.32	0.74	3
Having access to professional development in regards to accessing learning analytics	2	2.9	11	16.8	29	42.7	26	38.2	3.16	0.8	3
Having easy access to graphical representations of data	2	2.9	8	11.8	33	48.5	25	36.8	3.19	0.76	3

The next question probed further into the importance teaching academics attached to different types of support, as detailed in Table 13. *Support for accessing data* was rated as moderately or extremely important by the majority of respondents (91.1%), with the least number of respondents noting *Policy/guidelines on ethical use of student data* as moderately or extremely important (69.1%). The fact that 8.9% of respondents rated *Support for accessing data* as not at all or slightly important indicated they are staff who are already confident in accessing data.

Table 13

Importance of Different Types of Support (adapted from Table 5, (Jones, 2019, p. 153) (n=68)

	Not at all Important		Slightly important		Moderately Important		Extremely Important				
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*Mean*	*SD*	*Median*
Support for accessing data	1	1.5	5	7.4	26	38.2	36	52.9	3.43	0.7	4
Support for contacting students identified as at risk of not satisfactorily completing the course	2	2.9	9	13.2	24	35.3	33	48.5	3.29	0.81	3
Professional development regarding understanding learning analytics	4	5.9	7	10.3	31	45.6	26	38.2	3.16	0.84	3
Support for analysing and interpreting data	2	2.9	8	11.8	33	48.5	25	36.8	3.19	0.76	3
Policy/guidelines on ethical use of student data	4	5.9	17	25.0	26	38.2	21	30.9	2.94	0.9	3

Considering the results from Tables 12 and 13 in combination, it appeared that both support and training were highly regarded. However, respondents would prefer to have support to access, analyse and interpret student data than be provided with professional development to enable them to complete the tasks themselves. This insight suggested further exploration through the interview phase on whether this was due to the time constraints mentioned as a barrier and/or other factors.

These observations affirmed the insights from previous questions that an implementation plan that provides training and support for all aspects of LA adoption and use was likely to be effective. This affirms the following design principle would be important to include in a LA implementation plan:

- include training and support in accessing and interpreting data, and implementing actions resulting from those interpretations.

4.4.5 Influence of Others

The next series of questions in the survey examined the external factors and motivators that determined whether a particular person chose to adopt, or not adopt, LA and who were the most influential people when considering implementation of LA. All the questions in this grouping were ranked on 5-point Likert scales.

The first of these questions, as detailed in Table 14, asked staff to note whether they agreed or disagreed with statements regarding use of LA by their peers and how strongly they were influenced by their peers. Respondents did not appear influenced by whether *other colleagues have adopted LA, or will do so in the next 12 months,* with only 8.8% agreeing or strongly agreeing with that statement. The proportion of respondents who disagreed or strongly disagreed with the statement that *Doing what other academics are doing is important to me* (25%) was slightly higher than the proportion that agreed or strongly agreed with this statement (22.1%). This result suggested that the action of others was not a major factor in staff adopting LA. Rather, it was more their own decision on whether or not they would adopt LA, and responses to the third option in this question affirmed this, with 58.9% agreeing or strongly agreeing with the statement that *It is mostly up to me whether or not I adopt learning analytics in the next twelve months.* The neutral option in the first two statements drew the highest proportion of responses (56% and 53% respectively), suggesting that staff were not aware of how other staff were using LA in their teaching practice.

Table 4

Comparison with Peers (n=68)

	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Most academics in my discipline have adopted learning analytics or will adopt learning analytics in the next twelve months	6	8.8	18	26.5	38	55.9	4	5.9	2	2.9
Doing what other academics are doing is important to me	6	8.8	11	16.2	36	52.9	14	20.6	1	1.5
It is mostly up to me whether or not I adopt learning analytics in the next twelve months	3	4.4	6	8.8	19	27.9	25	36.8	15	22.1

The next question asked staff to rate the *Importance of approval and pressure from others within university*. In this question, *staff in my discipline* referred to colleagues teaching in the same broad subject area, *supervisor* referred to their line supervisor, and *the university* referred to senior management and any policy or guidelines. Responses, as outlined in Table 15 indicated that staff respond positively to approval, with greater than 65% agreeing or strongly agreeing with each statement. The responses further indicate that supervisors are the most influential group of people, with 73.5% of respondents agreeing or strongly agreeing that *Approval of their teaching practice from supervisors was important* to them. Approval from supervisors would likely be important as they have influence through the annual performance review system. Conversely, few staff felt *under pressure to adopt LA* from colleagues (8.9%), supervisor (11.8%) or the university (22.1%). These low numbers suggest that there are no imperatives being driven from the university for LA implementation and it is internal motivators that are influencing academics' decisions regarding using LA.

Table 15

Importance of Approval and Pressure from Others within University

(n=68)

	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Approval of my teaching practice from the following people is important to me										
Staff in my discipline	3	4.4%	1	1.5%	19	27.9%	29	42.7%	16	23.5%
My supervisor	1	1.5%	1	1.5%	16	23.5%	31	45.6%	19	27.9%
The university	1	1.5%	1	1.5%	20	29.4%	29	42.7%	17	25.0%
I feel under pressure from the following people to adopt learning analytics in the next twelve months										
Staff in my discipline	23	33.8%	15	22.1%	24	35.3%	5	7.4%	1	1.5%
My supervisor	17	25.0%	17	25.0%	26	38.2%	7	10.3%	1	1.5%
The university	16	23.5%	13	19.1%	24	35.3%	11	16.2%	4	5.9%

Based on these observations, an implementation plan that promotes a positive environment through acknowledgement from management and the institution of good practice and efforts of staff to adopt LA and encouraging collaboration between staff was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- include recognition and reward mechanisms for adopting LA; and
- develop and promote a positive workplace environment.

A further question asked staff about the influence of others, including those outside the university, on their decision to adopt, or not adopt, LA. Responses to this question are outlined in Table 16 and indicated that the largest number of responses for each option in the question were for the neutral, midpoint of the respective options (50%, 45.6% and 44.1%). These responses suggested that staff had not really considered these factors. For the two options on expectations of others, there were slight negative skews with 28% of respondents noting *disagree* or *definitely disagree* for the option *Most people who are important to me think that I should adopt learning analytics,* compared with 22% who noted agree or definitely agree. For the option *The University expects me to adopt learning analytics in the next twelve months,* the skew was similar with 29.4% noting unlikely or extremely unlikely compared to 24% who noted likely or extremely likely. In contrast, 47% of respondents noted they agreed or strongly agreed with the statement *The people in my life whose opinions I value would approve of me adopting learning analytics* compared with 8.8% who noted they disagreed or strongly disagreed with the statement.

Table 16

Influence of Other People in Uptake of LA (n=68)

	1		2		3		4		5	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Most people who are important to me think that I should adopt learning analytics in the next twelve months (Definitely disagree-definitely agree)	8	11.8	11	16.2	34	50.0	9	13.2	6	8.8
The University expects me to adopt learning analytics in the next twelve months (Extremely unlikely-Extremely likely)	10	14.7	10	14.7	31	45.6	9	13.2	8	11.8
The people in my life whose opinions I value would approve of me adopting learning analytics in the next twelve months (Strongly disagree-strongly agree)	2	2.9	4	5.9	30	44.1	26	38.2	6	8.8

These results built on the insights from the previous question and suggested that approval for adopting LA is more important than setting expectations that staff will adopt LA. These insights affirmed that the following design principles would be important to include in a LA implementation plan:

- include recognition and reward mechanisms for adopting LA; and
- develop and promote a positive workplace environment.

4.4.6 Motivations

The final series of questions considered staff motivations for adopting LA, and were based on the TPB (Azjen, 1991), examining their attitudes towards LA and their intentions to adopt. The terminologies used in these questions to describe attitudes are typical of a TPB survey. All questions regarding attitudes, as shown in Table 17, drew overall positive responses with 75% of respondents ranking usefulness for self and students, and desirability as 4 or 5 on a 5-point scale. Importance also rated highly with 72% ranking this as a 4 or 5. This indicated that respondents had positive perceptions of the value of adopting LA. The exception was pleasant or unpleasant with 59% ranking this as 4 or 5. This lower score indicated concern over the time needed to build the requisite knowledge and skills or adding a further layer of complexity to workloads, and these were questions to be further investigated in the interview phase.

Table 5

Attitudes towards Adopting Learning Analytics (n=68)

For me, adopting learning analytics in the next twelve months would be:	1		2		3		4		5	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Unpleasant: Pleasant	0	0	4	5.9	25	36.8	23	33.8	16	25.5
Useless for me: Useful for me	1	1.5	3	4.4	13	19.1	26	38.2	25	36.8
Useless for my students: Useful for my students	0	0	3	4.4	14	20.6	31	45.6	20	29.4
Undesirable: Desirable	0	0	0	0	17	25	24	35.3	27	39.7
Unimportant: Important	1	1.5	4	5.9	14	20.6	23	33.9	26	38.2

The questions on intention, as detailed in Table 18, drew slightly less positive results than those on attitudes, with only 58.7% of respondents responding agree or strongly agree to the highest rating question, *If I wanted to, I could adopt learning analytics in the next twelve months.* Only 33.8% of staff noted that they agreed or strongly agreed with the lowest rated question, *I am determined to adopt learning analytics in the next twelve months.*

Table 6

Intention to Adopt Learning Analytics (n=68)

	1		2		3		4		5	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
I intend to adopt learning analytics in the next twelve months (Highly unlikely – Highly likely)	2	2.9	7	10.3	29	42.7	17	25	13	19.1
I am determined to adopt learning analytics in the next twelve months (Strongly disagree- Strongly agree)	2	2.9	13	19.1	30	44.1	13	19.1	10	14.7
If I wanted to, I could adopt learning analytics in the next twelve months (Strongly disagree- Strongly agree)	4	5.9	2	2.9	22	32.3	28	41.2	12	17.7
For me to adopt learning analytics in the next twelve months would be Highly unlikely – Highly likely	2	2.9	7	10.3	30	44.1	20	29.4	9	13.2
How much control do you believe you have over adopting learning analytics in the next twelve months? (No control – complete control)	3	4.4	10	14.7	22	32.4	22	33.4	11	16.2

Considering these two questions together indicated that whilst respondents felt they had the capabilities to implement LA, there were lower levels of determination to make that happen. Providing an environment in which staff feel more empowered and encouraged to use their capabilities to implement LA was thus an important aspect of an implementation plan, possibly through breaking down some of the earlier identified barriers of time and support. The other questions in this grouping also confirmed this recommendation, with less than half of respondents indicating positive responses to each question.

Based on these observations, an implementation plan that encourages and promotes the implementation and use of LA was likely to be effective. My

interpretation of this is that the following design principle would be important to include in a LA implementation plan:

- provide an encouraging and enabling environment.

4.4.7 Free Text Response

One free-text question was included in the survey, asking: *What is your opinion on learning analytics?* This drew 61 valid responses. Responses were analysed through thematic analysis using Excel and ranged from succinct, e.g. *It has a lot of potential* (for) *better teaching and learning*, to detailed and considered responses that indicated some staff were already beginning to consider the effectiveness of LA and different ways of using the data, e.g. *Quantitative data on students can be useful for determining more qualitative decisions, and can help in future course design*. Twenty-five positive responses were received mentioning different ways in which they considered LA are, or could be, useful. As examples, some respondents wrote, *Useful tools especially re. external students,* and *Very useful in providing evidence around issues such as engagement and outcomes.*

A further 18 responses included qualifiers such as *good, important, valuable,* and *essential*. For example: *It is an important factor that all teachers at USQ should have an awareness of*. Many respondents did have caveats on usefulness, which indicated that staff had a range of concerns that would need addressing before they felt confident implementing LA. These caveats also aligned with the barriers discussed in earlier questions. The following are exemplar responses that mentioned each of the main barriers:

- "They (LA) are helpful additions to my own qualitative understanding to gain insights on student learning. However, using them more meaningfully and accessing them and interpreting them more expediently is something I don't fully understand how to implement". (*Knowledge and skills*)
- "Okay - good if you have time to really investigate and use them" (*Time*)
- "I think learning analytics could be an invaluable tool for evaluating various aspects of teaching. However, unless a full understanding of

interpreting analyses and the implications of those analyses is gained, learning analytics are not likely to be very useful". (*Interpretation*)

- "Can be very useful for broad data gathering but the time for downloading often leads to system freeze". (*Accessibility of data*)
- "Would be useful but no training has been given on how to use this information". (*Training and support*)

The depth and breadth of positive responses may indicate some bias within the respondents, which could be expected as this was a voluntary survey and likely to have attracted responses from staff who had a genuine interest in learning and teaching issues, including learning more about LA. This though, was considered as an opportunity rather than a concern. The issues raised by the respondents provided suggestions for an implementation plan that would benefit these early adopters and interested staff as well as staff who are followers, in terms of educational technology implementation. For example, this response which indicated the need to consider what story the quantitative data provided:

> I'm just getting more involved with them. I think they can be useful but not the only source of data. Hard to ascertain motivations e.g. do more clicks = increased engagement or a student who can't find what they are looking for?

Similarly, this response which indicated accessibility of information was an issue, and professional learning and support needed to be more than just workshops:

> Useful, and I believe that the current practice of academics slowly becoming aware of the resources available to them as they progress through their usage journey is the best practice. However, along with the other IT resources at USQ, I believe the search options should be improved so that academics can retrieve the information they need on an as-needed basis. This is what academics need. Training sessions are not useful as having information you do not use is not practical and academics do not have time to attend training sessions.

> We just want the information to be available and easily accessible - via a search option - when we need it.

There were 22 comments indicating a more negative perception as indicated through use of language including *don't know* and *too slow*, and these offered further insights into design principles for the implementation plan. As examples:

> *Too complex and reduces time with students*

> *Over hyped, poorly understood by most. Constrained by limited systems and assumptions about how to support/design them.*

Overall, the free-text responses indicated a predominantly positive attitude to the benefits of using LA. These responses added depth to the insights from other questions in the survey through discussion of the main barriers to adopting LA.

4.5 Comparison with Results from LA for Retention Survey

This section provides an overview comparison of results from this survey with the corresponding questions from the Academic Level survey developed by West and colleagues. In publications their data has mainly been reported in graphical format and the data compared here has been provided to me by the authors.

Comparison of demographic data across the two surveys, as shown in Table 19 shows similar patterns of responses across all factors indicating that this was a valid comparison.

Table 19

Comparison of Demographic Information with West Survey

		This survey	West survey	
		%		%
Academic level	A (Associate Lecturer)	4.4	Associate Lecturer/tutor	9
	B (Lecturer)	44.1	Lecturer	42
	C (Senior Lecturer)	26.5	Senior Lecturer	29
	D (Associate Professor) or E (Professor)	25	Associate Professor	10
			Professor	7
			Other	4
Length of service (HE)	0-2 yrs	2.9	<1.5 yr	1
	3-5 yrs	5.9	1.5-5 years	13
	6-8 yrs	14.7	5-10 years	23
	9-10 yrs	7.4	10-20 years	39
	>10 yrs	69.1	> 20 years	24
Length of service (USQ) or current institution	0-2 yrs	17.6	<1.5 yr	7
	3-5 yrs	14.7	1.5-5 years	22
	6-8 yrs	17.6	5-10 years	31
	9-10 yrs	8.8	10-20 years	29
	>10 yrs	41.2	> 20 years	11
Basis of employment	Fulltime	85.3	Fulltime	81
	Part time	4.4	Part time	13
	Casual	8.8	Casual	5
	Other	1.5	Other	1

The question of current reasons for using the LMS was the same in both surveys allowing for a direct comparison as shown in Table 20. The exception being that the question on use for assessment submission and feedback was one question in the West survey and split into two questions fro this survey as they were considered different processes. Both groups of respondents reported very high levels of use for content delivery and assessment purposes with >80% of respondents in both surveys reporting that they did use their

LMS for these purposes. Respondents to the survey in this study reported considerably higher usage of the LMS for communication purposes (>80% for both questions) compared with the West survey (66% and 55%). This could be a reflection of the high proportion of online courses offered by USQ, where discussion forums are the main avenue for communication.

Table 20

Comparison of LMS Usage with West Survey

	This survey %	West survey %
I don't use the Learning Management System for my teaching	6.0	2.2
Provision of learning materials and resources	86.6	92.8
Assessment submission	82.1	89.9
Assessment feedback	80.6	89.9*
Learning focused interactions between myself (or other lecturers/tutors) and students	85.1	66.3
Learning focused interactions between students	82.1	55.1

*Assessment submission and feedback were combined in West survey

There were some slight differences in wording in the questions regarding interest in applications of LA as the West survey had a focus on student retention, and the response options were also slightly different, with the survey in this study including an option of "I already do this". Comparing the percentages of respondents who were not interested in particular applications, as shown in Table 21 shows similar low levels across four of the five options (<10%). The exception is use of LA to predict student success with 16% of respondents from this survey indicating they were not interested.

Table 21

Comparison of Interest in LA with West Survey

	I am not interested in this %	I am interested in trying this %	I already do this %		No interest %	A little interest %	A lot of interest %	Not sure %
Identify students at-risk	1.5	64.7	33.8	Identification of at-risk students with a view to staff proactively responding to address the risk responding to address the risk (n=317)	3.2	19.2	73.8	3.8
Improve teaching practice	2.9	61.8	35.3	Teaching staff evaluating and improving their own teaching practice (n=315)	2.9	20.6	72.4	4.1
Improve student retention	4.4	72.1	23.5	Informing potential initiatives to promote student retention (e.g. mentoring)(n=316)	3.8	26.3	66.2	4.1
Improve course design	2.9	60.3	36.8	Informing design and layout of online learning sites and environments (n=317)	7.9	24.3	62.5	6.0
Predict student success	16.2	70.6	13.2	Identification of student success with a view to providing an affirmation/reward type of response (n=314)	8.6	32.5	52.2	6.7

Taken together these comparisons indicate that the strategy developed in this study is likely to be relevant for use in other Australian universities need to be adapted, possibly with some adaptation for the unique context of each institution.

4.6 Chapter Summary

This chapter discussed the results from the initial staff survey and provided a snapshot of staff knowledge and use of LA tools and reports in the LMS, the main barriers to engaging with these tools, the different supports staff felt

they needed to engage with LA as well their main motivations for engaging with LA. The results from the survey addressed sub-question 1 of the Research Question: *What do academics identify as the enablers and barriers to the implementation of Learning Analytics use to inform and enhance their teaching practice?* The main barrier noted was lack of time and many respondents noted multiple additional barriers, with lack of knowledge and training also being prominent responses. The main enablers were identified as provision of training and support, with support being considered more important than training. One reason for preference for support could be related to the barrier of lack of time and academics wanting professional staff to undertake some of the administrative work. This is an area to be drawn out in the interviews. Respondents noted that training and support were needed to access appropriate data, analyse and interpret that data, and develop and implement actions resulting from that interpretation. Staff also noted different reasons why they were interested in using a range of reports with student retention and success identified as the areas of highest current use and interest. Respondents also noted that approval of their teaching practice from colleagues, supervisors and the university was a significant factor determining whether to engage with LA and most noted that they did have intentions of engaging with LA within the next 12 months

The results from the survey also informed sub-question 4 of the research question: *What are the design principles that underpin an effective LA adoption strategy?* I consolidated the draft design principles noted throughout the chapter into a set of draft design principles for an implementation plan to overcome these barriers, and build on the supports and motivators, specifically:

- provide professional learning on different aspects of LA and data including:
    - reports and data available in the LMS and the purpose and benefits of use to inform teaching practice; and
    - how to access, analyse and interpret student data in the LMS;
- provide support and resources to empower staff to access, analyse and interpret student data in the LMS;

- contextualise these opportunities and support around the areas of student retention and success;
- support staff to make more efficient and effective use of time;
- recognise the time needed to engage in these processes and reward staff for their involvement; and
- provide an encouraging and enabling environment.

A comparison of responses to this survey with similar questions from the West academic level survey showed generally similar levels of usage of the LMS and interest in different applications of LA. This indicated that the implementation plan developed through this study is likely to be relevant and transferable to other contexts and institutions.

The survey results also provided areas for further investigation during the interviews held as part of Phase 1 including:

- What factors apart from knowledge impact your use of LA tools and reports in the LMS?
- What is your perception of using LA to predict student success?
- What are your main reasons for using or wanting to use LA?
- Are you confident in accessing data from the LMS?
- What are your main areas of concern about adopting LA?

The responses to these interviews, including these questions and analysis of those results will be explored in Chapter 5, along with analysis of log data of staff interactions with the LMS.

Chapter 5: Phase 1 Initial Data Gathering – Interviews
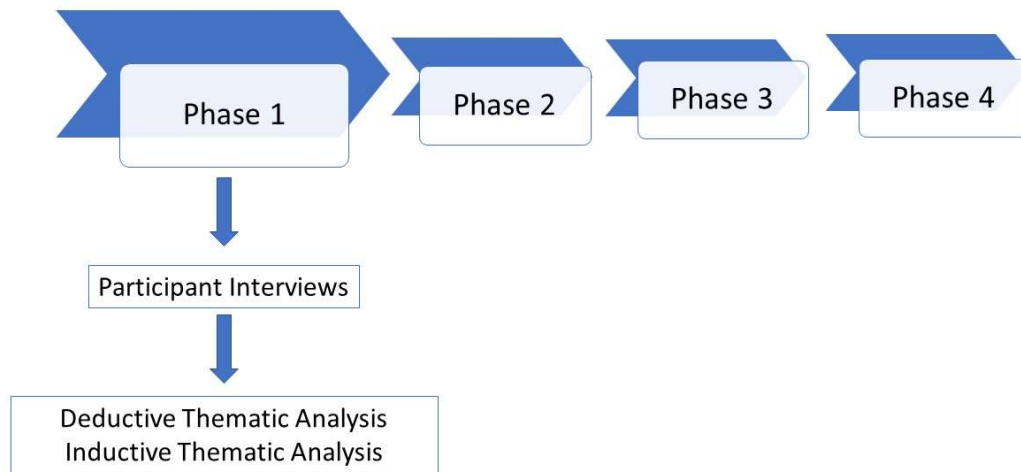
5.1 Introduction

This chapter builds on Chapter 4 by analysing and discussing the interviews held as part of Phase 1 of the study. The chapter begins with an outline of the processes for the recruitment of participants, the conducting of interviews, and the formulation of discussion questions. Discussion of the deductive and inductive thematic analysis of the transcriptions follows, including comparison between the different participants. Analyses of data throughout these components of Phase 1 of the study specifically informed sub-questions 1 and 4 of the main research question, namely:

2. *What do academics identify as the barriers and enablers to the adoption of LA in their teaching practice?*

4. *What are the transferable design principles that underpin an effective LA adoption strategy?*

The purpose of this interview component of Phase 1 of the study was exploratory: what perceptions of Learning Analytics (LA) were held by a

small group of academics? Why were they interested in using LA, and how were they using LA to inform their teaching practice?

5.2 Participant Interviews

5.2.1 Process of Interviews

As noted in Section 3.3.1, recruitment of participants for Phase 1 of this study began with email contact with the Executive Deans of the two faculties and from there took divergent paths, as detailed in Appendix G. This process took place over six months and meant that different pairings of participants were involved in different numbers of interviews. The aim of having pairings was to have perspectives from different disciplines and to enable staff to share experiences with each other, leading to more detailed discussions and opportunities for social learning. Overall though, it transpired that disciplinary differences were not a major factor in participant responses and rather, their responses were influenced by their individual approach to learning and teaching. A total of 24 semi-structured interviews were conducted over a period of 18 months in 2016 and 2017, with a mix of interviews as pairs, or individuals, depending on availability of participants. At different points during Phase 1, some participants were absent from campus which meant their interviews were conducted via videoconference. This was also the case when participants were on different campuses or myself, as researcher and interviewer, was away from campus. On one occasion, the interview was conducted via email. It is acknowledged that there were limitations to using email for this interview as there was no opportunity to probe deeper or seek clarification on responses, however there were opportunities to do so in later interviews. Each interview participant in Phases 1 and 3 are identified throughout this and subsequent chapters with gender-neutral pseudonyms. There were three participants who continued from Phase 1 to Phase 3 and the same pseudonyms are used throughout the discussion chapters.

A semi-structured approach to interviews was employed for consistency of the opening questions across the four groups whilst providing opportunities for all participants to expand on these in their own way, which also gave the

participants some ownership of the tone and direction of the conversations. The aim of the interviews was to collect in-depth data on participants' knowledge and use of LA, their motivators and approaches to adopt LA, and to determine if having the opportunity for such discussions over an extended period had any effect on these factors. Both inductive and deductive thematic analysis of the transcripts was conducted with the deductive themes related to the research sub-questions and considerations of the barriers and enablers to implementation, along with the participants' motivations and the supports they indicated they would need.

The inductive analysis focused on emerging themes and ideas from the interviews. During the interviews and focus group sessions, participants discussed plans for using LA to address a question of their choosing, related to some aspect of their course design, teaching approach and/or student engagement, and their progress in enacting those plans, using data from the LMS. At times, discussions in the interviews would veer off on more general discussions about pedagogy or the institutional context. Whilst not directly related to LA, they did provide background to the complexity of issues and environment in which academics work, all of which can, and did, impact on their ability to engage with LA. The following sections discuss the deductive and inductive thematic analysis of transcripts of all the interviews. NViVo was used to facilitate these analyses.

5.2.2 Initial Interviews

A series of questions were used in each of the initial interviews to guide discussions and elicit details of what the participants hoped to gain from participating in the study. The questions also related to the first phase of the I Framework, as developed in Chapter 2, investigating the impetus for participants to want to engage with LA. The questions were:

- What question(s) would you like to investigate?
- Why have you chosen this/these question(s)?
- What is your definition of success regarding LA use?
    - What is quality teaching and learning?
    - How do you rate yourself?

- What information/evidence/data do you use to inform your understanding?

Flexible approaches to some interviews were necessary in this process, based upon participant availability. For example, Greer was not available for the initial interview, whilst the interview with Blake and Hunter was conducted by email due to difficulties in finding a mutually convenient time as Hunter was overseas.

The questions participants nominated to explore varied, with some noteworthy commonalities. When considering the questions, *Student engagement and experience* was the most noted theme across the questions with all participants including this as an aspect they wished to better understand. There were, however, different levels of questions included, with Jamie being quite specific and detailed about which components of the StudyDesk they were interested in investigating for student interaction. Conversely, the questions that Blake, Dallas, Hunter and Jordan raised were more general. Finlay was the only participant to mention the order in which students interacted with various elements of the LMS and the interpretation of that interaction. Both Finlay and Jamie referred to assessment in their questions. Whilst most participants had a positive frame to their questions, with an aim of trying to improve the student experience, Frankie took a slightly more negative approach, using a frame of correlating engagement with possibility of academic misconduct. Blake and Hunter also mentioned course design in their questions, and Hunter included teaching practice in their questions, making them the only participant to include all three of these theme areas. Details of the questions for each participant are shown below in Table 22.

Table 22

Initial Participant Questions by Theme

	Question(s)	Student experience and engagement	Course Design	Teaching Practice
Blake	What can be done to encourage students to engage more fully with the course learning activities? What can be done to make the course learning activities more attractive and valuable to students?	✓	✓	
Dallas	How often have students accessed specific links or resources? What resources are they using?	✓		
Finlay	How are students engaging with materials and in what order they approach this?? How can I recognise at-risk students or students who might potentially be looking to cheat the system? When do students engage with their assignments?	✓		
Frankie	Is cohort A who have been found guilty of academic misconduct behaving differently to cohort B who have done minor misconduct or cohort C who have done nothing wrong?	✓		
Hunter	How often and which items are students engaging with? Is that engagement related to results? How might I use the stats available to enhance my teaching and the learning environment?	✓	✓	✓
Jamie	Which StudyDesk items do students access: -The most often - Regularly over the semester - For the longest time on each access? What are the peak days for student access and how do these align with teaching events? Do students access multiple choice quizzes? How long do they spend out of the allocated 60 minutes to do the quiz on average and what percentage attempt a second time? Do the results correlate with engagement patterns? Does the level of access differ between a first-year core course and a later year elective course? Does the students' GPA outcome have any correlation to patterns of engagement?	✓		
Jordan	What resources are most used? Do students regularly engage with the StudyDesk and how does this relate to marks? Do students engage with the tutorial Q & A document?	✓		

Notes:

GPA: Grade Point Average

Most participants commented on the themes of course design and teaching practice in response to the second question regarding the reasons their chosen questions were important. For example, Blake commented on aspects of engagement and course design: "I go to substantial effort to develop course activities, but students often do the minimum required. I'd like to match things more effectively", whilst for Hunter it was a combination of student experience and teaching practice: "Ongoing improvement of quality outcomes for my teaching and my students' learning". Similarly, Jamie noted how using LA could help with future course design:

> In my StudyDesk these are the things that students focus on and so, for instance, I know they will focus on assessment and things like that. So if they focus on some things in a good way I can spend more time on making them fantastic. You know, doing videos around assessment or something, but if they don't touch on some of the other things then I'm wasting my time on those and I would reform the way I deliver.

Jamie was also able to see how learnings from one course, and the ways in which other academics designed their courses, may be able to support future development, indicating that there was applied value in engaging with LA: "I'm writing another course. When I have the time, this stuff will influence me in how I work and how I deliver" and

> I think the other thing when we are finished, I would be interested in seeing your course, Jordan, because we both do different things but the response from students to your things would help me. That's why it's nice to have joint research because it's wider, more courses would help me. If students were really hitting this thing and I don't have it in my course, I would consider thinking in future that I need to do that.

Jamie noted the potential of research and Dallas echoed this, albeit in a more direct comment: "I think it would be good if this could lead to a publication for the school".

Whilst Jordan's focus on students continued through this discussion, they also included related elements of course design:

> So I suppose it's to see what resources are most used, whether students do regularly engage with the StudyDesk, and I am quite interested in the tutorial Q & A document because it's such a basic thing. Last time I did the analysis, less people looked at that document than the recorded lectures, and I also want to see if engagement with the StudyDesk, how that relates to marks.

The initial paired interviews with Finlay and Frankie diverged quickly into looking specifically at their course sites in StudyDesk, and down to individual student interactions with the site. This divergence appeared to be due to a genuine interest in learning more about LA and information available in the LMS that they could use to support their students, rather than related to their discipline. As a result, there was not enough time for specific discussion of the reasons they had chosen their investigation questions. This was despite holding two interviews with them to try and cover those aspects.

In summary, the initial interviews focussed on the motivators for staff engaging with LA and three main theme areas emerged: student experience and engagement, course design, and teaching practice. Based on these observations, an implementation plan that acknowledges the different motivators and encourages collaboration was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- build facilitators' understanding of staff reasons for wanting to engage with LA and use those as starting points for conversations; and
- include opportunities for social learning and collaboration with peers.

5.3 Deductive Analysis

After transcription of the interview recordings, a deductive analysis process was used, using the research sub-questions as the lens for analysing interview data to investigate the barriers and enablers for academics engaging with LA. Further, the participant responses to the initial survey

revealed key themes, and the interview data were coded according to these same themes and considered from the perspective of whether participants considered them a barrier and/or enabler. Motivations for LA use were similarly coded. Quotations included in the following sections are a selection only and were chosen to provide an overview of the depth and breadth of the issues discussed and the different perspectives each of the participants offered.

5.3.1 Knowledge and Skills

Participants generally acknowledged their lack of knowledge of the range of LA tools available, which was consistent with the responses in the initial survey. The comments ranged from noting lack of knowledge of the levels of information available in the standard reports, for example when Jordan noted "that's interesting, how many users. Because I didn't know… that individual users would show up", when being shown one of the activity reports. Others made more detailed observations, for example Finlay who commented:

> Yes, so these are things I don't know. I'm not sure about the detail of what to look for. Some things will tell you how many times it has been accessed, not who or when. Is there data that tells you, there must be data that tells you when students accessed? So, if that was accessible in some other mechanism or can be extracted in some way and then processed, that would be useful.

In this one comment, Finlay noted how lack of knowledge was a barrier as was lack of easy access to data, whilst acknowledging that if those barriers could be overcome, using LA would be useful. Dallas echoed this lack of knowledge and noted that this could contribute to a superficial use of LA:

> I don't think for one minute that I'm fully aware of the capacity or the capabilities of the analytics…. it's sort of like using your iPhone or your iPod, you just do the basic things over and over again because you know that they're there, but the capabilities are so much greater.

Participants also noted that knowledge was also more than just knowing that the tool or report existed and considering how to use; they were also

interested in being able to practice using the tools. For example, Blake noted "It's more than thinking about it, it's actually playing with it, and have some experience of it. Yes, I think there was a playground system[1] somewhere. I don't know whether that's still available", and added that, "Without being able to play with it, it's trying to get a real sense of how this actually works". Greer also discussed this form of lack of knowledge:

> Well, we're all picking up the analytics by the seat of our pants and we're not even sure what analytics are available. If I could take a basic user's course or the basic user's manual or StudyDesk devoted to analytics one on one, I would find that helpful… I know some basic analytics that I use a fair amount but I'm sure there's other useful things that it's 'you don't know what you don't know'.

Whilst in this thread Greer notes lack of technical skills as a barrier, as well as lack of knowledge of what is available, they do suggest ways these barriers could be reduced through provision of support resources and personal support.

Both Blake and Hunter commented that it would be beneficial to know which resources or format of a resource students viewed as this could help them decide whether it was worth their effort to create and upload different formats (for example PowerPoint slides of a lecture and pdf version of that presentation). This was an example of the pairings building on and affirming each other's experiences and sharing concerns, which emphasised the importance of these concerns.

Issues with dissemination of information about upgrades to the LMS were also noted as a concern and that this could impact on the lack of use of new tools. For example, Hunter noted "I suspect they'll be disappointed that some of the things people didn't take up. We didn't take them up because we don't know what they are".

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[1] A playground in this context was a site in the LMS that academics could request where they could experiment with different designs, tools and reports and gain experience without affecting the live course site.

A further area of participant knowledge that was lacking was the Human Ethics process, although this was not applicable across all disciplines. For example, Frankie noted "I haven't done an ethics application before for this kind of thing and I'm trying to avoid the situation of getting knocked back. My data will be aggregated and de-identified, just looking for trends, how students are engaging". This was one of the few instances where disciplinary differences were noted during the interviews.

Based on these observations, an implementation plan that includes training and resources on different aspects of LA was likely to be effective. Training and resources would need to include knowledge of what reports and tools are available and building technical skills to analyse and interpret student data and pedagogical knowledge to implement changes to course design and teaching practice. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- provide training to build staff awareness of LA reports and tools available in the LMS in technical skills to analyse and interpret data, and pedagogical knowledge and skills to implement changes to course design and teaching practice;
- provide resources that detail all LA tools and reports available within the LMS and how these can be utilised; and
- include clear and timely dissemination of information about any new tools and reports.

5.3.2 Time

Many different aspects regarding lack of time were included in discussions, and comments again ranged from the succinct observation from Dallas that "Time (is) obviously one of the barriers" through to more detailed conversation on a range of aspects of time. The lack of time to prioritise engagement with LA was mentioned on multiple occasions. For example, Jamie noted in an early interview that "there's other things that just pile on top and you never get that free moment because I think it is a thing you really need to get your head around". Similarly, Greer noted:

You don't even know to look for an answer or look for that data because it might be something that's really cool. I've just never had the luxury of time to be poking around enough to have found that on my own.

In this comment, Greer also links time to the difficulty in accessing data which was echoed by Hunter: "I've pretty much been ignoring the data. In the past I would have looked, but I think something changed and it got harder to get in and I just said, 'No, I'm too busy'".

Participants also noted regret at the lack of time to engage fully with this research project. For example, Jamie lamented, "I just feel sad that I wasn't able to give the time to really commit," and that, "I am honestly just so flat chat... this semester I wouldn't necessarily be able to respond in how I deliver the resources, because I'm on a process here. But what I see at the end is some reflection time to change things for next semester". Both comments though are seen as positive as they show an interest in engaging further and using the learnings from involvement in the project in future courses.

Time was also discussed in terms of workload issues; that there were many competing priorities for an academic. The tasks being delegated to them were ever-increasing, and there was no recognition in workload agreements for engaging in LA or taking actions as a result of that to achieve quality learning environments for their students. All of these are valid concerns and difficult ones to address in the scope of this study. They are, however, considerations to be brought to the attention of university administration. For example, Hunter commented, "if we're not going to get any workload for this, let's see how many hours we are giving the university and see if we can scoop some of it back in any way". Greer expanded on the issues of allocation in workload agreements during discussion of how more time was needed to support students in online courses:

One of the things I find difficult with the (academic) workload model is that there is not a lot of recognition of, you know, the (Course) Examiner is going to be doing a whole lot more work if they have 600 students than if they have 10 students, just by sheer numbers. And

while you get some contribution for communication, the current model is a little bit insulting.

Dallas raised similar concerns, bringing together general concerns around workload and specifically around LA:

There could be various reasons why. I mean, minimum standards suggest that you should be in there three times a week. Student expectations are that you're there seven days a week and that's 24 hours a day. I guess not everybody would want to, or haven't got time to engage in the analytics I suppose. It's flat out controlling the students. Even that has its moments. I think that the workload is such that learning analytics doesn't feature within any workload allocations, nor does quality. While there is no recognition of that, then I seriously doubt that the teachers will do anything other than teach, do what they have to do, and move on.

In a later interview, Dallas noted a slightly more positive take on workload issues, commenting on how recognition of this by the university could encourage staff engagement with LA:

if they're actually serious about quality in teaching and learning or if they actually even have any sort of commitment to scholarship in teaching and learning, then possibly they need to put their workload where their mouth is to support us. That would be the biggest thing and that's probably the biggest barrier.

Frankie also noted a different perspective on time, as an investment:

I'm trying things because I'm trying to do my job more efficiently. I can see where, if I invest a bit of time here, I can save a lot more time later on. That's what I'll do. Sometimes you waste plenty of time, but in the end, if that's in your nature, that's what you have to do.

Based on these observations, USQ and other institutions, could consider how to include recognition of the time needed for staff to develop capabilities needed to engage with LA and then to use LA in their teaching practice, into academic workloads. This recognition could be achieved by allocating specific

time for these tasks, or increasing hours for general course development, contingent on the methods used to calculate and allocate workloads. My interpretation of this was that the following principle would be important to include in system-wide support for LA implementation:

- provide incentivisation for engaging with LA through recognition in workload allocation.

5.3.3 Accessibility of Data

Lack of easy access to LA data within the LMS was a common theme across all participants, that was linked to lack of knowledge and skills, in how to access that data, and the time taken to access data. For some, this also raised concerns as to the reliability and completeness of data. For example, Hunter felt "there are a number of inefficiencies in our system that do take time and energy up*,"* and Dallas noted, "the limitations of using *Useful links* to recordings etc. does not record analytics". It is noted that *Useful links* was a tab included in the USQ version of Moodle through which students could access lecture recordings and other resources. However, clicks through that link were not recorded in the Moodle log data resulting in incomplete usage data. This anomaly does appear to have been resolved in the current version of Moodle at USQ. Several reports, including *Course Participation* and *Engagement Analytics* could not be exported in a usable format. Participants had to copy and paste the data in these reports into an Excel spreadsheet on a weekly basis and manipulate to compare changes in interaction levels over the course of the semester to make meaning from these reports. These are issues that have been noted by other authors (e.g. Falcão, 2020) suggesting this is an area of improvement for Moodle and other LMS developers to consider.

Participants suggested that having LA reports pushed to them on a regular basis would be likely to improve levels of use and engagement, for example Greer who noted, "I wish the analytics were much more of a push analytics and targeted at important dates". Dallas expanded on this, suggesting this would also be a way of encouraging more academics to engage with LA:

> If we as academics didn't have to go chasing the analytics, it would help. It would increase engagement with the data with academics if it was pushed... some academics might, despite themselves, actually read it and take note of it and get interested in it. I think that that would certainly be something that would be worthwhile across the board.

The notion of push data was taken a step further in a conversation with Finlay and Frankie around the affordances of push or pull information when Finlay noted that a push service that included some statistical analysis would be useful and encourage more academics to engage with the data. Through this comment they were showing interest in not just the data but also recommendations and advice on how to use that information. Frankie and Finlay also discussed more technical aspects of accessing data through the log files, with Frankie noting:

> The primary blockages I've got is actually accessing the logs because the log is so enormous that I can't download it. It "times out" because it's so enormous. The other one: I might have to go and try a different format. I'll try a spreadsheet but it's got 3,000 pages [chuckles]. All logs. I don't know how much is on a page.

Finlay responded:

> Yes, if you could get the bulk of the data and then process it any way you want, that'd be nice. If you can get all the data there that you were having trouble with, in your case and slice it and dice it in the spreadsheet using slices and whatever, that's reasonably powerful; if you can get the data.

The USQ Analytics tool was mentioned frequently as both a barrier and an enabler to their effective use of LA. While this tool had provided insights for both into levels of student interactions with course content, they were interested in improvements to the efficacy of the report. This report does offer a broad overview of student interaction with the LMS and whilst the participants considered this provided a good starting point for engaging with LA, they also were interested in more detailed information. Finlay and

Hunter commented on the restrictive nature of the USQ Analytics tool while Jordan and Blake noted concern about how resulting messages were forwarded to students. The nature of comments ranged from simplistic, for example from Jordan who noted USQ Analytics as an enabling tool because of its "ability to be able to easily identify and contact students not engaging", through to more considered and detailed, as in the following examples.

Hunter commented:

> The new USQ stats thing does make things quick and easy, that made it a lot easier for me to do stuff. So saying, the fact that it is individual items and I can't collate 3 or 4 things together because I might present the same thing in different ways, by audio, video, PowerPoint; it's problematic but I've heard that's going to get fixed.

It should be noted that this change was made in an upgrade to the USQ Analytics tool.

Finlay had a similar perspective and provided additional ideas for improvement of the tool through inclusion of options to choose a specific timeframe for the data. "If you've got time-based, week to week, so you can get a trajectory of information, I think you'd probably get that out of the logs if you looked hard enough now".

Blake noted an issue with the way nudges were sent from the USQ Analytics and suggested a possible enhancement to the tool, to alleviate this concern:

> Some of the tools that are there, to communicate with students once you have the data sent aren't that useful, because it uses Moodle messenger system, which may or may not be tied to their email. They could have turned their email off, so you can't be entirely confident that the message is getting through to their email; you really need to go via Peoplesoft, so it's full of interesting wormholes that you can fall down. So, some distance to go before it presents an at-your-fingertips picture without a lot of effort or interpretation, but yes it helps.

These comments all indicated a willingness to engage with LA that was hampered by lack of access to, and confidence in, the data in its common format. This feedback suggested some participants had not been engaging as deeply with LA as those who offered more considered responses. Whilst there were many possible factors for these different levels of engagement throughout this phase, this did indicate that an implementation plan would need to cater for a range of levels of engagement.

Based on these observations, an implementation plan that embraces the different capabilities and knowledge levels of academics was likely to be effective. It would also be important to provide support for academics to access LA data in the LMS and for institutions to continue to develop LA tools and reports that provide information in easy to access formats and in a timely manner. Pushing information to academics on a regular basis could also improve their effective use of LA. My interpretation of this was that the following design principle would be important to include in a LA implementation plan:

- provide training and resources that support staff to access data in a timely manner.

These insights also identified the following recommendations for USQ and Moodle for enhancements to the LMS:

- develop reports for key touchpoints during a teaching period and mechanisms to push this data to academics in a timely manner; and
- enable export of all reports in Excel format.

5.3.4 Training and Support

There was also a lack of knowledge regarding the appropriate people in the university to contact for ongoing support, and the key roles and personnel. Participants also expressed a desire to know who to contact for support in different aspects. Hunter noted a need for guidelines and direction on how and why to use LA, indicating a desire to understand the benefits and affordances of use, in addition to development of the technical skills needed to achieve this. Participants did not always want to develop all the skills

themselves and noted they would rather have access to people who did have the skills and detailed knowledge of the different systems, so they could work with them. For example, Hunter noted:

> A lot of people here work in their own system every day and know it very well, but it's a system that we might work in every 3-4 months so were not familiar with: it's not at our fingertips, can't even remember where the damn thing is often, … I'm lucky that I can talk to xxx*; I can talk to yyy*; "This is what I want done," or "Who else can I talk to?" depending on what the issue is.

These sentiments were echoed by Jamie, when discussing a desire to work with a statistician:

> It needs some statistical analysis, which I don't have so I have to go off and find someone to tell me what all those stats mean and what are the analyses. Really, I think learning analytics is probably something that works best in pairs or with other people working in a group. It's a bit hard in isolation unless you're that kind of person and I'm not a numbers person or a graph person.

TeachDesk was mentioned on several occasions as a logical central site for support resources, for example, Hunter who commented:

> But that's part of the drama; it's still very messy. There's still stuff in TeachDesk, there's still stuff in MyIT[2], there's still stuff in 2-3 of the older versions of those types of things so I have actually found that not useful at all because I don't know where to search. So now I just ask, I don't even bother to try searching.

Greer suggested one way forward was to provide support on an ongoing basis and build on expertise of academics across the university:

> I think that part of the problem, certainly other universities I've worked at, when you bring people on as being full-time hires, they have a day a week off, Mondays or Fridays or Wednesdays or

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[2] TeachDesk is a site in Moodle at USQ dedicated to staff support and development and MyIT is the IT help site at USQ

whenever it happens to be (for professional learning). You bring them in to learn how to be teachers. That includes understanding LMS, understanding curriculum design, understanding how to use analytics for evaluative purposes, so on and so forth.

What you'll find is that across the university, people are really uneven as well. You have certain people who can probably teach you stuff about analytics. There are people who are computerphobic. Somehow across that broad spectrum of people, we have to try to bring the phobic people along and get the people that can do analytics in their sleep to talk to us about what that might look like from a basic user's point of view.

Blake and Finlay commented on the value of peer support and discussions:

What would do wonders would be something like the previous USQ online users' maillist[3]. And I think too a lot of loose communication, where someone can float a question and others can respond. Someone else may have already found a solution, so how do you find out about that? It's about building up trust. (Blake)

If that was even just a little group of people that shared information around, in some form, then that could then be beneficial to each other, but it could be turned into something that other staff could then utilise or try. Say, "I never thought of that. What if I tried that? I'll put in those things and see what I get". (Finlay)

Finlay also mentioned social learning in their final interview when comparing the different types of conversations held during their involvement in this study to those in the pilot for the USQ Analytics tool:

It's been enlightening to see how each of us think about what we might be able to do with some stats, for want of a better word. I knew that the trial (*for USQ Analytics tool)* was on, and I was working with them. There has been some feedback paths with the trials

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3 The online users' was a maillist to which USQ staff could subscribe to share experiences and ask questions related to online teaching

specifically, but it's always good to discuss those... outside that, because they're focused on the tools in some respects. Or maybe in how to use so that it can be best developed, but talking about other aspects, not just the tool. It makes you think about what else you might be able to use things for, or different ways you could do it, even if you don't use this tool. I've been looking at such and such, some data or something from somewhere else. Not related to this, but you mention it in a discussion like this [and] it gives other people ideas.

Greer focussed on the support provided through implicit reminders and discussions during their participation:

I think it's actually been very useful. It's one of those things that, because it's not something that we have to do every day, it's easy to fall off your mind... Actually, even when things appear in my calendar, I think to myself, "I haven't checked my analytics recently." I go back. For me, it's been a good reminder, and just things that we've talked about; sometimes it's triggered in my mind, "Can you do that? Let me go back and look at that." It's been a good reminder.

Based on these observations, it will be beneficial to include opportunities for academics to share practice and learn from each other as part of an implementation plan. A single site where all resources could be easily located would also contribute to the training needs of academics, as would ongoing support and training to build their skills and knowledge. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- include effective communication regarding supports available across the institution;
- provide opportunities for social learning and collaborations;
- include details of key personnel and roles in resources; and
- include resources on how and why to implement LA and consolidate these in one central location.

5.3.5 Interpretation of LMS Data

Interpretation of LMS data was discussed in several interviews, and while this did not receive as much coverage as the barriers discussed in the previous sections, the comments were often considered and insightful. Much of the discussion also had a positive tone, with participants suggesting ways that they could be supported to better interpret the data. For example, Finlay noted:

> If the system has access to the data, whatever system we use whether it'd be manual, semi-manual process or something else, there's lots of data that we could use... But somehow [we need to implement] the mechanism that the big data people might know of to come up with correlations that we aren't aware of.

This theme was continued in a later conversation when Finlay discussed how considering different datasets could lead to different ways of considering student behaviour. These comments also showed that Finlay was engaged with considerations of indications of student learning, rather than just an interest in what students were accessing:

> It's probably more an experience. To some extent, it's probably an experience of using it, but also, I guess, yes, it's a question of, "Is this everything?" Because there's more to studying the courses than necessarily just submitting assessments or posting or being on the forums and logging in. I guess the logging in one is trying to capture the behaviour of, "Okay, are you looking at the material that's out there?" I guess that's capturing that rather than necessarily targeting, "Okay, are they looking at this particular resource?"

Dallas focused on the fact that the data by itself does not tell the full story and it is important to follow-up on context, and include the student voice when possible to understand student behaviour:

> We need some best buddies who are statisticians who would be basically prepared to do this for us, with no pay, because we can't report any of this without statistical analysis. By the same token if we can identify a trend, say for example if only 50% of the student cohort

looked at something, we have no idea why that phenomenon happened so we would need the student voice and perspective, wouldn't we? So if we had data that said 50% did this and then some way of getting the student voice had said that they hadn't bothered because it was boring then that would support what we were saying. *But* if we didn't have the student voice, it would only be conjecture. Maybe it's boring; maybe their internet broke; the link didn't work; only 50% managed to get in; you could jump through all sorts of reasons but you wouldn't have THAT reason.

Similarly, in a later interview, Dallas acknowledged that the data from the LMS is only part of the picture when they noted circumstances in which gathering LA would be difficult: "because my area is hampered by geographic isolation – in some cases the info is sent on USB so that makes it difficult for LA because obviously they can't engage online; some are incarcerated".

The lack of knowledge on how to interpret data arose in conversation with Jamie and Jordan, with Jamie explaining to Jordan the necessity of this for research papers: "If we get all these numbers, if we get these analytics and say this number of people were accessing the resources, that's raw data. What you have to do for publication is interpret that raw data".

Based on these observations, an implementation plan that includes access to support from data experts, as well as training in how to interpret LA data from the LMS was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- provide support, training and resources to assist staff interpret data.

5.3.6 Institutional Guidelines

Institutional guidelines and support were not a prominent discussion point with any of the participants, echoing the low levels of concern for this aspect noted by survey respondents and discussed in Section 4.3.4. One exception to this was the lack of consideration of time to engage with LA in workload allocation as discussed above in Section 5.3.2. Dallas was the most effusive in noting a need for institutional support on several levels:

I would suggest that really if you want learning analytics within this university, there needs to be a serious commitment to supporting that and even if that means having somebody who is employed specifically to run around and do this.

Jamie also noted that more widespread uptake of LA may only happen with more explicit institutional support noting there is: "so much we could be doing and need time and reward/incentive". They did not, though, expand on what that reward or incentive might look like.

5.3.7 Motivations

Throughout the interviews, participants were asked to discuss the reasons they wished to engage with LA and their motivations for engaging, to build on the questions they developed in the initial interviews, and to help determine appropriate strategies for support for staff. In line with the categorisation of those initial questions, the following sections discuss those motivators through the lenses of students, course design, and teaching practice. A fourth motivator of academic recognition also emerged through the discussions and subsequent coding of themes from the transcripts of interviews. All participants discussed some, or all, of these sub-themes though the emphasis and dominant motivator was different for different participants.

5.3.7.1 Students

Participants identified that LA were useful in understanding what resources students were accessing, when and why they were accessed, and whether particular patterns of interactions had any correlation to grades or tendency to engage in academic misconduct. These comments all indicated that participants were interested in looking beyond the mere "number of clicks" and considering how student interaction with their course sites could be used as a measure of behaviour and learning. For example, Dallas commented that, "It might be interesting from their (student) point of view. What do they find useful to help them? You know, tracking their progress and helping them in the course." Frankie queried what different patterns of interaction might indicate:

Is cohort A who have been found guilty of academic misconduct behaving differently to cohort B who have done minor misconduct or cohort C who have done nothing wrong? That's the kind of thing, maybe we can get something from the logs that give some kind of measure.

Building on these types of comments, several participants specifically mentioned using LA to improve student success and retention, as being a motivator to engage with the data. Participants discussed a desire to be able to use LA to identify students at risk, patterns of interaction that could lead to student success, and using this information to contact students to provide pastoral care. The focus on pastoral care has also been mentioned by academics in other research (Howell et al., 2018). This further suggests positive beliefs in the usefulness of LA. Contextualising LA by including this in discussions of retention and success may be a useful strategy to increase staff uptake of LA. The importance of improving student retention and success as an institutional imperative was also noted by several participants. The need for appropriate and timely reports to support these processes and empower staff was also listed by Finlay: "progression/retention, being able to provide student husbandry- identifying students at risk and providing appropriate support, why are students struggling with assignments." Similarly, Dallas stated, "all of that counts as far as retention which is important for the uni – one of the holy grails". Greer also noted the importance of LA in recognising students at risk and being able to improve student retention and success:

If I got a weekly summary of students at risk so I or the tutors could reach out to students and ask if there is anything we can do. "Is it something as simple as technology? Or something as complicated as - my life is falling apart and I'm sleeping in my car... aside from the technical pieces... I think if we could make the learning more engaging and more interesting and more dynamic, and if we can use our analytics better, we'll have better retention and better student outcomes, and those are the things that I think become compelling arguments for people like the Senior Deputy Vice Chancellor, that

this isn't just a look nice, feel good, whatever. Students are more engaged and they get better marks.

Based on these observations, an implementation plan that contextualises LA in discussions of student success and retention is likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- contextualise LA in discussions of student retention and success;
- provide timely and appropriate reports to help academics support students who may be at risk; and
- provide support for contacting students at risk to offer pastoral care where needed.

5.3.7.2 Course Design

Using LA to measure the impact of course design on student interaction and conversely the impact of student interactions on the course design were the two main elements of course design that participants discussed, with main questions being centred around which resources or activities students accessed regularly, and if changing something in course design changed student interaction. The impetus for these questions in most cases was deriving the most benefit from the limited time participants were able to spend on course design. For example, Blake asked, "Do changes to course design have impact on students? What is my cost/benefit ratio for the amount of effort undertaken? I want to gain an understanding of what interventions work." Similarly, Frankie and Finlay both indicated an interest in understanding which sections of their course sites students were interacting with:

> What's being used and what the outcomes of that usage are and if tool A is not being used much at all then how relevant is it? Can I remove it from the StudyDesk because it's just something else the students feel that they're not doing and causing the anxious ones to be more anxious? (Frankie)

> But [if I can] get a little bit bigger picture of what a semester looks like in terms of student engagement, even if just from an anecdotal

point of view, then I can look forward into the semester and think 'last semester or the last couple of semesters students didn't engage with this properly or they didn't understand this or they went to this module, over and over and over and over. What's wrong with it? Doesn't it make sense?' Then I can move forward into the semester and modify stuff. That's probably the first thing I'm interested in. (Finlay)

Hunter noted that the context of the course was also important when considering the value and use of LA to inform course design as there may be differences between the design and content in a course site for an online course compared with a face to face offering. They also expressed an interest in comparing course design across courses, looking for exemplars of good practice and the ways in which student behaviour in their course was affected by changes in course design in another course. This latter point was also discussed by Finlay, Frankie, and Jordan. These are examples of the sophisticated ways in which participants were already using, and wanting to use, LA to inform their course design. Hunter also suggested that providing opportunities for discussion and collaboration with other staff would be beneficial in an implementation plan:

Is it different, because I know when I plan a course that is only online it's really different than a face to face one or one with both, in terms of the design. That is something to consider. And is it just in my course or did someone else do something in their course which has had an impact on my course. If you can find people who are trialling similar stuff - what impact did they have? Or if someone is trying something different, what effect did they have just in terms of the bigger picture?

Frankie also recalled an occasion when they had used LA, without giving it that specific terminology, a few years earlier, indicating that staff have been engaging with student data and information on different levels for some time:

> What I did with one of my colleagues a few years ago was we found that students weren't doing our assignment at the end of semester and we looked at their other courses and we found that they were all doing an assignment at the same time. So what they were doing, they were doing a poor job on the assignment, they were submitting something but it wasn't great and we figured what the problem was, was the coincidence of all the assignments being due at the same time. So what we did was shift our assignment to be early and suddenly had a much better uptake.

Comparisons across courses to gain deeper levels of understanding of student behaviour was also noted by Jordan, indicating that participants were able to think more holistically than just the experience in their individual courses:

> If for example comparing if people were listening to her course and not mine it might be telling us something. Hers is a second-year course that follows on from mine but very similar structure and a good comparison and I'm sure she would be willing to share her data

Based on these observations, an implementation plan that includes opportunities for collaboration with, and learning from, other academics was likely to be effective. Providing academics with access to student data from related courses could also be beneficial. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- provide opportunities for collaboration and discussion with other staff; and
- provide access to data from other courses to enable comparisons.

5.3.7.3 Teaching Practice

In response to questions in the interviews which were designed to elicit further details to responses in the survey, participants also discussed how using LA could inform their teaching practice helping them become more effective and efficient. They also discussed the benefits of upskilling themselves through professional learning opportunities associated with building levels of knowledge around different aspects of adopting LA. The

skills required to access, analyse and interpret appropriate data and then implement interventions resulting from that analysis and interpretation were also mentioned. Sharing this knowledge with other members of their teaching team was also discussed, for example when Greer discussed an incident when advice they offered tutors resulted in issues for the students. This was an example of participants being willing to change practice as a result of feedback from students.

> Sometimes they (referring to tutors) were doing what they were supposed to do, which is that they had gone in behind the scenes, hadn't necessarily posted anything when the students were doing well, but I could see that they were interacting with the courses in the different groups. That was probably a good lesson where we told them not to over-post because we wanted the groups to become independent. [It demonstrated] that you probably at least needed to go in and put some comment like "very good, carry on", or something so that the students could see that you were actually following the projects as they were developing. I'm always concerned because I find with online, if the teacher responds too quickly or whatever, it puts the students off or they wait for the teacher's response. In this case, it backfired because it was my bad advice saying, "Don't post anything. If they're doing well, just let them keep going." Then they didn't think anybody was looking at them.

Dallas was more succinct in their discussions regarding how teaching practice could change based on LA data, suggesting how they could improve student interaction through critical questioning: "If they (students) hit something once and not again, maybe you could put up a forum post and ask what do you think about this."

Overall, there were more discussions with a focus on students or course design than on teaching practice, indicating that participants generally had a student-centred approach to their teaching.

Based on these observations, an implementation plan that focusses on the benefits for students from staff taking actions based on interpretation of LA

data in the LMS was likely to be effective. My interpretation of this was that the following design principle would be important to include in a LA implementation plan:

- focus contextual discussions on the benefits of LA for students rather than the academics.

5.3.7.4 Academic Recognition

Participants considered factors such as the type of publications they would be able to write from their investigations, and how using LA would help with recognition through Teaching Grants and Awards. There were also some comments on how this could help their career progression and promotion. This aspect was the one with least comment in interviews, suggesting that this was not a major motivator for most of the participants, and would not need to be given as much attention in an implementation plan. In addition, the perspectives of publishing in journals with an educational or pedagogical focus was not an incentive for several participants. The imperative in their disciplines was to aim for high quality journals with a discipline research focus and there was acknowledgement that educational journals often have lower impact factors than discipline journals.

5.3.8 Responses with Multiple Foci

It was rare for any of the discussions with participants to focus on one particular aspect or benefit of engaging with LA; rather they included two or more aspects. There were differences in these combinations that indicated that support and training need to be personalised for staff, rather than being a one size fits all approach. For example, Jordan and Greer each discussed students and teaching practice in one of their conversations: "What things are students focusing on? How can I make them more fantastic (as opposed to working on things they are not engaging with?)", (Greer) and "This stuff will influence me in how I work and how I deliver." (Jordan)

Greer in their final interview focused on teaching practice and the ongoing support needed, suggesting that the university could undertake the data analysis and push information to staff and that embedding training on how to use LA in orientation to the LMS would be useful. They also noted that not

introducing these ideas and USQ terminology could impact negatively on the confidence of new staff:

> That's always my fear here. It seems that the notion is instead of actually doing the analytics for us, the university would probably prefer us to learn how to do the analytics ourselves even if we didn't do them particularly well and that that would be one more thing downloaded on the academic stuff.

> It's part of a broader issue. The faculty members were talking about, whether it's casual staff or full-time staff, when they first start they really need a good orientation to Moodle and its capabilities. That probably includes at least some basic analytics. A couple of them said to me after the meeting, "I feel really bad but I don't know what you're talking about [chuckles]. I didn't want to say it at the meeting, but I simply don't know what you mean by including data analytics and course health checks."

Finlay and Dallas focused on the student, while Jamie and Hunter both held some focus on the benefits for themselves. Knowing these differences can help in the way staff are approached and supported, all with the aim of providing a satisfying learning experience for students. For academics like Finlay, Greer and Dallas - academics who are focused on pastoral care - the support and discussions would focus on how interventions would help their students and how they could build up an evidence base that the interventions had a positive outcome.

In contrast, for academics like Jamie, who were focused on publication, it would be important to ensure that they had a relevant and measurable research question. They could be directed to relevant literature and previous research that has investigated similar questions and the discussion could be centred on the understanding of how implementing these changes would not only benefit their students but also help provide evidence for their teaching grants and awards or promotion applications.

It would be important in an implementation plan to be able to establish early which areas are the focus for each academic and use that to appropriately

contextualise individual support and help build trust and rapport. As the professional learning opportunities continue it would then be possible to incorporate the areas that staff did not currently focus on to continue to build staff knowledge, confidence, and capabilities.

Based on these observations, an implementation plan that acknowledges the different foci of academics when using LA and then encourages them towards a more holistic approach was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- determine participants' main focus for using LA and personalise preliminary support and training accordingly; and
- build staff capability by incorporating all aspects of use of LA from accessing data to analysing and interpreting that data and implementing appropriate actions.

5.4 Inductive Thematic Analysis

As the transcripts for each of the participant interviews were coded for the deductive analysis, any different themes outside the deductive codes that emerged were also coded, and the main themes from those are discussed in the following sections.

5.4.1 Nudges

Nudges in the context of discussion with participants pertained to any prompts made by academics as a reminder to students to take a voluntary action regarding their learning and could include reminders to complete an activity or engage with an important resource (Dimitrova et al., 2017; Graham et al., 2017). Most participants indicated that they had used the USQ Analytics report to identify students at risk and send automatic nudges to selected students. They did though note varying degrees of success in using nudges as well as concerns regarding the way these were disseminated to students and the usefulness of these in some cases. The following discussion with Hunter highlights the process and thinking that was common across the participants:

Hunter: The Friday before semester starts I'll be going back into that new USQ analytics and nudging people. Now that I know that it exists and it's that easy, especially because of that, because my assessment is front heavy I need them to get hit the ground running right up and not ease themselves into the semester.

Researcher: What do you expect from nudging them? Just that they will engage, or that you'll hear from them?

Hunter: Well, no, I don't expect to hear from them, but that email I sent out, two students did respond to me either yesterday afternoon or this morning to say thanks for making contact, I do have one question, bang. That was it. ..I would just like to make sure that they're all in there (StudyDesk) ...because the longer it takes them to get in there, the harder it is for them to be very successful on the course... If they haven't been into it-- if you get to week four, which is the drop date, and they haven't been into Week 1, 2 and 3, there's another trigger to go, "Well, I just noticed that you didn't engage in that stuff," and well, maybe this week because someone else is taking most of the teaching for me, so I might have time to actually have a look at that on a week by week basis and actually see, well, how many students didn't get into what I would have called the critical bit and see what happens.

Finlay also discussed the positive feedback they received from students who received nudges:

I've had a few students contact me back because I use the USQ Analytics and I said, "I noticed you haven't accessed such and such a resource or whatever, and I was concerned that you haven't started on the assignment." I forget what it was. I had two or three students come back to me and say, "I really appreciate you contacting me. It's prompted me to do something." Or, "It's okay, I've been doing something separately," or, "I've been away, but thank you for contacting me." In that sense, it makes a good service to the student. It shows an interest in the students, and they feel valued.

In a later discussion, Finlay did though note that "One concern is whether students will then come to expect/ rely on nudges, a sentiment that was echoed by Dallas who commented that "students can suffer from an overkill of communication". These concerns echo those noted by Buckingham Shum and Ferguson (2012) who note, "Analytics could disempower learners, making them increasingly reliant on institutions providing them with continuous feedback, rather than developing meta-cognitive and learning-to-learn skills and dispositions". (p.19)

Frankie noted that they had not used the USQ Analytics tool but had still used nudges with some success:

> What I tend to do about looking at analytics is to confirm my thinking about students and their behaviours. If I put something up on StudyDesk, which is a sample solution to a problem or something, and then in class I might ask, "Who had a look at the sample solution?" You might get one person in a class of 10 or 20 or whatever put their hand up whether they have or not really done it. Then if I look at the analytics, for instance, I can go, "There's my new item I've thrown up." 6% people have actually looked at it. Then I can send out, and I do send out a reminder and go, "Don't forget, I've just put up the solution." The numbers will jump up in response.

Jordan though noted that nudges were not going to be effective for all students:

> For instance, and this is not the end of learning analytics, but there's a woman whom I saw hasn't logged into the StudyDesk yesterday. She's been doing her degree, nearly as long as we've had a degree and this is a first-year course that everyone would do in first year. People like that, no amount of prompting is going to help.

This sentiment was echoed by Blake:

> Yes because sometimes you're just flogging a dead horse; they've failed eight courses in a row, they're obviously only here to get the Austudy, or whatever it's called now; they've got no intention of

completing. I've got email from someone saying "Can you stop bothering me? I don't want to do anything", and it's sad you can't dob them in.

Greer offered a more proactive approach to nudges:

> You could take that into context and you could also send out a reminder to the groups that, "I know next week is really busy for all of you. Remember that whoever your course group lead is, they participated in your discussions, you need to have that same collegial response to them." I found that reminding people in advance of that thing helped a lot as well. Having the analytics actually pushed to me work really well.

Based on these observations and the passionate discussions of nudges, an implementation plan that includes training, support and resources to empower academics to identify students at risk, disseminate nudges and evaluate the effectiveness of nudges was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- provide training, support, and resources to enable staff to identify students at risk;
- provide training, support, and resources to enable staff to forward appropriate nudges; and
- provide training, support, and resources to enable staff to measure effectiveness of nudges.

The discussions also helped identify the following recommendation for USQ and Moodle for enhancements to processes for sending nudges:

- organise ways that nudges can be sent by email rather than as Moodle message.

5.4.2 Usage

Participants discussed two types of approaches to use of LA; proactive and reactive, with proactive being deliberate attempts to use the analytics to gain

insights. Alternatively, reactive use is when the academics investigated data as a result of a question or complaint from a student. For example, Dallas noted: "Some students complain, 'I've done all of this work and only got 2/50 for the assignment' and then you check the analytics and they probably haven't gone into some modules at all so you can use that information." Greer acknowledged that although using LA in a proactive way, such as using nudges, would be useful this was not always possible: "I tend to use at a time that there is a problem rather than proactively and I'd rather be able to do it the other way around".

Participant discussions suggested that most use was reactive, rather than proactive, which is likely to be a result of the various barriers noted throughout this phase of the study. Increasing the proportion of proactive use could thus be one indication of a successful implementation plan.

5.4.3 Benefits of using LA

Whilst several participants discussed the benefits of engaging with LA, the focus was mainly on potential benefits rather than any benefits that had already been realised, pointing to factors that need to be included in an implementation plan. The potential benefit that drew most discussion was sharing with colleagues from across the university, which included learning from each other, sharing good practice and collaborations. For example, Finlay commented that:

> If that was even just a little group of people that shared information around, in some form, then that could then be beneficial to each other, but it could be turned into something that other staff could then utilise or try. Say, "I never thought of that. What if I tried that? I'll put in those things and see what I get".

Hunter also noted the opportunity of being able to network with colleagues as a potential benefit:

> I think there would be more benefit from having conversations with bigger groups with people with different ideas… to see what other people were doing and were interested in because there doesn't seem

to be much opportunity in our school to make that happen, even within the school and across the university.

Notably, several participants mentioned the potential benefits for students, for example Finlay who noted:

> I think it stems from what I mentioned before, about providing that student husbandry service. Also, in the process, we might be able to identify some of the problem children who cause others grief. If we can identify, for want of a better word, that trajectory for a student, to say, "Now I see you are struggling with such and such. Our analysis tells us that you might be having problems with this. Would you like to discuss that?" If you can identify those few students and help them, then I think that'll benefit the whole class, benefit everybody, in a sense, because there's not those students who feel that they are disadvantaged.

And Jamie, who focussed on ways that insights from LA could be used to promote effective interaction with students by explaining to students in one cohort how student engagement in previous offerings had impacted outcomes and satisfaction:

> Students who do engage in this way, blah-blah-blah, would get a good result. I think that's a sales point but it's evidence-based, so that's a very good advantage. I guess, if I was trialling new things, it may show up what things students like more than others, but having said that, I do find every cohort of students are different.

The benefits for improving course design were also mentioned, for example by Greer who commented:

> It's essential to master learning analytics in the online environment, not so much for the students that are on campus and using learning support, but for the students that are totally online or that are doing external courses and only checking in during residential. It is our way of being able to survey what's going on. If we use the analytics wisely, it lets us be able to fix learning activity that's not working well, or an instruction that's not clear. Maybe we back it up with a little video at

the beginning or the end of the week, knowing that people have struggled with something. It gives us a chance to manage the course on an ongoing basis. Instead of waiting till the end of term, you'll get My Opinion data (end-of-semester student evaluations) that says, "I couldn't understand the instructions," or, "It took too long to download something," or whatever it was.

Based on these observations, an implementation plan that enables academics to become proactive in their approach to using LA and provides opportunities for networking and social learning was likely to be effective. Automatic provision of insights to academics could also assist, through allowing staff more time to interpret data and implement actions. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- provide opportunities to network with other colleagues;
- provide insights that could enhance course design; and
- provide insights that could improve student engagement and learning.

5.4.4 Professional Learning Opportunities

Opportunities arose spontaneously and unintentionally during some interviews to provide professional learning and advice on ways in which the participants could consider using the LA tools embedded in the LMS. For example, in one paired interview with Hunter and Blake, Hunter noted that they had not previously seen the Statistics report. I took the opportunity to explain how this report could be used, as well as its affordances and limitations and Hunter responded with some further observations of how the information in the report could be interpreted. Similarly, during a discussion with Jamie about lack of student engagement, I suggested using a quick poll with students as to why they were not engaging and what support would be useful for them.

The collaborative nature of these interviews also provided opportunities for the participants to learn from each other and build on each other's ideas. For example, during one discussion Dallas suggested ways they could collaborate with other academics and use LA to compare student usage of the LMS

148

across 1st year and 2nd year courses. Similarly, during a conversation with Frankie and Finlay concerning different ways to use the data, they worked together looking at spreadsheets of log data and undertaking slices to compare, discussing issues along the way and working together to try to solve this.

Based on these observations, an implementation plan that included informal opportunities for professional learning, capacity building, and social learning was likely to be effective. My interpretation of this was that the following design principles would be important to include in a LA implementation plan:

- include opportunities for informal *Just in Time* learning;
- include opportunities for discussion and social learning with peers/colleagues; and
- ensure that those facilitating the implementation plan have the requisite knowledge and expertise to provide professional learning on all aspects of working in LMS as well as LA.

5.5 Conclusion and Summary

This chapter has discussed the responses from participants in a series of interviews held to elicit their perspectives on implementation of LA. Whilst there were a number of similarities in their responses, each participant had their own unique approach. This suggests that an implementation plan will need to have some basic ideas and also be adaptable to fit the needs of a range of academics. Participant responses were coded through deductive and inductive thematic analysis, which provided insights that addressed the first sub-question of the research question, and informed draft design principles for a LA implementation plan, thus addressing sub-question four.

5.5.1 Research Questions

1. *What do academics identify as the enablers and barriers to the implementation of LA in their teaching practice?*

In early interviews, the main barriers identified were lack of time, lack of ready access to LA data in the LMS and lack of knowledge and skills. Over the

period of the interviews the focus of most participants shifted slightly with lack of access becoming more prominent in discussions, a barrier that has also been identified widely in the literature (Gunn et al., 2017; Macfadyen & Dawson, 2012; West, Heath, et al., 2016). It became evident that participants viewed training, support and self-help resources as a main enabler to the uptake and implementation of LA. Recognition of the time needed to develop requisite skills and knowledge and engage with LA was also considered a potential enabler, with participants noting that inclusion of these activities in the academic workload model would be important for widespread implementation of LA. These findings are consistent with previous research that time to integrate LA is an essential element of a successful LA implementation plan (Wise & Vytasek).

All participants considered opportunities for collaboration and social learning with like-minded colleagues from across the university as an important component of a successful LA implementation plan. Participants also discussed four main themes of using LA to inform and enhance student engagement, course design, teaching practice and academic recognition. tT first three of these themes are consistent with reasons for using LA discussed in the literature (Colvin et al., 2016; Greller & Draschler, 2012) , although there has been little discussion of academic recognition as a motivator. The USQ Analytics tool, which had been piloted at the time of these interviews, was also considered as an important component, with some participants recommending ways the tool could be improved to provide additional layers of data.

4. *What are the transferable design principles that underpin an effective LA adoption strategy?*

There were five main design principles that emerged from the implications for draft design principles developed throughout this chapter and these are outlined in Table 23 with examples and more detailed expansion.

Table 23

Draft Design Principles from Participant Interviews

Draft Design Principle	Expansion	Interview themes
Provide training in all aspects of LA implementation in a range of modalities	Provide training to empower staff to access, analyse and interpret a range of student data. Provide one-one and group learning opportunities. Provide training to build staff awareness of LA reports and tools available in the LMS in technical skills to analyse and interpret data, and pedagogical knowledge and skills to implement changes to course design and teaching practice. Ensure that those facilitating the implementation plan have the requisite knowledge and expertise to provide just in time learning on all aspects of working in LMS as well as LA and learning design. Provide training to enable staff to identify students at risk, forward appropriate nudges, and measure effectiveness of nudges. Include opportunities for informal *Just in Time* learning. Build facilitators' understanding of staff reasons for wanting to engage with LA and use those as starting points for conversations.	Accessibility of data Benefits of using LA Interpretation of LMS data Knowledge and skills Motivations Nudges Professional learning opportunities Time Training and support Usage
Provide support and resources for all aspects of LA	Provide support for contacting students at risk to offer pastoral care where needed. Provide timely and appropriate reports to help academics students who may be at risk. Support staff to access data in a timely manner. Provide support and resources to assist staff interpret data. Provide resources that detail all LA tools and reports available within the LMS and how these can be utilised. Include details of key personnel and roles in resources. Include resources on how and why to implement LA. Provide insights that could enhance course design and improve student engagement and learning. Provide resources and support to enable staff to identify students at risk, forward appropriate nudges, and measure effectiveness of nudges.	Accessibility of data Benefits of using LA Interpretation of LMS data Institutional guidelines Knowledge and skills Professional learning opportunities Time Training and support Usage

	Include resources on how and why to implement LA and consolidate these in one central location.	
Provide an encouraging and enabling environment	Provide recognition and reward for successful implementation of LA. Provide opportunities for collaboration, discussion and peer learning with other staff. Provide access to data from other courses to enable comparisons.	Accessibility of data Institutional guidelines Professional learning opportunities Time Training and support
Contextualise LA	Determine participants' focus for using LA and personalise preliminary support and training accordingly. Contextualise LA in discussions of student retention and success. Focus contextual discussions on the benefits of LA for students rather than the academics.	Benefits of using LA Institutional guidelines Motivations Professional learning opportunities Training and support
Provide clear and timely communication	Include clear and timely dissemination of information about any new tools and reports Include effective communication of supports available across the institution.	Institutional guidelines Knowledge and skills Professional learning opportunities Training and support

Some of the implications are beyond the scope of this study, but are included, as they are important components of an implementation plan for more widespread uptake and success at the university. Further insights for the university and LMS developers include:

- provide incentivisation for engaging with LA through recognition in workload allocation;

- develop reports for key touchpoints during a teaching period and mechanisms to push this data to academics in a timely manner;

- enable export of all reports in excel format; and

- organise ways that nudges can be sent by email rather than as Moodle message.

This chapter has discussed the main findings from thematic analysis of transcripts of interviews with four pairs of academics from across USQ. The main themes that emerged built on the findings from the initial survey discussed in Chapter 4 and provided further insights into the main barriers to implementation of LA. The insights gained also contributed to

development of draft design principles for an effective LA implementation plan. Chapter 6 continues the discussion of Phase 1 of this study, providing insights gained through analysis of reports of staff usage of the LMS and associated LA reports and tools by interview participants and at an institutional level. The insights from Chapters 4, 5 and 6 will then be synthesised in Chapter 7 and further developed into a final set of draft design principles that were used to inform the design of the implementation plan piloted in Phase 3 of this study.

Chapter 6 Initial Data Gathering –
Log Data of Staff Interactions
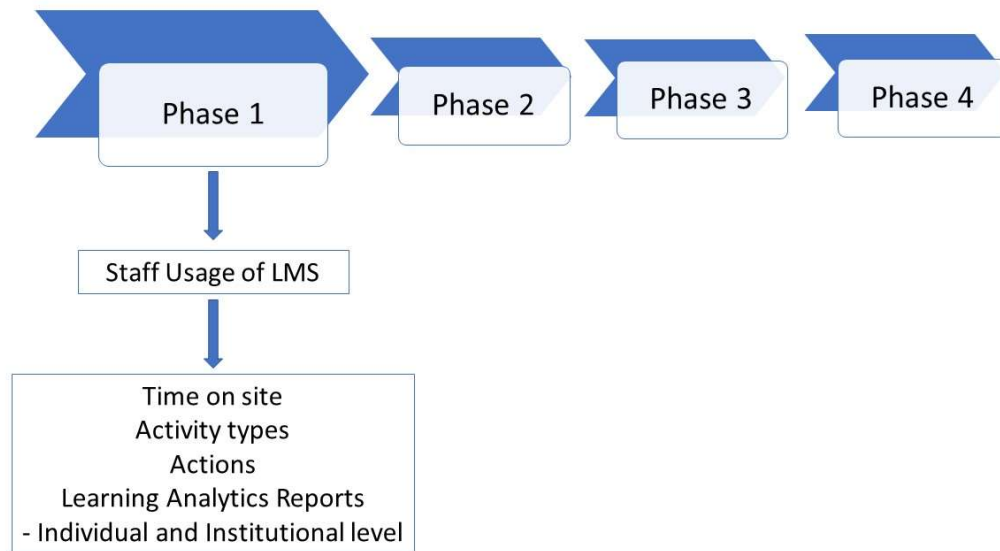
6.1 Introduction

Different staff engage with Learning Management Systems (LMS) in different ways. Aspects such as teaching style, pedagogical motivations, and competing work priorities are likely to influence engagement with an LMS. This chapter analyses staff interactions with the LMS to develop insights into usage habits. Analysing the interactions of staff with the LMS provides understandings that can be used to determine staff patterns of engagement and determine how staff approach their online teaching. This in turn can provide information and strategies for:

- individual staff on how they might enhance their approach;
- academic development/educational design staff on how they might better support teaching staff;
- Information, Communications and Technology (ICT) staff on how to present relevant data and visualisations in a manner that is clear and useful to staff; and

- institutions on more realistic workload models for staff engaged in online teaching.

An academic's work in the LMS is only one component of their workload and one minute spent within the course site can be a result of several hours work offline, for example, uploading a lecture presentation that has taken research and design work, or adding a grade for an assignment after marking and providing feedback outside of the LMS. However, analysis of the amount of time academics spent working within the LMS could provide insights into similarities and differences in approaches.

This chapter reports on analysis of the ways in which participants in the interviews during Phase 1 of the study interacted with their course sites. Data were collected from the LMS log data reports of staff usage for each of the participants and analysed on a range of levels, using simple counts. Comparisons were then made for each of these levels of usage between the participants. Usage of each of the tools and reports included in the initial survey were also analysed at an institutional level.

The chapter begins with an overview of the data collected and how this was treated and categorised, followed by an analysis of each participant's usage. Details of the reports provided to participants is then provided with discussion of their feedback and reaction to those reports. A brief outline of usage at the institutional level is then provided and the chapter concludes with a compilation of the different analyses and discussion of how these results informed the draft design principles, thus addressing the fourth sub-question of the Research Question for this study:

- *What are the transferable design principles that underpin an effective LA adoption strategy?*

It is noted that access to student data was not included in the Ethics approval for this study and hence could not be included in any data analysis. Using staff data though did enable modelling of ways in which participants could access data and build reports for their students. Participants were also encouraged to access student data when opportunities arose in interviews. It is further noted that whilst this was the data least valued by respondents in the survey, 50% of

respondents noted interest in using this data and 20% already accessed that data, suggesting building staff knowledge of this data would be worthwhile.

6.2 Participant Log Data

Within the Moodle LMS there is an extensive range of actions that academics and their students undertake. For staff those actions include uploading learning materials and resources, creating assessment tasks and grading student work, and checking and responding to discussion forum posts. These interactions are recorded as "clicks" and reported in the log data for the site. The Moodle system also collates various sections of student data into reports that provide information on student interaction and performance on assessments. Staff can access these reports to gain further insights into their students' interactions with the LMS and the staff interactions with those reports are also recorded in the log data.

ICT staff extracted log data from the LMS, relating to teaching staff interactions, and provided them to the researcher in a de-identified manner for courses for which participants were Course Examiners. Course Examiners, in the USQ context are the academic staff with primary responsibility for development of course material and the course site, and teaching and assessment in the course. Data were extracted from the 2016 offerings of courses that the participants nominated.

6.2.1 Treatment of Data

The raw log data reports were analysed and cleaned to provide a realistic and consistent view of staff interactions with their nominated course site in the Moodle LMS. Data were collected over a 25-week period encompassing the four weeks prior to teaching, the teaching period including exam period, and 4 weeks after final exam date. This period was chosen to include development work that may have occurred prior to semester and any final assessment tasks and future-focussed development after the end of teaching. Data were only included for the participants in this study, with data for all other teaching staff being disregarded.

In the log reports for Moodle, the action *Course viewed* indicated that the homepage of the course site in the LMS had been viewed. These actions were

all removed before analysis because this is the landing page and main navigation path, and was not a true reflection of interaction with the site for two reasons:

1. instances where this was the only activity in a session indicated that a staff member had looked at the home page, discovered there had been no new activity on the forums, or elsewhere and logged out again; and

2. in all other instances, this indicated that the staff member had looked at one section of the site and then navigated back to the homepage to then navigate to another section of the site.

There were also some actions where one click within the course site registered as an action against each student and hence for large classes in particular this registered in the log report as several hundred actions, all in the space of one minute, the smallest unit of time registered in the log reports. One example of this was when a staff member changed the status of all submissions to an assessment task from *submitted* to *in marking*. For this type of action, the data were cleaned to show one click only for each minute.

For all the following reports, except *time on site* and *no of sessions* clicks were used as the base unit for recording interactions. This choice was made as clicks were the basic unit recorded in the log reports and provided the most accurate representation of interactions. For some actions, it was possible for an academic to have multiple clicks in one minute, for example, viewing different pages of a Moodle book, and in other cases, one click could represent several minutes of interaction, for example, when making a post to a discussion forum. There were also different levels of reach of activities, for example, downloading a resource from the site would have little if any impact on students, whereas adding a discussion forum post could impact the whole cohort. Having indicators of time on site, and the number and range of actions presented a more holistic picture of an academic's interaction with their course site than considering just one aspect in isolation.

6.2.2 Layers of Information

Once the cleaning as described above had been undertaken, information was extracted from each log report on several layers. Each layer provided insights

into particular aspects of the staff interactions which were combined to give an overall picture of the different ways in which staff interacted with the LMS. The following analyses were all undertaken manually using the sort and filter functions in Excel. This was done to allow myself as researcher to fully immerse into the data, to consider the most appropriate ways to present the information to staff and look more closely at patterns and outliers across participants.

6.2.3 Time on Site and Number of Sessions

Time on site, and *number of sessions* were used to analyse the amount of interaction for each participant in their course site. A session was defined as a period of continuous time on the site with less than 15 minutes lapse between two clicks as recorded in the log reports. This approach and timeframe is in line with previous studies considering students' time on task (Kovanovic et al., 2015). Time on site was divided into three distinct groups:

- working hours (wh): for this study were defined as 8:00am to 6:00pm Monday to Friday, to align with conditions in the Academic Enterprise Agreement at USQ, and times during which face to face classes were usually held;
- after hours (ah): any hours on a weekday outside wh; and
- weekend (we): any hours on weekends.

All times were reported in the format of hours and minutes and public holidays were included in working hours. Detailed information on how *time on site* and *sessions* were calculated is included in Appendix H.

6.2.4 Activity Types

The next layer of interaction investigated was the activity type. Each activity type was recorded in the *Event name* column in the log reports and indicated the way in which academics interacted with the course site. For example, *discussion created* which referred to creating a new discussion thread in the forum and *chapter updated* which referred to amendments having been made to a chapter in a Moodle book, which is one way of presenting content in Moodle. Each activity type was allocated to one of five broad categories

158

which were based on those developed by Macfadyen and Dawson (2012) who conducted similar analysis for student interactions with an LMS. They identified four main areas of interaction for students: engagement with content, engagement with others, engagement with assessment, and administration activities. Viewing analytics data was added as a separate category for this study. The staff interactions and each of the event names from the log data were assigned to one of these areas as per Table A1 in Appendix I. In total, 144 different activities were noted in the log data for this phase of the study, with the breakdown being 22 student-related, 40 content related, 43 assessment related, 20 LA related and 19 administration related. Over the course of the study, additional features have been added to the USQ version of Moodle and all new activities were subsequently added to Table A1.

6.2.5 Action Types

Action Types refers to the way in which a participant interacted with the LMS, as denoted in the Event action column of the log reports. For this study these actions were classified as being either visible or invisible to students. This was considered an important differentiation as work that is visible to students, for example responding to discussion posts or uploading new content, contribute to the building of a Community of Inquiry (CoI). In contrast, invisible work, such as viewing posts or downloading all submissions for an assignment, does not contribute directly to building the CoI, although they are important components of an academic's interaction with their course site. A total of 26 action types were recorded in the log reports with 10 being categorised as visible and 16 as invisible.

6.2.6 Learning Analytics Reports and Tools

As noted above, there are a range of LA tools and reports available that are recorded in the Event name column of the log reports. Comparison of each participant's interaction with these reports was undertaken to gain insights into usage and determine where the focus of professional learning would best be targeted. Twenty LA reports and tools were recorded.

These different levels of interactions types are summarised in Figure 11.

Figure 11

Interaction Types Recorded in Log Reports

6.3 Results and Discussion

Each of the participants nominated a course for which they had a significant role. In most cases, this was the role of Course Examiner, the exception being Greer who had the combined roles of teacher and moderator. The analysis of interactions and comparisons that follow are presented as a snapshot of the practice of each participant in the offering of their nominated course prior to the start of Phase 1 of the study and represent a range of approaches and contexts.

Using data of actual usage of the LMS by these academics also allowed comparison between their perceptions and the reality, allowing insight into whether these were closely matched or whether there were large differences. There was also an element of exploration of the data itself: what was readily available, what narratives could be gleaned from the different levels of investigation and interpretation of that data, and how did the academics react to the data when it was presented to them? These reports, taken by themselves provided only an overview of how participants engaged with their course sites.

6.3.1 Course Context

Each course had its own unique context including the level within the overall program, mode(s) of delivery, and number of students and the teaching team. All these factors influenced the way in which the course was designed and the interaction with the LMS for the Course Examiner and other staff. This uniqueness was discussed in different conversations with the participants and provided insights into the different patterns of interactions that were recorded in each of their log reports.

6.3.2 Time on Site

As noted in Table 24, there were wide variations in the patterns of interactions, as well as in the total time on site and number of sessions, across the participants. Blake was the most active person with 115 hours and 24 minutes, in 738 separate sessions. In contrast, Hunter was the least active with six hours and 48 minutes over 99 sessions. This contrast suggests that, in this sample, time on site is not discipline-related as Blake and Hunter were teaching in the same discipline. Whilst the majority of participants were most active during work hours, Greer had a different pattern of interaction with their interactions occurring for similar times across the three time periods.

Whilst the average time per session was quite low for all participants, ranging from seven to 14 minutes, Jordan had the longest average session time at 14 minutes, suggesting that they took a more a deliberate approach to their interaction with the site. The longest sessions for each participant ranged from 46 minutes (Dallas) to 4 hours 46 minutes (Jordan) indicating that all participants at some point had concentrated periods of interaction with their course site. The maximum number of sessions on one day ranged from six (Hunter) to 17 (Blake) again indicating different approaches to their interaction with the course site.

Table 24

Time on Site and Number of Sessions for each Participant in Phase 1

		Blake	Finlay	Frankie	Greer	Jordan	Jamie	Dallas	Hunter
Total time on site (hr:min)	wh	66:18	84:59	40:14	14:26	27:38	15:54	10:24	6:09
	ah	26:03	5:34	9:23	18:53	9:17	2:05	1:16	0:35
	we	21:21	1:16	3:49	11:14	0:02	2:26	0:04	0:04
	Total	113:42	91:49	53:26	44:33	36:57	20:25	11:44	6:48
Total no of sessions	wh	416	413	329	111	122	102	83	90
	ah	191	9	98	111	34	13	11	8
	we	131	8	27	51	1	24	2	1
	Total	738	430	454	273	157	139	96	99
Average time per session (min)		9	13	7	10	14	9	7	8
Longest session		1:20	3:38	1:10	1:56	4:48	0:54	0:46	0:57
Max no of sessions in one day		17	11	11	16	10	8	7	6
Pre-semester	Actual Time	9:20	3:09	4:02	0:10	0:42	3:25	2:15	0:02
	% total time	8.1	2.5	7.5	0.4	1.9	16.7	19.2	0.5
	No of sessions	51	18	58	6	2	15	16	2
	% total sessions	6.9	3.3	12.8	2.2	1.3	10.8	16.7	2.0
During semester	Time	97:41	104:59	47:08	39:52	36:14	16:51	8:19	6:22
	% total time	84.6	97.3	88.2	89.5	98.1	82.5	70.9	93.6
	Sessions	615	471	365	220	154	121	73	92
	% total sessions	83.3	94.9	80.4	80.6	98.1	87.1	76.0	92.9
Post semester	Time	8:23	0:21	2:16	4:31	0:01	0:09	1:10	0:24
	% total time	7.3	0.2	4.2	10.1	0.0	0.7	9.9	5.9
	Sessions	72	14	31	47	1	3	7	5
	% total sessions	9.8	1.9	6.8	17.2	0.6	2.2	7.3	5.1

Time on site and sessions were further investigated to explore participants' patterns of interaction prior to semester, during semester or following semester. If time and sessions were allocated proportionately, it would show 16% of time prior to semester, 68% during semester, and 16% following semester. It would also be expected that most of the course development would occur prior to semester; during semester there would be a combination of all five categories of activity types; and following semester

there would mainly be assessment tasks and viewing LA reports. The patterns from all participants, however, showed different patterns to these, as well as a range of approaches. Jamie and Dallas were proportionately the most active prior to semester, whilst Greer and Hunter spent less than 1% of their total time on site prior to semester. The number of sessions for Jamie and Dallas prior to semester were proportionately less than the time spent in that period, indicating that they were more deliberate in their interactions prior to semester with longer sessions. All participants had proportionately low levels of interaction with their sites after the end of semester and in all cases the number of sessions was proportionately higher than time, suggesting short, sharp sessions, which were most likely reactionary, rather than planned.

These results are further summarised in Figure 12 which displays the *Total time on site* (in minutes) and number of sessions for each of the participants for each category of wh, ah and we. This diagram highlights the difference in time on site between participants and the different pattern of engagement for Greer in comparison with other participants.

Figure 12

Comparison of Time on Site and Number of Sessions for Participants
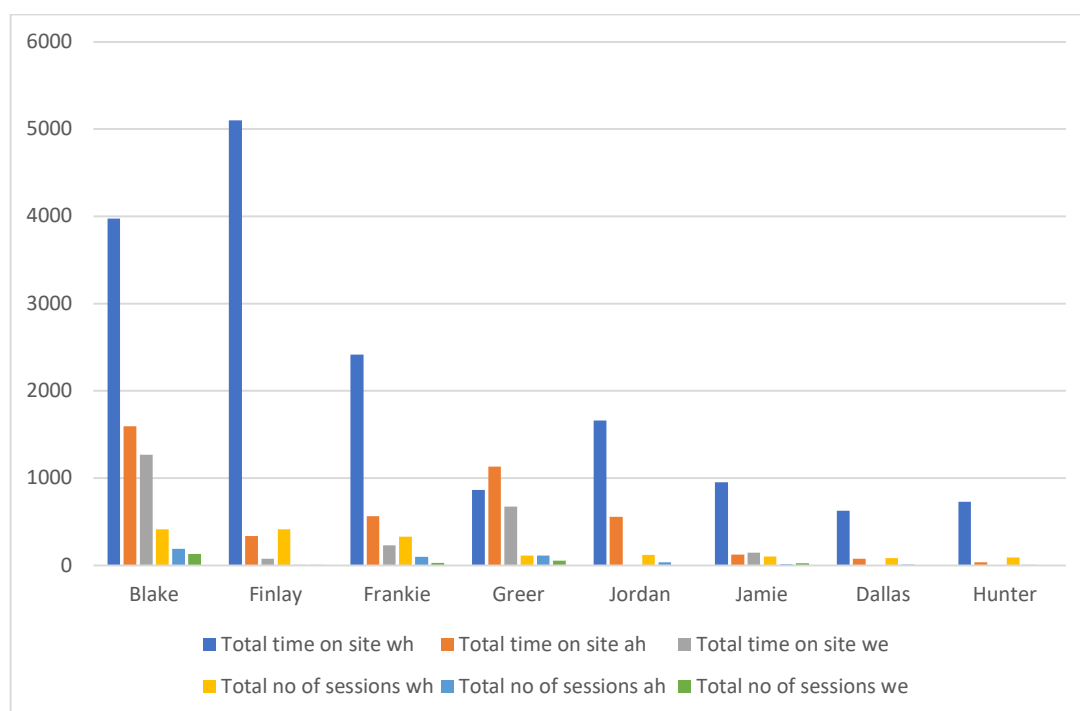
These results and analysis show the diversity of approaches to interaction with course sites and suggest that a *one size fits all* approach to professional learning and support for engaging with LA would not be appropriate. There was also a need to drill down beyond just number of clicks, as represented here by time on site, to understand the full picture. The low levels of interaction from some participants affirmed the findings from other components of Phase 1 of this study: that time is a barrier, whilst the high levels of interactions from some participants indicated this was not always the case. For those who interacted through multiple short sessions, support and suggestions on how to interact more efficiently and effectively may be a key factor in professional learning.

Based on these observations, an implementation plan that includes discussion of participant's usage patterns was likely to be effective. Such discussions would encourage academics to determine if there were ways their time on site could be more effective and consider using similar reports of

their students' time on site. My interpretation of this is that the following design principle would be important to include in an effective LA implementation plan:

- support staff to determine most efficient and effective ways of interacting with their course sites in the LMS.

6.3.3 Analysis of Activity Types

Activity types for each participant were categorised as outlined above in Section 6.2.4 and results are outlined in Table 25. In keeping with the results of *time on site*, there was a wide range of levels of interaction with Blake being the most interactive and Hunter the least. Of interest is that Frankie had more clicks overall than Finlay, although they spent almost 40 hours less time on their site. The only category in which Frankie had less clicks than Finlay was assessment related, suggesting that Finlay's course either had a higher number of assessments and/or a larger cohort. It was only through further investigation and discussions with the participants that it became apparent that Finlay had a larger cohort of students and a different assessment regime than Frankie, while Frankie had more interaction with discussion forums.

Comparison of the percentages of each category as shown in Table 25 and Figure 13 identified some different patterns of interactions which had been influenced by participants' course designs and teaching approaches. Greer and Hunter had interaction patterns that were heavily weighted towards assessment activities, whilst Dallas had a focus on content. Jordan had low levels of interaction with students and the highest percentage interaction with LA reports and tools. Blake, Finlay, Frankie, and Jamie all had relatively balanced interactions across the three main categories of students, content and assessment. The levels of engagement varied considerably, and overall demonstrated that participants had not engaged with the full range of affordances of the LMS, as shown in Table 25. For student-related activities, only Blake and Frankie had engaged with more than half of the available activities and for content related, only Blake had engaged with more than half.

Table 25

Activity Types for each Participant in Phase 1

	Blake	Dallas	Finlay	Frankie	Greer	Hunter	Jamie	Jordan
Clicks								
Students	2458	59	1742	2284	100	153	418	113
Content	2459	712	1159	1449	327	50	675	683
Assessment	1555	187	2325	1636	2459	803	341	1003
Analytics	934	94	200	346	286	12	86	332
Administration	217	44	371	411	28	5	156	51
Total	7623	1096	5797	6126	3200	1023	1676	2182
% of total interactions								
Students	32.2	5.4	30.1	37.3	3.1	15.0	24.9	5.2
Content	32.3	65.0	20.0	23.7	10.2	4.9	40.3	31.3
Assessment	20.4	17.1	40.1	26.7	76.8	78.5	20.3	46.0
Analytics	12.3	8.6	3.5	5.6	8.9	1.2	5.1	15.2
Administration	2.8	4.0	6.4	6.7	0.9	0.5	9.3	2.3
Count of actions								
Students (Total 22)	17	5	9	13	4	6	8	8
Content (Total 40)	23	15	17	9	13	7	9	11
Assessment (Total 43)	27	24	19	22	22	13	12	11
Analytics (Total 20)	14	10	5	13	8	3	12	10
Administration (Total 19)	15	6	10	9	3	2	7	5

Figure 13

Activity Type Comparisons
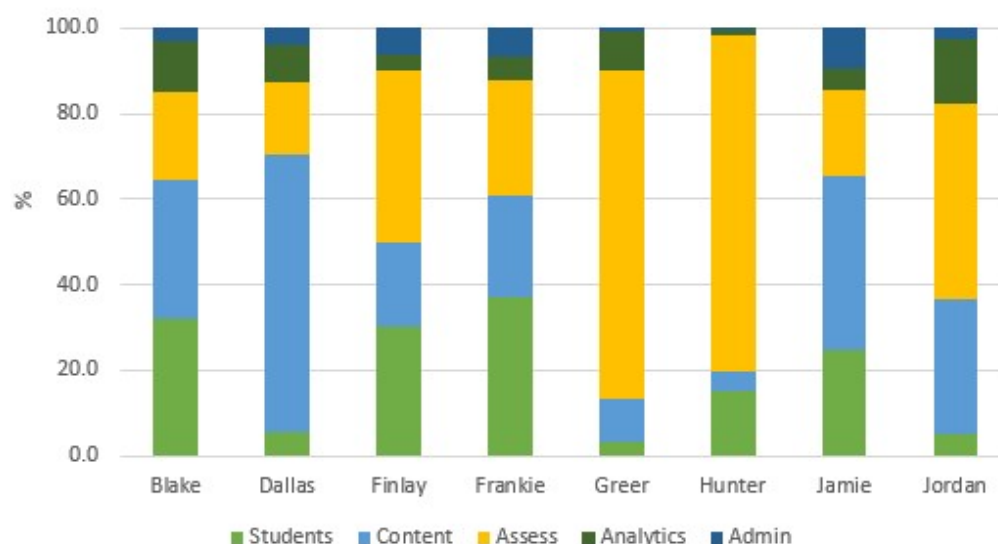
Based on these observations, an implementation plan that is flexible and can be customised to embrace a variety of teaching approaches and course design is likely to be effective. It will also be beneficial to include opportunities for staff capacity in understanding the full affordances of the LMS to enable them to select the reports and data that are most relevant to their specific context. My interpretation of this is that the following design principles will be important to include for a LA implementation plan:

- provide training and support that can be customised to cater for a variety of teaching approaches and course designs; and
- provide training, support, and resources to build academics' knowledge of the full affordances of the LMS so they select appropriate reports and tools.

6.3.4 Action Types

The next level of investigation considered the action types with which participants interacted. Counts for each action were compared for all the participants. The actions were categorised as visible and invisible. The visibility and the spread of actions for each participant were compared and results are shown in Table 26.

The visible actions for all participants were aligned to the main areas of activity as noted in the above section and included uploading and updating content and grading assessments. The action type *created* referred to several activity types including calendar events, course modules (course design), discussions, discussion subscription, groups, and posts (students) and question category (assessment). The main invisible action undertaken by all participants was, not unsurprisingly, *viewed*, as this is the first action taken for LMS activities, for example an academic would view a discussion forum before they posted a response. For all participants, *viewed* accounted for over 98% of the invisible actions, suggesting that discussing ways to reduce viewing components of the LMS and replacing with more active and visible actions could be an important component of an implementation plan. Twenty-six different action types were identified in the LMS, with maximum different ones used being 24 by Blake and minimum of nine by Jamie, Jordan, and Hunter.

These observations affirmed the discussion in Section 6.3.2 that an implementation plan that included discussion of participant's usage patterns was likely to be effective. It would be beneficial to include explanations of the difference in visible and invisible actions and how building teacher presence through visible actions can contribute to an engaging learning environment. My interpretation of this was that the following design principles would be important to include in an effective LA implementation plan:

- build staff knowledge of the benefits of visible action and limiting viewing as an action.

This analysis also unearthed limitations of the data, including several actions that are not recorded in the log reports providing the following insights for consideration by USQ and Moodle developers:

- investigate ways of recording more actions in the log reports;
- consider ways of collating data from several systems and presenting in an accessible manner for staff; and
- keep staff updated on any changes and course design approaches that will maximise availability of LA data.

Table 26

Action Types for each Participant in Phase 1

	Blake		Dallas		Finlay		Frankie		Greer		Hunter		Jamie		Jordan	
	vis	invis	vis	invis	vis	invis	vis	invis	vis	invis	vis	invis	vis	invis	vis	invis
added	252	0	0	0	9	0	175	0	0	0	0	0	0	0	1	0
assigned	0	6	0	0	0	12	0	3	0	0	0	0	0	1	0	0
autoinited	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
created	685	0	39	0	642	0	817	0	31	0	61	0	139	0	88	0
deleted	40	0	27	0	67	0	66	0	10	0	1	0	33	0	127	0
disabled	2	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0
downloaded	0	1	0	0	0	4	0	34	0	0	0	0	0	0	0	0
edited	0	0	0	0	0	0	4	0	0	0	0	0	2	0	0	0
evaluated	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
graded	186	0	7	0	444	0	772	0	267	0	123	0	40	0	362	0
granted	48	0	2	0	52	0	36	0	10	0	21	0	0	0	0	0
locked	0	9	0	2	0	0	0	0	0	0	0	1	0	0	0	0
moved	0	9	0	0	0	1	0	7	0	0	0	0	0	0	0	0
printed	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
removed	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
restored	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
reviewed	28	0	2	0	26	0	1	0	24	0	0	0	0	0	515	0
searched	0	44	0	0	0	22	0	3	0	0	0	0	0	0	0	0
started	0	13	0	1	0	0	4	0	0	11	0	0	0	2	0	4
submitted	3	0	1	0	9	0	0	0	1	0	1	0	0	0	0	0
switched	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unassigned	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
unlocked	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
updated	619	0	296	0	563	0	520	0	279	0	114	0	315	0	289	0
uploaded	380	0	8	0	357	0	297	0	0	0	36	0	96	0	33	0
viewed	0	5260	0	709	0	3587	0	3384	0	2555	0	665	0	1048	0	763
Totals	**2243**	**5380**	**382**	**714**	**2170**	**3627**	**2694**	**3432**	**622**	**2566**	**357**	**666**	**625**	**1051**	**1415**	**767**
%	29.4	70.6	34.9	65.1	37.4	62.6	44.0	56.0	19.4	80.2	34.9	65.1	37.3	62.7	37.3	62.7
Count	10	14	8	5	10	6	11	6	8	2	7	2	6	3	7	2

6.3.5 LA Reports and Tools

A final level of investigation of information from the log reports was to look at the interactions of participants with the various LA reports and tools; a summary of which is provided in Table 27. This analysis showed that each participant had different patterns and levels of engagement. As was the case with comparative levels of engagement for *activity types and action types*, Blake was the most engaged with the LA reports and tools, having the most clicks, and greatest spread across the available tools. Jordan though had the highest percentage of overall interactions in the Analytics category. Hunter demonstrated the least interaction with the LA reports and this was minimal with single digit number of clicks with just three of the 20 available reports. Overall, Finlay had deep engagement with a small number of reports. In contrast, other participants had relatively low levels of interaction although they had interacted with a broader a range of reports than Finlay.

The highest levels of interaction were with those reports associated with assessment, though this depended on the assessment regime adopted. For example, Jamie and Jordan both had relatively low levels of interaction with quiz reports, indicating quizzes were not a major assessment component in their courses. The level of interaction across participants was also greatest for the automatic, easy to access reports such as *User List* compared to reports that required more clicks to access, such as *Grades Outcomes*.

It is noted that the above list of LA reports and tools did not correspond exactly to the list of reports and tools included in survey questions, as interaction with some of the tools was not always included in the log reports. Conversely, some of the detailed reports recorded in the log reports were not included in the survey. A further limitation for use of some of this information is that the event name recorded in the log reports does not always directly match the report or tool as it is appears in the Course sites; for example the event *User list viewed* refers to viewing the Participant list in the USQ version of Moodle. Also, some of the quiz related reports (*Grades, Responses and Statistics*) were aggregated in the log report under one event of *Quiz Report.* This adds a further level of knowledge that staff need to obtain to be able to fully engage with these reports.

Based on these observations, an implementation plan that builds participants' awareness of the full range of LA tools and reports available in the LMS was likely to be effective. It would also be important to support staff to build capacity in choosing and using the reports and tools that were most relevant to their course design and teaching approach. My interpretation of this was that the following design principles would be important to include in an effective LA implementation plan:

- build staff capacity in knowledge and use of the full range of LA data available within the LMS; and
- provide information that links the names of reports in the *Event name* column of log reports to the way that data is provided in the course sites.

This analysis also affirmed the insights noted above for considerations by USQ and Moodle and provided a further insight of:

- align naming and recording of *Event names* in the log reports with the actual action taken in the course site.

Table 7

Learning Analytics Reports and Tools Usage for each Participant in Phase 1

	Blake	Dallas	Finlay	Frankie	Greer	Hunter	Jamie	Jordan
Activity report viewed	5	1	0	2	0	0	1	1
Choice report viewed	0	0	0	0	0	0	10	0
Engagement analytics report edited	0	1	0	0	0	0	2	2
Engagement analytics report viewed	1	0	0	4	2	0	2	2
Grade outcomes report viewed	0	0	0	7	0	0	0	0
Grade single view report viewed	4	0	0	0	0	0	0	0
Grade user report viewed	0	0	62	0	0	4	1	1
Grader report viewed	129	2	0	156	118	0	9	9
Live log report viewed	16	1	0	3	1	0	0	0
Log report viewed	9	2	36	64	0	0	1	1
Outline report viewed	13	0	0	0	0	0	0	0
Participation report viewed	0	2	0	4	0	0	10	10
Quiz report viewed	396	49	95	48	75	0	10	10
Recent activity viewed	1	0	0	0	0	0	0	0
Statistics report viewed	0	0	0	1	3	0	2	0
User list viewed	265	17	0	31	46	5	33	33
User log report viewed	24	1	0	1	0	0	0	0
User profile viewed	69	18	7	24	40	3	5	5
User report viewed	1	0	0	1	1	0	0	0
User statistics report viewed	1	0	0	0	0	0	0	0
Total	934	94	200	346	286	12	86	74
% total interaction	12.3	8.6	3.5	5.6	8.9	1.2	5.1	15.2
Count (total available =20)	14	10	5	13	8	3	12	10

6.4 USQ Analytics tool

The USQ Analytics was a tool developed in-house at USQ and introduced into the university LMS through a pilot during Semester 1, 2017. The tool provides a simple

visual representation of the proportion of students who had not accessed the site at all, not accessed a specific resource or activity, or had accessed the resource or activity. Staff are able to select an individual student or groups of students and send them a nudge message. Description of the tool is provided here as several of the participants in this study were involved in the pilot and discussion of the use of this featured in many of the interviews. The tool has been both an enabler and a barrier for those participants involved in this research. Participants found the USQ Analytics tool to be a superficial tool that did not allow deep interrogation of student interactions with the LMS. This caused participants to disengage from using LA, even though the simplicity of that same tool is what encouraged them to engage in using LA originally. Participants initially found the tool useful on one level, particularly due to the ease of access, however as they engaged more with the tool, they began looking for more detail, for example, the ability to group resources, group students, and time slice. This indicates that staff are engaging deeply with the tool and can see ways LA can be more helpful. It is worth noting that the tool was rolled out to the whole of the university from Semester 3, 2017 and many of the suggestions made by those involved in the pilot, and discussed here, were incorporated into that version.

A sample visualisation of the USQ Analytics tool from one of the courses included in this study is shown below at Figure 14.

Figure 14

Sample Screenshot of USQ Analytics Tool
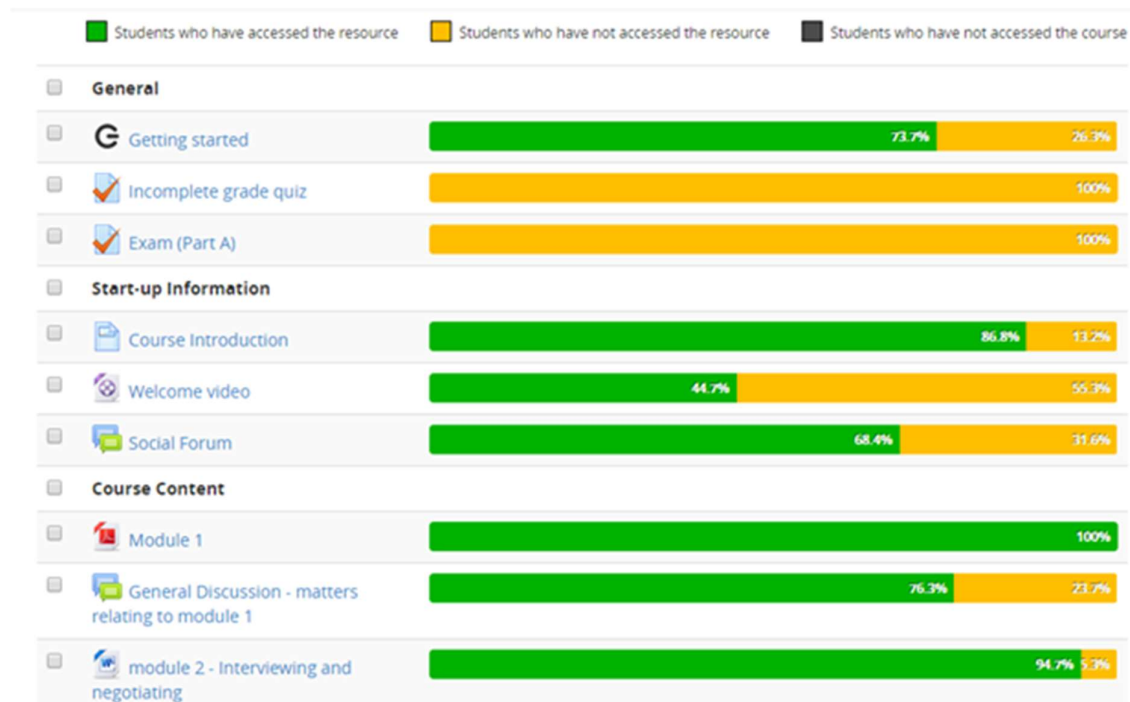
6.5 Usage Reports

Reports were prepared and presented to participants to provide an indication of their interaction with their nominated course. The reports included visualisations of the different levels of interactions discussed in the previous sections, adding a level of information in a readily accessible format that they may not otherwise have considered. The aim was also to introduce academics to different ways they consider investigating their students' interaction with the LMS, through employing similar processes. The reports were discussed with each participant to determine whether the information contained within their report was useful and whether the report:

- presented any new insights for them;
- confirmed or contradicted their understanding of how the course had been designed and how students would engage;
- confirmed or contradicted their understanding of how they had interacted with the LMS during that semester; and
- provided impetus for any change in relation to the course.

Appendix B includes an example of the reports provided to participants and discussed with them in their interviews.

6.5.1 Participant Feedback

Each of the participants provided positive feedback on the usefulness of the reports, and some noted concerns about how senior management could use the information inappropriately. Dallas commented on the possibility of using the data from the report as evidence that more hours needed to be allocated for different roles.

> This could be a good mechanism: data that says how long the moderator is on time and it could be used as evidence that more than 2 hours is needed. That's a use of the analytics that we hadn't thought about.

Greer added:

> Interesting to see this in retrospect because this represents what xxx and I were legitimately doing. It wasn't, "Oh we know Hazel (referring to me, as the researcher)... is going to be looking at the analytics; let's turn the computer on before we do the dishes." It is useful real data. So interesting.

Greer also commented on learnings from the staff usage reports in their final interview:

> It was fun to look and see what you were able to do with analytics as opposed to what I could do. It was no surprise to me that you could do things that I couldn't do in my dreams. It was nice to see an example of how you could use the analytics to do a certain amount of analysis in the course, and how you might be able to use that in really novel ways as well.

Blake also noted concern that management could use the reports as surveillance or in a punitive manner. Jamie voiced a similar sentiment, commenting that staff may try and game the system:

> I do a bit of everything every day. So, this is interesting because now that we get aware of this – as we get more aware of learning analytics could teachers manipulate this by just going in and opening that because, "Look, this one here is going to register that I've been in here for a while now," and they could just make their stats look good.

These types of concerns have also been noted by Falcão and collegaues (2020) in their study of Brazilian academics' perspectives on LA, indicating this is a concern that warrants further investigation.

The discussion with Blake and Hunter added some explanation of their different approaches to assessment tasks, highlighting again that the simple *Time on Site* numbers needed to be understood in the particular context of each course. Blake noted that they preferred to handle the tasks themselves, while Hunter was comfortable with having support from administrative staff:

> The other thing is even when you collect some of this data, there are some things you can offload, so I get the (faculty) assessment support team to create groups for allocation of assessment marking... I used to do it myself but now I say ... "if they're going to pay somebody to do it, then I'm happy for them to do it".

Jordan noted interest in the reports on several levels and that their Head of School had actively discouraged them from going in to their course sites out of hours to respond to students, as that was setting unrealistic expectations across the school; one of the few mentions of influence by management. They also noted that this was a course they had been working on for several years and hence was not making much change to, especially as they were also Course Examiner for a second, much larger course. When the low levels of engagement with students were noted, Jordan commented this was a good thing because it meant there were no problems, which had been the case in previous offerings. They also noted that the report gave them a different picture of their interaction with the course site:

> I found it interesting that what the graph you showed me about Course xxx about the access to the StudyDesk...how many times I get into the StudyDesk, what I did, and when I did it; I found that really interesting. I found it interesting that you said some people had gone in multiple times during the day. I wouldn't have guessed that that's my pattern of accessing it.

The discussion with Jamie elicited some defensive comments, and a reluctance to see that they were being provided with an opportunity to change their behaviour to improve the student experience. This was particularly evident when trying to explain

the difference between the visible and invisible actions to them, and how increasing visible actions could improve teacher presence, and they responded:

> It is counter to that argument that I'm not present. It's saying that, yes, I am present but I'm only present if I need to engage to do something because they're doing something wrong. I'm constantly checking and monitoring.

Further discussion on the lack of content upload to the course unearthed an issue that the particular format for their course design meant much of development work had not been recorded in the log report. This inability of Moodle, or at least the version at USQ, to provide accurate data when staff take an innovative approach to course design can contribute to frustrations and lack of confidence in the system by academics.

Frankie used the opportunity to discuss their way of approaching interaction with the LMS and how this varied depending on the time of semester, however the discussion had no real focus on the actual reports or visualisations

> Essentially, I log on in the morning to check discussions and then leave Moodle running in background and just check every hour or so for any new posts. I may need to log in again due to timeout. As well someone else was looking after most of course and I only go on to do whatever admin work is needed or I would go in every now and then just to see what was happening. A deliberate approach is more efficient day to day, week by week, but then when it comes to crunch time, for assessment obviously you are more on top of it because students don't want to sit around for 3-4 hours; they only want to sit for 20 minutes before getting a response. I think it's just a way of managing time better.

These observations affirmed the insights in previous sections that an implementation plan that recognised that each course had a unique context and included consideration of that context in discussions of participant's usage patterns was likely to be effective. My interpretation of this was that the following design principles would be important to include in an effective LA implementation plan

- provide overview of staff usage and opportunities for discussion to consider actions that could be taken as a result.

6.6 Institutional Usage Data.

Data were also obtained as to the actual usage of each of the StudyDesk tools and reports as detailed in Table 28. The percentage of courses in which each tool or report had been accessed were similar across both faculties, indicating that there were no significant differences between the faculties. This suggested that discipline was not a contributing factor to use of LA reports. The participant list is the report that had been accessed in the most courses (73% in both faculties) and most often, on average 76 times during the semester in each course in Business, Education, Law and Arts (BELA) and 62 in Health, Engineering and Sciences (HES).

Table 28

Institutional Interactions with LA Reports and Tools

	BELA (453 courses)				HES (356 courses)			
	No of Courses	% courses	No of Actions	Actions/ course	No of Courses	% courses	No of Actions	Actions/ course
Activity report	102	22.5	2622	25.7	86	24.2	370	4.3
Course participation	15	3.3	268	17.9	22	6.2	233	10.6
Engagement analytics	43	9.5	98	2.3	50	14.0	174	3.5
Grades (Grade history)	45	9.9	91	2.0	20	5.6	41	2.1
Grades (Grader report)	298	65.8	7534	25.3	217	61.0	5673	26.1
Grades (Outcomes report)	33	7.3	46	1.4	7	2.0	38	5.4
Grades (Overview report)	9	2.0	9	1.0	1	0.3	1	1.0
Grades (Single view)	62	13.7	396	6.4	62	17.4	534	8.6
Grades (User report)	61	13.5	214	3.5	37	10.4	98	2.6
Participant list	331	73.1	25430	76.8	263	73.9	16314	62.0
Progress bar	27	6.0	0	0.0	18	5.1	0	0.0
Quiz responses	17	3.8	177	10.4	10	2.8	118	11.8
Quiz results	89	19.6	4853	54.5	74	20.8	4089	55.3
Quiz statistics	6	1.3	24	4.0	5	1.4	15	3.0
Statistics	62	13.7	245	4.0	50	14.0	181	3.6

Data obtained for Semester 1, 2016 did not include any information on usage of the *Activity Completion* report or *Communications* tool, the latter of which is an in-house addition to the standard Moodle platform. On checking with ICT, they discovered that this data had not been linked and this issue was immediately resolved. This is one small indication of how this study has impacted university

processes. Additionally, the provided reports only recorded courses that had included the *Progress Bar* and not how often staff had accessed that tool. The *Progress Bar* is a tool staff can add to their course site which provides visual information to students on whether or not they have interacted with resources and activities and provides an overview of all students' interactions for staff.

Further comparison of the data across the two faculties, as shown in Figures 15 and 16 indicated that the *Participant List* was the only report that recorded usage in high numbers of courses and high levels of interactions per course. Whilst the percentage of courses in which the *Activity report* was used was similar for the two faculties, the pattern of usage was different with courses in BELA using this much more often than HES courses. Of the 14 categorised reports, 10 had been used in less than 20% of courses across both faculties. Similarly, only three of the reports had greater than 20 views per course on average over the semester and eight had less than ten views on average per course.

Figure 15

Percentage of Courses using each Report
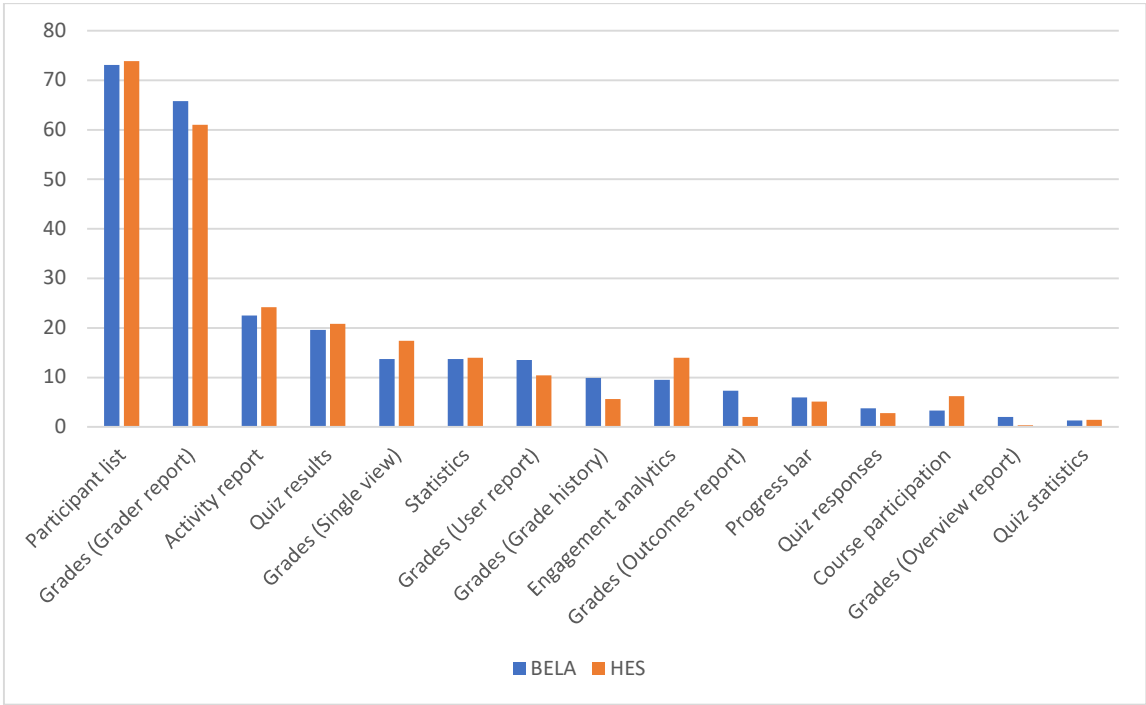
Figure 16

Actions per Course for each Report
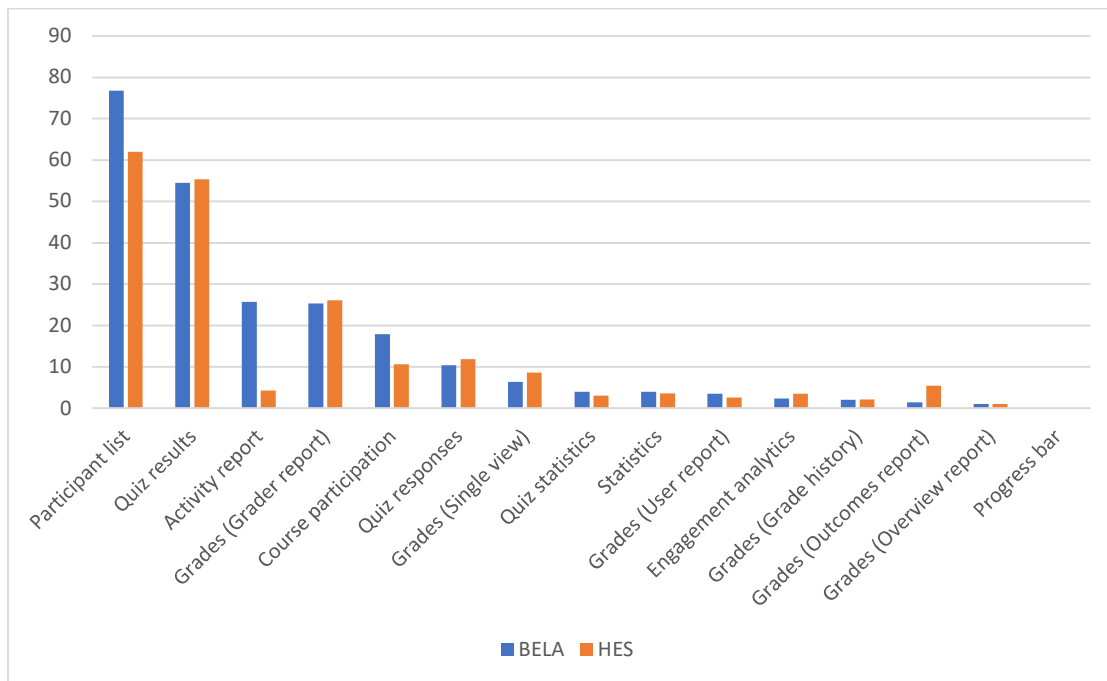
These results indicated that across the institution there was only superficial use of LA reports and supported previous insights that building staff awareness of the range of reports available would be a beneficial aspect of a LA implementation plan. Providing training and support to access the reports and information on the benefits of each report would also be a valuable inclusion. My interpretation of this was that the following design principles would be important to include in an effective LA implementation plan:

- include training and resources on the full range of LA reports available in the LMS; and
- provide information on the benefits of engaging with LA reports, particularly those that had low levels of use.

6.6.1 Comparison with Survey Responses

The institutional usage data were then compared to the responses to the corresponding question in the survey that were discussed in Table 7. The aim was to determine how closely perceptions of the survey respondents of their levels of usage

matched the reality across the university. As shown in Table 29, there was a strong correlation between the two groups of results with the *Participant list* being noted as the most used report in both the survey and usage report. *Quiz results* was an anomaly as the actual usage recorded was higher than the reported use in the survey. All other reports, except *Course participation*, that were noted as low courses, low usage above were also identified by large numbers of respondents as having never been used or only used 1-5 times a semester. Actual usage of *Course participation* was reported as being lower than responses to the survey indicated, and this could have been due to a positive bias as survey respondents were likely to have been those academics who had already engaged with LA on some levels. Spearman's rank coefficient was calculated to compare the perception rankings with each of the three actual measures for combined results across the two faculties to determine how closely perceptions of survey respondents matched actual usage across the university. Coefficients were calculated as of 0.45 (number of courses), 0.74 (actions) and 0.83 (actions/course). These results indicated a strong positive correlation between perceptions and institutional usage for Actions and Actions/Course, suggesting that staff perceptions of their own usage were a reliable indicator of actual usage. Only those reports that had a direct correlation between the usage report and survey question were included in this comparison.

Table 8

Comparison of Staff Perceptions of Usage and Actual Usage at Institutional Level

Tool/ Report	Likert score						BELA			HES		
	1	2	3	4	5	Median	Courses	Actions	Actions/ course	Courses	Actions	Actions/ course
Participants	4	11	6	23	30	3.86	331	25430	76.8	263	16314	62.0
Course participation	21	24	9	8	12	2.54	15	268	17.9	22	233	10.6
Activity report	20	27	6	15	6	2.46	102	2622	25.7	86	370	4.3
Quiz results	18	29	8	11	4	2.38	89	4853	54.5	74	4089	55.3
Quiz responses	22	29	8	11	4	2.27	17	177	10.4	10	118	11.8
Quiz statistics	28	25	8	10	3	2.12	6	24	4.0	5	15	3.0
Engagement analytics	42	18	8	3	3	1.74	43	98	2.3	50	174	3.5
Statistics	41	23	8	1	1	1.62	62	245	4.0	50	181	3.6

Key:1=I have never used this, 2= I use this 1-5 times per semester, 3= I use this once a month, 4=I use this 2-4 times a month 5=I use this at least once a week

Overall, this comparison affirms the implications for the development of draft design principles for a successful LA implementation plan to:

- provide information on the benefits of engaging with LA reports, particularly those that had low levels of use.

6.7 Discussion

The analyses of staff usage reported in this chapter have shown that there are a variety of ways in which staff interact with their course sites in the LMS. This observation suggests that a LA implementation plan needs to be flexible and adaptable to meet the needs of staff. Comparison of usage for each of the participants in Phase 1 of the study, for a nominated course, showed that there were a range of approaches and levels of interaction. Blake and Finlay spent four to five hours on average each week, interacting with their course sites, compared to Dallas, Hunter, and Jamie, who spent on average less than one hour per week. Log reports were interrogated on several levels to gain further insights into the types of usage and interaction with LA reports and tools. Information from these analyses was collated into individual reports for each of the participants and discussed with them during interviews. All participants reported that they found the reports useful, though on different levels and some concern was raised that management could use such data in punitive and inappropriate ways.

Low levels of usage of the LA reports were noted for many participants in terms of percentage of total interaction, ranging from 1% for Hunter to 15% for Jordan. Finlay, Greer, and Hunter all accessed less than half of the available reports and all participants had accessed nine of the available reports less than 10 times over the course of a semester. These low levels of use were also indicated at the institutional level, with only two of 15 reports used in more than 50% of courses across the university and 12 reports used in less than 20% of courses. Similarly, only two reports were accessed on average more than 50 times per course over the semester and nine reports were accessed less than 10 times on average each semester. The low usage of different reports and actions indicates staff are not using the full affordances of the LMS, and there may be a multitude of reasons for this, some of which align with the barriers to LA implementation discussed in Chapters 4 and 5 of lack of time, knowledge and skills and ease of access. It may also be that some academics have

carefully selected reports and tools that are appropriate for their specific context. These insights affirm the importance of building staff awareness and capabilities of the full range of LA reports and tools available in the LMS, as part of an effective LA implementation plan.

The discussions with academics reported in this chapter and analysis of log reports also highlighted limitations of the data which act as a further barrier for staff. These limitations included: a number of actions that were not recorded in the log reports, a mis-match of naming of reports compared with the action undertaken in the course site, and collating of several actions as one *event* in the log reports.

6.8 Chapter Summary

The purpose of this chapter was to create a snapshot of staff usage of course sites in the Moodle LMS at USQ and investigate how analysis of this usage of course sites could inform teaching practice and provide insights into draft design principles for a LA implementation plan. The chapter first provided an overview of the cleaning and treatment of data obtained from log reports of staff usage of course sites to create a series of analyses and reports of interaction on several levels. Data were also analysed for access to LA reports at the institutional level and this affirmed the low levels of use. The participant list was the only report recorded as having broad interaction across courses and depth through average number of clicks. Together these analyses provided a holistic picture of the variety of ways staff interacted with their sites.

6.8.1 Research Question

The data for individual log reports and institutional usage analysed and discussed in this chapter also provided further insights into the draft design principles thus addressing sub-question 4 of the research question. The draft design principles developed through this chapter have been consolidated into the following list:

- provide training that can be customised to cater for a variety of teaching approaches and course designs and will build academics' knowledge of the full affordances of the LMS so they select appropriate reports and tools;
- provide support and resources for staff to determine most efficient and effective ways of interacting with their course sites in the LMS;

- build staff knowledge of the benefits of visible action and limiting viewing as an action;
- provide staff with an overview of their usage of their course sites and LA reports and tools, and opportunities for discussion to consider actions that could be taken as a result; and
- provide information on the benefits of engaging with LA reports, particularly those that had low levels of use.

Discussion of the limitations of the data also provided the following insights for consideration by USQ and Moodle developers:

- investigate ways of recording more actions in the log reports;
- consider ways of collating data from a number of systems and presenting in an accessible manner for staff;
- update staff on any changes and course design approaches that will maximise availability of LA data; and
- align naming and recording of Event Names in the log reports with the actual action taken in the course site.

The ways in which these draft design principles were combined with the draft design principles developed in Chapters 4 & 5 to develop a final list of draft design principles will be discussed in the next chapter. Chapter 7 also discusses how these insights informed the development of the LA implementation plan adopted in Phase 3, using the Behaviour Change Wheel.

Chapter 7 Phase 2: Developing a Learning Analytics Implementation Plan
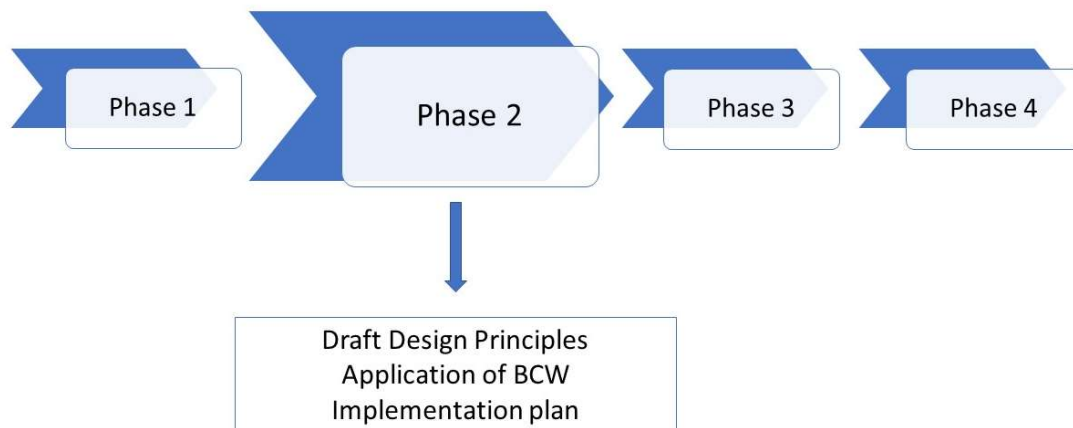
7.1 Introduction

Previous chapters have discussed the barriers, enablers, and motivations to engaging with Learning Analytics (LA) that staff at University of Southern Queensland (USQ)have experienced. This chapter builds on those insights to create a set of draft design principles for the development of a LA implementation plan and provides an overview of Phase 2 of this study. The implementation plan was developed using the framework of the Behaviour Change Wheel (BCW). This framework's use enabled consideration of how the capabilities and motivations of staff, and the opportunities afforded to them through professional learning and support, could influence them to change the ways in which they use LA in their teaching practice. The BCW was the most appropriate theoretical framework as it provides a practical approach to designing an intervention that considers the capabilities of participants regarding a targeted behaviour, their motivations for changing that behaviour, and the opportunities that will enable them to make that change. Using the combination of general design principles and a well-tested theoretical framework enabled the design of an implementation plan that was specific for the context of USQ and that could be readily adopted and adapted in other contexts.

This chapter begins with a summary of the findings from Phase 1 the Initial Data Gathering phase of this design-based research (DBR) study (as discussed in Chapters 4, 5 and 6) and then combines the draft design principles developed in each of those chapters into a concise list to be applied in the implementation plan. An overview of each of the three stages of the BCW is then provided, followed by a detailed discussion of how each of these stages were applied in the context of this study to develop the LA implementation plan. Explaining these processes in detail provides a framework that will allow other researchers to adopt a similar approach in their own context. The chapter concludes with an outline of the plan; and the following chapters discuss the trialling of the plan with an expert group drawn from educational designers and academic developers at USQ, and two groups of academic staff.

The discussions in this chapter address sub-questions 1 and 4 of the research question for this study, namely:

> *What do academics identify as the barriers and enablers to the implementation of LA in their teaching practice?*

> *What are the transferable design principles that underpin an effective LA adoption strategy?*

These sub-questions are addressed through a collation and summarising of the results from Phase 1. The main contribution of this chapter is discussion of how the BCW was applied in this study to develop a LA implementation plan.

7.2 Summary of Results from Phase 1

7.2.1 Barriers

Responses to the survey indicated that lack of time and lack of knowledge were the main barriers to engaging with LA and participants confirmed this during their interviews. In those discussions, different aspects of time and knowledge that the participants expanded on included wanting to:

- learn and develop skills;
- explore and experiment with the available tools, and push the boundaries;
- develop questions and use LA to inform their teaching practice and course design and improve the student experience;

- implement actions;
- evaluate the effectiveness/impact/value of those actions; and
- disseminate and publish findings.

Participants noted lack of recognition of the time required to engage with each of these components in the academic workload as a barrier to using LA. Staff usage logs also pointed to time being a barrier with half of the participants spending less than 50 hours on their course sites in the LMS over a 20-week period.

Lack of easy access to data was also mentioned as a barrier in both survey responses and participant interviews, with the interviews elaborating on different aspects of data access and participants making suggestions of ways the data could be made more accessible. This also linked to the barriers of lack of time and knowledge. For example, some participants noted an issue with downloading log reports from the LMS for large classes as the download would time out due to the large size of the file. Others noted that the amount of scrolling needed to view all the data in some reports added considerably to the time needed to interact with those reports, which acted as a deterrent to engagement. Participants indicated that lack of knowledge of which reports and tools would be most useful, depending on the questions being investigated, and how to access those reports as areas in which they needed to build their knowledge and skills. Similarly, the usage logs indicated that participants were only using a small portion of the affordances of the LMS, and the LA tools and reports, with only Blake and Frankie accessing more than 60% of the available LA tools and reports. In addition, several participants only accessed 12 of those tools and reports once over a semester, and that access was usually during one of the interviews when the researcher was explaining the affordances of the different tools and reports. Whilst it may be possible that participants attained all the information they needed in a small portion of reports and tools, one of the reasons for the individual consultations was to familiarise participants with the full range of information available to them and to encourage them to explore the reports in more detail.

During survey responses and interview discussions, participants gave least attention to a lack of institutional guidelines as a barrier, which could indicate that either respondents and participants were comfortable with the level of guidance or that this was not a consideration for them. Neither of these options received coverage in the

interviews so it was not possible to differentiate the reasons for this. Any comments regarding institutional guidelines were related to workload issues. These insights suggested that institutional guidelines did not need to be included as a component of the LA implementation plan.

The discussions of each of these barriers during the Phase 1 interviews offered opportunities for consideration of how they could be minimised and turned into enablers to improve the use of LA. Further enablers that were identified in the components of Phase 1 are now compared.

7.2.2 Enablers

In the survey, support for accessing data was noted as the most valuable form of support to enable more use of LA, followed by support to analyse and interpret the data. Most respondents considered having support was more important than provision of professional development and training in all these areas. Discussions in the interviews confirmed, however, that both support and training were important enablers, suggesting that providing both as part of an implementation plan would be beneficial.. Through the interviews, participants also noted that knowing who to approach for the support they needed was also an important aspect. Training was also suggested for all the components of LA use as noted above as currently contributing to lack of knowledge.

7.3 Draft Design Principles

The insights gained through each component of Phase 1 contributed to the development of a set of draft design principles for a LA implementation plan. The principles identified throughout Chapters 4, 5 and 6 have been combined into one consolidated list of six draft design principles:

1. provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
2. provide support and resources for all aspects of LA;
3. provide easy access to relevant and actionable LA data;
4. nurture a workplace culture that encourages and enables use of LA through structures and discourse;
5. provide clear and timely communication of available reports, supports and any changes to systems; and

6. facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

Discussion of how these draft principles were combined with the BCW to develop an intervention is included in later sections of this chapter, following an outline of the structure of the BCW framework and the ways in which the framework was applied to this study.

7.4 Review of the Behaviour Change Wheel Approach

In their book, *The Behaviour Change Wheel: A Guide to Designing Interventions*, Michie et al. (2014) provide a detailed step-by-step process for developing interventions that result in a change of behaviour. Their guide includes worksheets to assist in identification of influences impacting behaviour for a given context and then determining appropriate components of an effective intervention. Their practical guide can be adopted in a wide range of contexts. Eight steps are included in the process, grouped within 3 Stages, as shown in Figure 17. Step 6, Policy Categories, through an attempt to influence institutional policy, was outside the scope of this study. This Step will though be referred to in the Discussion and Recommendations section in Chapter 10 as this does include points for considerations for institutions implementing LA. Whilst their guide provides detailed step-by-step processes and worksheets that can be used at each step, they are provided as an illustration and guide only. The authors do not prescribe any timelines or depth of interaction with each step of the process, leaving it to individual designers to use judgement based on the specific context and strategy being developed. For this reason, only some of the worksheets are included in the discussion throughout this chapter.

Figure 17

Behaviour Change Intervention Design Process (Michie et al., 2014, p. 25)
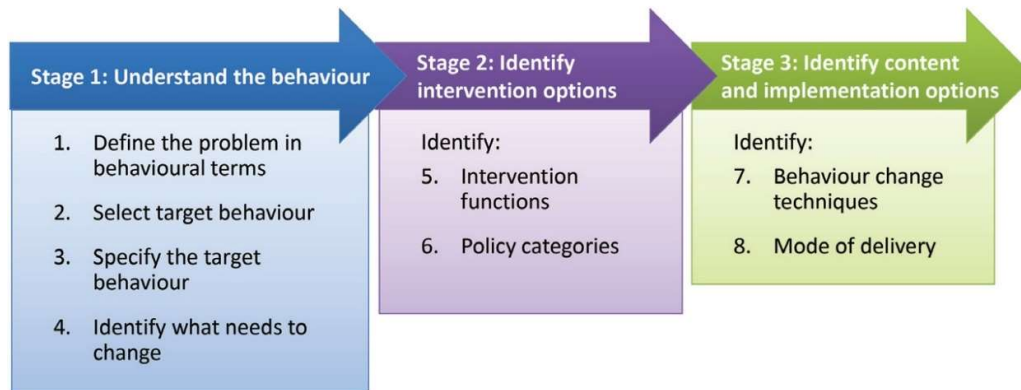
7.4.1 Stage 1

The initial steps of the BCW involve identifying the behaviour to be changed to solve the problem that is being investigated, specifying where the behaviour occurs and the specific group to be involved. Taking the time to be precise and clear in these steps are important processes that will lead to successful implementation.

Step 4 of the BCW involves using the COM-B model to identify what needs to change for the target behaviour to occur. As outlined in Section 1.3.2, the COM-B Model considers the ways in which the **C**apabilities of the intended audience, the **O**pportunities afforded to them and their **M**otivations form an interacting system with their targeted **B**ehaviour. To maximise the positive outcomes from an intervention using the BCW, on a long-term basis, one or more of these components needs to be changed.

Each of the COM components are divided into two types as outlined below:
Capability –
Physical: physical skill, strength and stamina: These were not considered important for LA implementation as no physical skills are required.
Psychological: knowledge or psychological skills – for LA implementation this could include the pedagogical and technological knowledge and skills needed to work effectively in the LMS, and with other available student data, and adopt LA to support teaching practice.

Opportunity –

 Physical: includes time, resources, locations, cues and physical affordance and for LA implementation will include the supports and resources that are provided to enable staff to engage with LA.

 Social: includes interpersonal influences, social cues and cultural norms that influence how we think about things. For LA implementation this could include investigation of the learning and teaching culture at different levels within the institution and the importance placed on using LA.

Motivation

 Reflective: includes self-conscious intentions (plans) and beliefs and for LA implementation could include consideration of the intentions of individual academics to use LA

 Automatic: involves emotional reactions, desires (want and needs) and for LA implementation could include investigation of whether staff perceive engaging with LA in a positive or negative way.

7.4.2 Stage 2

The next step in designing an intervention using the BCW is to consider which of nine intervention functions can be incorporated in a plan based on the COM-B analysis undertaken in the initial phase. Intervention functions, as explained in Table 30 are "broad categories of means by which an intervention can change behaviour" (Michie et al., 2014, p. 109). Each intervention function is linked to one or more of the COM-B components as they are likely to be effective in enabling change in that component. For example, *Education* is likely to bring about change to psychological capability and reflective motivation.

Table 30

Intervention Functions (from (Michie et al., 2014, pp. 111-112)

Intervention function	Definition
Education	Increasing knowledge or understanding
Persuasion	Using communication to induce positive or negative feelings or stimulate action
Incentivisation	Creating an expectation of reward
Coercion	Creating an expectation of punishment or cost
Training	Imparting skill
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)
Environmental restructuring	Changing the physical or social context
Modelling	Providing an example for people to aspire to or imitate
Enablement	Increasing means/reducing barriers to increasing capability (beyond education and training) or opportunity (beyond environmental restructuring)

Once all the possible intervention functions are determined through this approach, it is necessary to narrow this list to three-four interventions. A further six criteria to inform the choice of intervention functions are included in the BCW forming the APEASE criteria (Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/safety, and Equity). Each of the Intervention functions can also be linked to elements of the COM-B model to help determine the most applicable functions to choose for a particular context. The BCW authors provide a matrix to assist in this linking and the use of that matrix in this study is outlined in Section 7.4.2 below.

The second step in Stage 2 is consideration of policies that may support the intervention functions chosen in Step 5. Seven policy categories are included in the BCW, namely communication/marketing, guidelines, fiscal measures, regulation, legislation, environmental/social planning, and service provision. As noted earlier in this section this step is beyond the scope of this study.

7.4.3 Stage 3

Stage 3 also consists of 2 steps, the first of which is identification of behaviour change techniques (BCT). The BCW authors note that "The defining characteristics of a BCT are that it is observable, replicable, an irreducible component of an intervention designed to change behaviour and a postulated active ingredient within the intervention" (Michie et al., 2014, p. 145). Each BCT has a direct link to one or more of the intervention functions. They have created a taxonomy of 93 techniques which are categorised into 16 groups which they define and whilst some of these (for example, body changes and pharmacological support) are specific to a health discipline, most are applicable to an education and professional learning context and have thus been included in the intervention plan in this study.

The final step in the BCW is to determine the mode of delivery for an intervention. As for intervention functions, it is also recommended that mode of delivery be considered in terms of the APEASE criteria. In considering mode of delivery, decisions need to be made as to whether this will involve face to face and/or distance delivery; individual and or group presentations, and which media will be utilised. Ease of evaluation of the effectiveness of the intervention is also a consideration when choosing mode of delivery.

Timeframes for interventions are not mentioned in the BCW; this is left to the discretion of practitioners to determine what is most appropriate for their unique context. Judgement is mentioned as an important aspect in choosing the various components at each step of the BCW and undertaking two iterations of trialling in this DBR study will help confirm the validity of judgements in this study.

7.5 Application of the BCW to this Study

The following sections outline how the BCW was applied in this study to inform the design and development of a LA implementation plan. Terminology of the BCW refers to an intervention which, in the context of this study, was the LA implementation plan.

7.5.1 Stage 1 Understanding the behaviour

7.5.1.1 Steps 1 to 3: Defining the problem in behavioural terms and specifying the target behaviour.

The behavioural problem that was being addressed in this study related directly to the Research Question of *What are the requirements and characteristics of an effective LA implementation strategy in a regional Australian university?*. The problem in this study was that academic staff display low levels of engagement with LA. Expanding on this in the language of the BCW, the intended behavioural change in Phase 3 of this study was to improve levels of LA implementation by teaching academics at USQ to improve student experience. There are a series of further questions that are recommended to assist in the behavioural analysis and ensuring enough detail is included for the specific context (Michie et al., 2014, p. 48). Those questions and responses for this study are provided below to detail the USQ context.

What would academics need to do differently to achieve the desired change?
For this study, academic staff first needed to develop the necessary skills and knowledge to use LA and then apply those knowledge and skills to their teaching practice.
When would they need to do it?
Academics needed to acquire the knowledge and skills during sessions with the researcher and apply them during the normal course of their work, for the duration of their involvement in the study.
Where would they need to do it?
Academics needed to do this within the learning environment for their specific course, and in most cases the course site in the LMS was where most activity occurred.
How often do they need to do it?
This differed depending on each specific context and the time available for each participant to engage.
With whom do they need to do it?
There was a range of people with whom academics needed to engage. All participants needed to engage with the researcher and students in their courses. Other groups the participants needed to engage with included members of their teaching teams,

support staff across the university and colleagues, depending on each of their specific circumstances.

These requirements were all discussed with participants in their initial workshops which will be discussed in more detail in Chapters 8 and 9.

7.5.1.2 Step 4 Identifying what needed to change, using the COM-B Model

Each question in the staff survey was mapped to one of the five relevant components of the COM-B Model and combined with discussions during participant interviews and usage data to determine which of the components of the COM-B model were most important in the context of this study. Combined, this data will provide a picture of what needed to change to achieve the desired behaviour of adopting LA. Applying the results to the COM-B model suggests the following changes for each component of the model, for an implementation plan aimed at academic staff. This was the basis of the Phase 2 of the study.

7.5.1.2.1 Psychological Capability

The main areas that were identified in the survey as needing improvement for the psychological capability included knowledge of the LA tools and reports available and how to use these in teaching practice. In particular, responses in the survey showed that the tools and reports that required multiple clicks to access were shown to have lower levels of knowledge and use.

Survey questions considered levels of confidence in their ability as another factor of psychological capability. Staff generally noted low levels of confidence in undertaking different aspects of LA with less than half of respondents agreeing or strongly agreeing that they felt confident to interpret student data or implement appropriate actions based on those interpretations.

7.5.1.2.2 Physical Opportunity

Respondents to the survey noted lack of time as the main barrier to engaging with LA, suggesting that providing more time would be a beneficial physical opportunity. All interview participants also mentioned lack of time as a barrier. Opportunities for training on how to effectively use LA was also a common theme in responses to the survey and the participant interviews. Survey respondents also noted having easy access to data and access to consolidated data across several systems as important aspects of accessing student data.

7.5.1.2.3 Social Opportunity

Support from colleagues in areas such as statistical manipulation of data and learning from those who were already using LA and getting positive results, were two ways in which participants mentioned social opportunities in their interviews. By contrast respondents to the survey noted only low levels of influence from their colleagues, with 59% of respondents agreeing or strongly agreeing that it was mostly their decision as whether or not to adopt LA. Approval of colleagues, supervisors and the university were all noted as important or extremely important by greater than 65% of respondents, with supervisors' approval being most highly respected at 74%. In contrast, respondents did not feel under pressure from others. Survey respondents were generally neutral in their perceptions of the influence of others in their uptake of LA.

7.5.1.2.4 Reflective Motivation

As outlined in Table 17, survey respondents noted generally positive attitudes towards adopting LA in the next 12 months. On a 5-point semantic differential scale, adopting LA had an average score of 4.1 for desirable, 4.0 for important, useful for themselves and useful for students, and 3.75 for pleasant. This indicates that this is not a component that needs to be given priority in an intervention in the context of this study.

7.5.1.2.5 Automatic motivation

Through the survey results staff showed an interest in using LA in a variety of ways and for different reasons, with *checking of student engagement* expressed as a strong reason for wanting to engage with LA. This engagement included when and how often students accessed the course sites in the LMS as well as which activities and resources students accessed. As detailed in Table 18, responses about intentions to adopt LA, were generally positive although less so than for the attitude questions discussed above. On a 5-point semantic differential scale, average responses were 3.5 for intention to adopt, 3.2 for determination, 3.6 for wanting to adopt and 3.4 for likelihood to adopt.

This analysis has shown that, in the context of this study, the COM-B components that would be most beneficial to consider, in affording a behaviour change were psychological capability, physical opportunity, social opportunity and automatic behaviour. As most survey respondents and participants noted positive perceptions

of the benefits of LA use, reflective motivation was not considered important and physical capability was not needed for the target behaviour of engaging with LA. These discussions are summarised in Table 31. For researchers and practitioners in other institutions the combination of COM-B components that are applicable to their context may be different depending on staff capabilities and perceptions and available support mechanisms, and this will result in a different intervention plan.

Table 31

Application of COM-B Model to this Study (adapted from Michie et al. (2014, p. 63))

COM-B components	What needs to happen for the target behaviour to occur?	Is there a need for change?
Physical capability *Physical skill, strength or stamina*	No physical capability needed	No
Psychological capability *Knowledge or psychological skills, strength or stamina to engage in the necessary mental processes*	Building knowledge of: What is meant by Learning Analytics and how these can be used to enhance and inform teaching practice, What tools are available in the LMS, how to use these What data is available How to analyse and interpret data What actions could be put in place How to evaluate success of the action Build confidence in ability to perform these tasks	Yes, build knowledge of tools from awareness of existence to understanding of their capabilities and how to use. Build knowledge of all steps needed to successfully adopt learning analytics and confidence in completing all of those steps.
Physical opportunity *Opportunity afforded by the environment involving time, resources, locations, cues, physical 'affordance'*	More time, training and support provided for all of the aspects of LA implementation noted above under psychological capability	This is main area of need
Social opportunity *Opportunity afforded by interpersonal influences, social cues and cultural norms that influence the way we think about things*	Opportunities for discussing and working with colleagues Access to good practice exemplars	Yes, approval of discipline colleagues for teaching practice is important to staff so opportunities for sharing would be beneficial
Reflective motivation *Reflective processes involving plans (selfconscious intentions) and evaluations (beliefs about what is good and bad)*	Beliefs that adopting Learning Analytics will be beneficial to themselves, students and/or the institution	Not a priority as staff in this study generally rate usefulness highly
Automatic motivation *Automatic processes involving emotional reactions, desires (wants and needs), impulses, inhibitions, drive states and reflex responses*	Gain satisfaction and positive outcomes from adopting LA Develop routines to include LA in normal workload	Some changes needed to embed learning analytics into the teaching and learning culture and practice

7.5.2 Stage 2 Identifying intervention options

7.5.2.1 Step 5 Determining intervention functions

Step 5 of the BCW, the first step of Stage 2, involved determining the intervention functions to include in the implementation plan. Examples of ways in which each of the nine intervention functions can be applied to LA implementation are detailed in Table 32. Whilst coercion and restriction could be considered as relevant, they are not necessarily the most effective options, in a higher education setting. Coercion could be used by senior management in terms of promotion or inclusion of use of LA in workloads models, for example if an academic was asked to participate in a LA implementation plan and chose not to, they could have fewer hours allocated to teaching in their workload model. Similarly, with restrictions, an academic could have less hours allocated to research to encourage them to engage in LA. Both of these are negative uses of those intervention functions and appear unlikely to lead to positive outcomes. Those intervention functions were thus considered to be outside the scope for this study.

Table 32

Intervention Functions applied in this Study (adapted from Michie et al. (2014, pp. 111-112))

Intervention function	Example as relevant to this study and LA implementation
Education	Online resources supporting LA development
Persuasion	Discussing the benefits of using LA with participants
Incentivisation	Providing hours in workload for participation in study and implementing associated actions in their courses
Coercion	Outside scope of this study
Training	1-1 sessions with participants to show how to access and interpret LA reports in the LMS
Restriction	Outside scope of this study
Environmental restructuring	Developing institutional policies and guidelines, though this is outside scope of this study Making access to data easier
Modelling	Providing Case Study examples of how LA has been successfully adopted
Enablement	Increasing capabilities to reduce barriers Facilitating networking opportunities, within USQ to promote collaborative knowledge building

To help determine which of the intervention functions would be most appropriate for this study, first the matrix linking these functions to the components of the COM-B model was considered and then the APEASE criteria were applied to each of the identified intervention functions. The matrix, as shown in Figure 18, identifies which intervention functions are aligned with each of the COM-B components. As discussed above, for this study all COM-B components, except physical capability were shown to be important, with physical opportunity being the most important need. The matrix shows that the most relevant intervention function for physical opportunity were training, environmental restructuring, and enablement, as indicated by the filled cells. It can further be seen that enablement was relevant for four of the five important COM-B components, environmental restructuring, and training for three, and education, persuasion, and modelling two. This suggested that an implementation plan including a combination of these intervention functions was most likely to prove effective. Whist incentivisation was considered beyond the scope of this study, this could be included if the implementation was from an institutional perspective (for example, providing buy-out of time, inclusion of engagement with LA in workload model, or funding for attendance at learning and teaching focussed conferences).

Figure 18

Matrix linking COM-B Model Components and Intervention Functions and showing the Relevant Intervention Functions for this Study (adapted from Michie et al. (2014, p. 116)

COM-B Components	Education	Enablement	Modelling	Training	Environmental restructuring	Persuasion	Incentivisation	Coercion	Restriction
Intervention Functions									
Physical capability									
Psychological capability									
Physical opportunity									
Social opportunity									
Automatic motivation									
Reflective motivation									

Key

- Most relevant COM-B component for this study
- Relevant COM-B components and intervention functions for this study
- COM-B component not relevant to this study and/or inappropriate intervention functions
- Intervention function not relevant to this study
- Intervention function not considered relevant to COM-B component in BCW

7.5.2.2 Step 6 Applying the APEASE criteria

This step of the BCW involved applying the APEASE criteria to identify which intervention functions based on the behavioural diagnosis in Step 5 would be appropriate in the context of this study. Through this process, as outlined in Table

33, it was found that environmental restructuring] did not meet all of the APEASE criteria in the context of this study and so was not included in the LA implementation plan. Education, Training, Modelling, Enablement and Persuasion all met the full range of APEASE criteria. The BCW recommends choosing three or four intervention functions and it was resolved to not include Persuasion as communication on benefits of using LA could be included through each of the other intervention functions. Education, Training, Modelling, Enablement were thus chosen as the most appropriate intervention functions for this study.

Table 33

Application of APEASE Criteria (adapted from Michie et al. (2014, p. 247))

Possible intervention functions	Does the adoption function meet the APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, equity)?
Education	Yes: Equitable provided there are equal opportunities for staff on all campuses
Training	Yes: Equitable provided there are equal opportunities for staff on all campuses
Environmental restructuring	Effective, No side effects or safety issues, Equitable The practicality of providing more time for staff to engage with all aspects is beyond the scope of this study but could be an important component in other contexts There would be costs associated with improvements to systems to make data more accessible As most staff in survey responses rated institutional policy and guidelines as a low priority and interview participants made little mention of this, the acceptability criteria would likely not be met to the same extent as other intervention functions
Modelling	Yes
Enablement	Yes
Persuasion	Yes
Selected intervention functions	Education, Training, Modelling and Enablement

7.5.3 Stage 3 Identifying content and implementation options

7.5.3.1 Step 7 – Identify BCTs

Application of Step 7 of the BCW involved choosing appropriate BCTs from the BCT Taxonomy that would most suit the context of this study. This was done through consideration of the list of most frequently used BCTs for each intervention function, as detailed by the BCW authors, and applying the APEASE criteria to each of those techniques. There were also several of the BCTs which were considered in the guide as applicable across two of the intervention functions chosen for this study and were thus included for this. The final list of BCTs and their application are shown in Table 34. The BCTs chosen focussed on:

- building staff capabilities through demonstrating use of LA reports and tools;
- providing guides for the use of LA reports and tools;
- working with individual participants to set goals specific to their unique context; and
- providing feedback on their progress towards those goals and the outcomes of engaging more deeply with LA.

Table 34

BCTs used in this Study (adapted from Michie et al. (2014, pp. 250-253, 259-283))

Intervention function	Individual BCTs	BCT definition	Application in this study
Education/ Training	Feedback on behaviour	Monitor and provide informative or evaluative feedback on performance of the behaviour	Provide report of levels of engagements with LA reports and tools
	Feedback on outcomes of behaviour	Monitor and provide feedback on the outcome of performance of the behaviour	Discuss changes in student interactions as a result of actions resulting from using LA data
Enablement	Social support (practical)	Advise on, arrange or provide practical help (e.g. from friends, relatives, colleagues,' buddies' or staff) for performance of the behaviour.	Group discussions and support website with opportunities for discussion
	Goal setting (behaviour)	Set or agree on a goal defined in terms of the behaviour to be achieved	Agree on one question to be addressed and follow through I Framework to address this in an agreed timeframe
	Review behaviour goal(s)	Review behaviour goal(s) jointly with the person and consider modifying goal(s) or behaviour change strategy in light of achievement. This may lead to resetting the same goal, a small change in that goal or setting a new goal instead of (or in addition to) the first, or no change	Discuss progress through stages of I Framework in individual consultations
Modelling/ Training	Demonstration of the behaviour	Provide an observable sample of the performance of the behaviour, directly in person or indirectly e.g.via film, pictures for the person to aspire or imitate.	Work through LA reports available in LMS and how to use in individual consultations Provide guides to reports and tools on support site
Training	Instruction on how to perform the behaviour	Advise or agree on how to perform the behaviour	Individual discussions on which reports and tools most beneficial depending on question being investigated and how to interpret data

7.5.3.2 Step 8 – Identify mode of delivery

For this study it was determined that a combination of modes of delivery would be the most effective approach. This included group discussions and individual

consultations and asynchronous communication through a support site created in the LMS and email correspondence. All group discussions and individual consultations were held by Zoom videoconferencing and recorded, with conversations being transcribed for analysis. This approach was taken due to the researcher not being located in the same cities as the participants and to meet the APEASE, as there was no travel involved and participants were able to join sessions from their work environments. Creating a support site within the same LMS environment as course sites meant that staff were familiar with the layout and did not have to become comfortable in a new environment. This also enabled modelling of many of aspects of LA use. This approach also met all of the APEASE criteria.

The following section describes how these processes and resulting intervention functions and specific BCTs were combined with the draft design principles to design the LA implementation plan. Linkages of the plan to each component of the I Framework, as developed and described in Chapter 2 are also explained.

7.6 LA Implementation Plan

Building on the insights gained through Phase 1, identification of the problem and the process of designing an intervention using the BCW, a LA implementation plan was developed that would cover a 20-week period. The plan was then trialled over two iterations as Phase 3 of this study. This timing was chosen to cover one full semester plus a short period before and after, while maintaining a sustainable level of involvement for the participants. The plan included individual consultations and group workshops/discussions and development of a resource and support site within the LMS. The intervention involved working closely with academics to support and enable them to engage deeply with LA, implement an action and evaluate the success of this, based around a question of their choosing relevant to their specific context. The individual consultations focussed on their current and past StudyDesk sites, discussing what was and was not working for them and their students, looking at what information the Moodle reports were providing for them and how they could use those through the semester. Discussions included what changes/actions could be made based on their interaction with the analytics and then evaluating the effectiveness of those actions based on their meaning of success. The group discussions focussed on sharing experiences and learning with and from each other, with an aim of building a positive and constructive environment. The resource site

was designed to provide both individual and group support, with private areas for each participant where they could discuss issues with the researcher, guides for accessing and using the Moodle reports and tools, links to relevant literature, a glossary of terms, collaborative spaces, and a final evaluation survey. An overview of the implementation plan is presented in Table 35.

Table 9

LA Implementation Plan

Week	Session	Individual Actions - participants	Researcher Actions
1	Group	Attend workshop Determine question to be investigated	Provide overview Discuss possible questions
2-3	Individual	Discuss overview report and data to be interrogated	
4-5		Initial analysis of data	Provide support in gathering and analysing data
6	Group	Discuss initial analyses and progress as well as next steps	
7-9		Design and develop action/intervention and plan implementation	Provide support in developing intervention
10	Individual	Discuss project	
11-12		Implement intervention	
13	Group	Discuss intervention	
14-15		Continue intervention	Support each participant as needed
16	Individual	Discuss evaluation of intervention	
17-18		Evaluation of intervention	Support each participant as needed
19		Complete feedback survey	Distribute feedback survey
20	Group	Wrap-up and celebration	

The format and content of the workshop and individual consultations also aligned with the I Framework, as discussed in Chapter 2 and outlined below.

Institutional context: for this study the context was USQ and participants were made aware of these in the workshop to help them situate their implementation within these contexts.

Impetus: participants were asked to consider their specific questions prior to the initial workshop and these were further discussed in the initial focus group session.

Input: discussions were held with staff in individual consultations regarding the most appropriate data to access for their nominated questions and how they could access this.

Interrogation: discussions were then held with staff in individual and group discussions regarding how they would analyse and interpret their data.

Intervention: The actions participants planned as a result of the interrogation were the next topic of discussion in the group discussions and individual consultations.

Impact: The success of actions was discussed in the final individual consultations and in the evaluation survey.

The elements of the implementation plan each included most or all of the intervention functions and BCT elements of the BCW as well as all of the draft design principles. The steps of the I Framework were spread between the individual and group discussions. A matrix showing the spread of all of these inputs through the LA implementation plan is included in Table 36.

Table 10

Components of the LA Plan

Behaviour Change Wheel				
Implementation Plan Element	**Intervention functions**	**Behaviour Change Technique**	**Draft Design Principles**	**I Framework element**
Initial workshop	Education Enablement Modelling	Goal setting (behaviour) Demonstration of the behaviour Instruction on how to perform the behaviour Social support (practical)	Professional learning Support and resources Organisational environment Communication	Institutional context Impetus
Individual consultations	Education Enablement Modelling Training	Goal setting (behaviour) Demonstration of the behaviour Instruction on how to perform the behaviour Feedback on behaviour Feedback on outcomes of behaviour Social support (practical) Review behaviour goal(s)	Professional learning Support and resources Organisational environment Communication	Input Interrogation Intervention Impact
Group discussions	Education Enablement Modelling Training	Goal setting (behaviour) Demonstration of the behaviour Instruction on how to perform the behaviour Social support (practical)	Professional learning Support and resources Organisational environment Communication	Interrogation Intervention
StaffDesk support site	Education Enablement Modelling Training	Demonstration of the behaviour Instruction on how to perform the behaviour Social support (practical) Review behaviour goal(s)		

A plan for the initial workshop, as detailed in Table 37, was also developed to ensure a thorough overview was provided and expectations for the intervention could be set. The I framework and a workshop developed by Gunn and colleagues for their study involving staff at New Zealand universities influenced the development of this workshop plan (Gunn et al., 2017). The Gunn workshop was considered an appropriate template due to its similarity with the I framework and proven effectiveness.

Table 11

Initial Workshop Plan

Topic	Timing	Responsibility
Welcome and thanks	5 min	Hazel
Brief introductions	15 min	All
Overview of this phase	5 min	Hazel
Course and question overview	60 min	All
Ethics and ethical considerations	5 min	Hazel
Overview of StaffDesk site	5 min	Hazel
Scheduling of future sessions	15 min	All
General Q & A	5 min	All
Moving forward	5 min	Hazel

7.6 Chapter Summary

This chapter discussed Phase 2 of this DBR study, developing a LA implementation plan. Discussion in the chapter began with a comparison of the results from the staff survey, participant interviews and log data of staff interactions with the LMS, to address sub-questions 1 and 4 of the research question. Specifically

Sub-question 1: *What do academics identify as the enablers and barriers to the implementation of LA in their teaching practice?*

The main barriers to engaging with LA were confirmed as lack of time and knowledge and the difficulty in accessing data in an easily usable format. Enablers were confirmed as provision of support and resources to support capacity building.

Sub-question 4: *What are the transferable design principles that underpin an effective LA adoption strategy?*

A set of draft design principles were developed from responses to the staff survey and participant interviews that had four main themes of professional learning, support and resources, organisational context and communication.

An outline of the BCW was then provided followed by a detailed discussion of how the BCW was applied in this study. For this study, the behaviour change being investigated was increasing the academic staff usage of LA to inform and enhance teaching practice. Applying the COM-B model, which is an integral component of the BCW, to this study showed that psychological capability, physical opportunity, social opportunity, and automatic motivation were the components of the model which it would be beneficial to include in an intervention. Following through each of the steps of the BCW framework intervention functions of education, enablement, modelling and training were determined as most likely to form an effective LA implementation plan. The most effective BCTs were determined to be feedback on behaviour, feedback on outcomes of behaviour, social support (practical), goal setting (behaviour), review behaviour goal(s), demonstration of the behaviour, and instruction on how to perform the behaviour. A multi-modal delivery approach consisting of individual and group discussions and a support site was determined to be the best option for the context of this study.

A 20-week implementation plan was then outlined that combined the elements of the BCW with the draft design principles and the I Framework and details of the initial workshop plan were provided. Phase 3 of this study, trialling and refining of the implementation plan, is discussed in Chapters 8 and 9.

Whilst the implementation plan was designed for the specific context of USQ, the process of working through the stages and steps of the BCW could be followed by other researchers and institutions to create an effective LA implementation plan for their context. Whilst the draft design principles were also generated from the specific USQ context they are also able to be adapted and adopted in other contexts.

Chapter 8 Phase 3: Trialling of Implementation Plan with Expert Group and Iteration 1
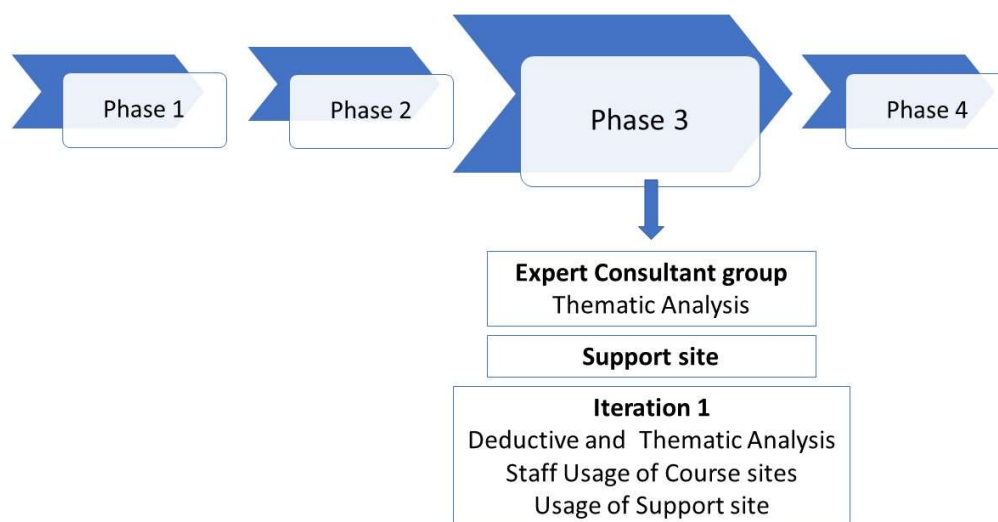
8.1 Introduction

The thesis now moves to discussion of Phase 3 of this Design-based research (DBR) study, the iterative trialling of the Learning Analytics (LA) implementation plan developed in Phase 2 (as described in Chapter 7). Feedback on the relevance and effectiveness of the implementation plan was solicited through a workshop with a group of people with expertise in learning and teaching within the University of Southern Queensland (USQ), held in December 2018. Participants in the workshop included staff from the central Office for Advancement of Learning and Teaching (OALT) who worked closely with academics on course design and professional learning. The workshop explained the purpose of this study and outlined the LA implementation plan. Discussions and insights from the workshop participants affirmed the plan and draft design principles and no changes to these were made as a result.

Two iterations of the trial of the LA implementation plan were then conducted during 2019: one in each of the two main teaching semesters, and each conducted over 20 weeks. The first trial was held in Semester 1 and included six participants, two of whom had participated in Phase 1 of the study. The second iteration was held in Semester 2 with seven participants, only one of whom had been involved in Phase 1 of this study.

Each iteration of the trial followed the implementation plan developed in Phase 2 (Chapter 7) and consisted of a series of individual consultations and interviews with participants, as well as small focus group sessions, supported by a Learning Analytics Collaboration and Support site developed in the StaffDesk area of Moodle. An overview of the trialling of the LA implementation plan is provided in Figure 19.

Figure 19

Trialling of the LA Implementation Plan

This chapter discusses the expert workshop and the first iteration of the trial. Chapter 9 will discuss the second iteration and provide a comparison of findings across the two trial iterations. The discussions of the two iterations of the trial do mirror each other allowing for a comparison of the two trials. Each discussion begins with explanation of the ways in which participants engaged with the components of the implementation plan. That explanation is followed by analysis of the discussions held during the individual consultations and interviews and the focus group sessions. The combined results of these two aspects of the trial will be used to confirm or amend the draft design principles.

This chapter begins with a discussion of the expert workshop/focus group and feedback received during that session, followed by discussion of the design and development of the support site. An in-depth discussion of the first iteration follows, which includes explanation of the recruitment process of participants, discussion of participants' engagement with the intervention, including their interaction with their

course sites and the support site. This discussion is followed by deductive and inductive thematic analysis of transcriptions from all individual consultations/interviews and focus group sessions. Evaluation of participants' responses to a feedback survey conducted at the end of the first iteration is then provided and the chapter concludes with a discussion of the success of the first iteration of the LA implementation plan and changes made to the draft design principles and implementation plan resulting from the insights gathered throughout the first iteration of the trial.

Through these analyses and discussions, the chapter provides further insights into the research question and all sub-questions for this study:

What are the requirements and characteristics of an effective LA adoption strategy in a regional Australian university?

1. What do academics identify as the enablers and barriers to the adoption of LA in their teaching practice?
2. Which aspects do academics engaging in a LA implementation strategy identify as enhancing their adoption of LA?
3. How is the LA adoption strategy effective in stimulating and supporting the usage of learning analytics by academics?
4. What are the transferable design principles that underpin an effective LA adoption strategy?

Research in this phase of the study was based around this research question and sub-questions which were reframed for the participants as:

1. What do you consider are the enablers and barriers to you adopting LA?
2. What opportunities and supports do you feel you need to use LA to inform and enhance your teaching practices that promote student learning and engagement?
3. What do you consider are the benefits from adopting LA and how will you measure your own success?

These questions were posed to participants prior to the initial workshop and they were also requested to come to the workshop prepared to discuss a question they would like to investigate and to provide details of the course they wanted to include

so log reports could be obtained and analysed for staff engagement in the course. The questions were also included in the final survey.

8.2 Expert Group

Prior to the two iterative trials of the LA implementation plan, feedback was sought from a group of staff within the university who had expertise in learning design and academic development. The group was drawn from the Academic Development (AD) and Educational Design and Development (EDD) teams within the central OALT at USQ. This group was chosen as they were the staff who most closely worked with academics on professional learning and course design and development. Because of their roles, they had a strong understanding of the Moodle environment, processes for supporting staff, and the current learning and teaching culture across the university. Staff from the AD and EDD teams were invited to a 1-hour workshop in December 2018, in which the researcher provided an overview of the research study and the implementation plan. Although the workshop was initially planned as a 2-hour event to allow for in-depth discussion in a focus group approach, the teams were only able to allocate 45 minutes within a scheduled meeting time. Because of this last-minute change, an information sheet was forwarded to all participants prior to the workshop with the aim of providing important context and background to enable focused discussion and feedback in the allotted time. This information sheet is included in Appendix J.

Feedback and constructive criticism were sought through an open discussion on several key points, including:

- the design of the implementation plan and its suitability for USQ;
- whether the implementation plan would be effective in supporting participants to engage with learning analytics to inform and enhance their teaching practice to optimise their students' experiences;
- any changes they would suggest to improve the plan;
- whether this approach is something that would be useful for the EDD team/OALT to adopt for more widescale adoption of Learning Analytics across the university;
- if yes, what, if any support/training would staff in their area need;
- if not, what were the limitations; and

- is this approach something they saw as useful for the EDD and AD teams/OALT to adopt for widescale adoption of other educational innovations across the university.

Eight staff members attended the event with four of them providing feedback at the time, and two of those adding extra information through follow-up emails. All participants were provided with a Participant Information Sheet, in accordance with the ethics approval for this study and signed a consent form. In line with the ethics approval, pseudonyms have been used for each of the participants. Key points arising from the expert consultation process are now explored. The late change to the workshop when reduced to 45 minutes resulted in limited time for discussion which may have contributed to a lack of involvement from all participants.

8.2.1 Feedback Discussion

Feedback was largely positive and constructive, and predominantly seeking clarification on some points with only minor suggestions for amendment raised. Clarification focussed on some of the terminology of the study and intent of the research, particularly Phase 3. Taylor succinctly summarised the conversation, noting that their interpretation was that the study was "looking at increasing learning analytics adoption and whether this [implementation plan] supports that."

Cameron and Taylor queried the ways in which participants would be asked to reflect on their experience and it was explained that the semi-structured nature of questioning in the individual consultations and group discussions, and the open-ended questions in the final feedback survey would provide those opportunities.

Drew provided positive feedback noting that using StaffDesk for the support site was a win as it was an environment with which academics were already familiar; and that having a mix of synchronous discussions and asynchronous supports sounded beneficial. They also affirmed this approach in light of the work of Stone (2017):

> what you are trying to do here is provide academics with another opportunity to have an evidence-based approach to know their students, so I think that is a big win. And the other one is about teacher presence and she *(Stone)* noted to USQ that this is her top recommendation and what I am thinking is that the more you can build linkages that help instructors know when it is best to be present, rather than just guessing and just hop in here, hop in there

because I know research shows that if you are over present for example in forums that can work counter and so that linkage to the national guidelines and knowing ways of when and how to be present and when to back off.

Drew and Taylor raised a concern regarding whether it would be possible to engage participants fully to the level required and queried what planning there would be for no-shows.   Drew added that one improvement to address this concern could be through incentivisation:

> Whether you can provide some incentive and design this in a way that they could get a badge or credential for this that articulates into a Grad Cert of Learning and Teaching or something similar, just that incentive, because they are already complaining about lack of time.

Drew further noted that it would not be appropriate to comment on some of the questions about the applicability of the plan until they had seen how the trial ran and the resources available on the support site.

Taylor queried whether the intent was for the intervention to become something that would be able to run by itself or whether it would always need a facilitator. As the researcher, I noted that it was likely there would always need to be a facilitator, though the level of involvement by facilitators moving forward may not always need to be as intensive as during the trials in the study.

No changes to the implementation plan were considered necessary as a result of the input from this group.

8.3 Support Site

As noted in Chapter 7, a support site was created to provide resources and guides on the LA reports and tools available within the Moodle LMS and how to use those, in addition to opportunities for collaboration amongst participants and private areas where participants could correspond and discuss with the researcher. The site was created in StaffDesk, an area of the USQ Moodle offering developed specifically for staff use and professional development. Access to the site was provided only to participants, and the researcher's supervisory team, who played no active role in the site.

8.3.1 Design and Development

The support site was designed to mimic as much as possible the common layout of course sites in StudyDesk with the aim of creating a familiar environment for participating academics. There were four main areas for the site, as shown in Figure 20 which shows the home page.

Figure 20

Home Page of the Support Site
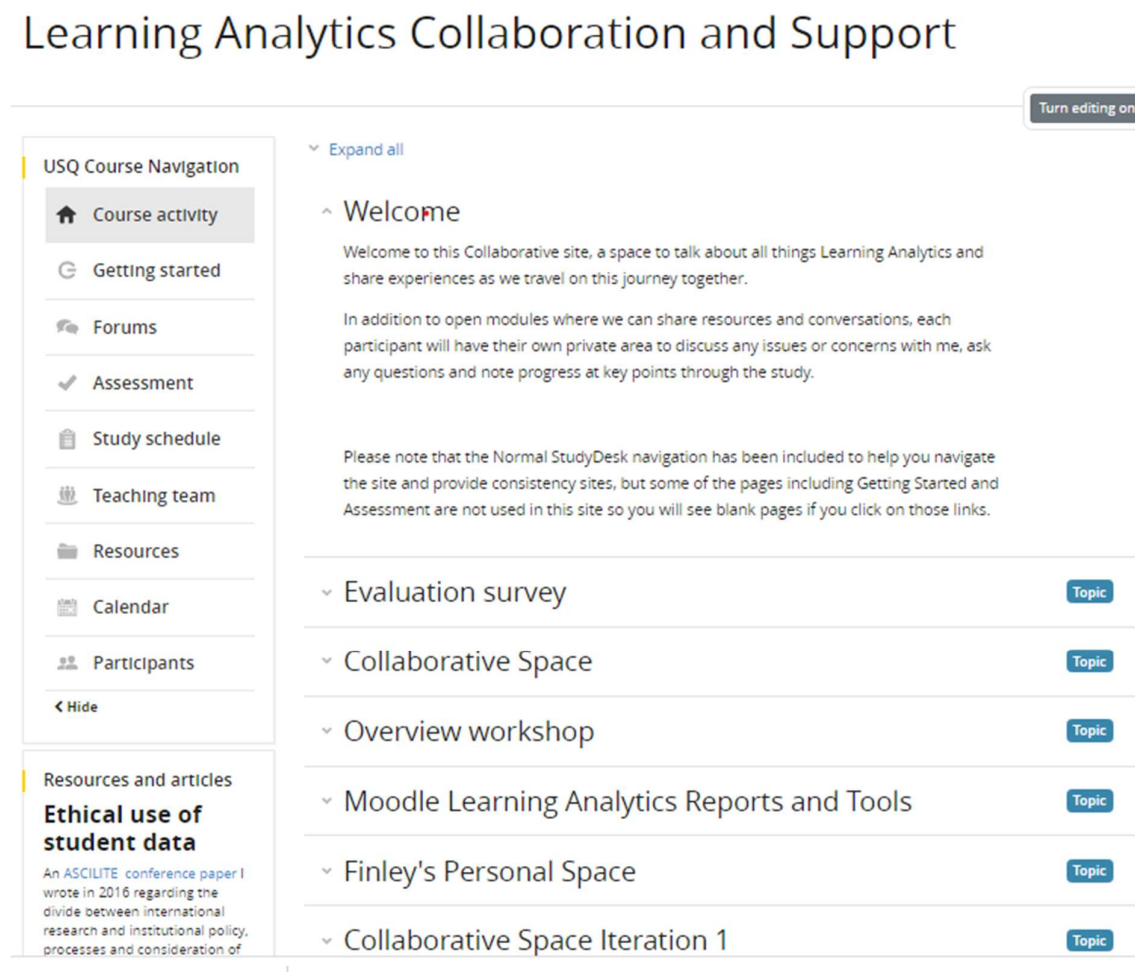
The analytics data generated through reports also reflected what they would see in their own course sites, and the course design modelled good practice in format of resources to enable maximum data to be extracted. Each of the elements supported one or more of the behaviour intervention functions of *Education, Enablement, Modelling and Training*, and the specific behaviour change techniques (BCT) of behaviour goal(s), as introduced in Chapter 7.

1. **Collaborative spaces:** one was created for each of the iterations and included discussion forums and glossaries that participants could contribute to if they wanted. A link to the glossary entries was also provided in the left-hand navigation, which randomly generated the information from an individual entry every time a participant accessed the site. Participants were also encouraged to share stories of successes or links to useful articles or resources. (*Education, Enablement, Social support (practical)*)

2. **Resources and guides:** information was provided in the format of Moodle books, which are a series of linked webpages. Separate books were created for the Moodle LA tools and Moodle LA reports. These guides provided information on each of the reports or tools, how to access them, and suggestions on how the tool could be used. An example of one of these pages is included in Figure 21. (*Education, Modelling, Training, Demonstration of the behaviour, instruction on how to perform the behaviour, review behaviour goal(s)*).

3. *Personal space:* a separate, private area was created for each participant where they could raise questions directly with the researcher and hold a private asynchronous conversation, outside of their individual sessions. (*Education, Enablement, Training, Demonstration of the behaviour, instruction on how to perform the behaviour, Social support (practical), and Review behaviour goal(s)*).

4. **Evaluation survey:** a final feedback survey which was made available at the end of each iteration, providing participants with an opportunity to reflect on their participation and provide feedback on the effectiveness of the LA implementation plan. *(Enablement, Review behaviour goal(s))*.

Figure 21

Screenshot of Page from Moodle Book: Moodle Analytics Reports

8.4 Phase 3 Participants

Recruitment of participants for Phase 3 of this study did present some challenges and was achieved in two ways. Initially, staff who had participated in the pilot of the USQ Analytics Tool were contacted from a mail list provided by the leader of that project. This group was chosen as possible participants as they had shown some interest in LA and involvement in this study could be a way of progressing that

interest. This resulted in nine participants from an initial list of 40 staff members, three of whom had been participants in Phase 1 of this study. As it was hoped to recruit at least six participants for each iteration, the researcher tapped into networks including participants in the expert group and PhD supervisors for recommendations as well as personal approaches to colleagues across USQ. This resulted in a further four participants being recruited, bringing the total number of participants to 13, with six involved in the first iteration and seven in the second. Both iterations had a mix of staff from the Toowoomba and Springfield campuses, with no participants from the Ipswich campus. Staff came from four schools in the Business, Education, Law and Arts (BELA) faculty, two schools in the Health, Engineering and Sciences (HES) faculty and one from a central unit. For focus group sessions, participants were encouraged to get together as a group at each campus to help build the community and cross-disciplinary connections.

The discussion from interviews in both iterations of the trial of the LA implementation plan followed the DBR approach and focused on themes previously identified in Phase 2 and discussed in Chapter 6, as well as any new themes which emerged through further inductive analysis of transcripts from the individual consultations/interviews and focus group sessions. This approach allowed for generalisation of the findings to other contexts in a way that would not be possible if the focus had been on each individual participant's journey.

8.5 Participants' Engagement through Iteration 1

The following sections detail the ways in which participants in Iteration 1 of the trial of the LA implementation plan engaged with each of the components of the plan.

8.5.1 Engagement in Individual Consultations

The main benefit of the individual consultations was the opportunity to personalise the discussion to each participants' context. Starting with the same questions and then allowing participants to determine the focus and direction of conversations also gave them a sense of agency and ownership. The conversation would often start with participants talking about their course design or levels of student engagement, into which they would bring aspects of LA, without necessarily realising in some cases. This led to me prompting them on what types of data may be useful for them through demonstration of the different reports and tools available. Participants appreciated

the opportunity to have the space and time to talk with someone, to explain their specific teaching approach and course design. For example, Leslie's consultations focused on the way that LA permitted them to change the structure of their learning quizzes. Similarly, all participants were able to raise contextually relevant issues and benefit from focussed discussion relevant to their course context and the questions they wished to address through involvement in this study.

These discussions and insights confirmed that providing personalised support and training through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities; and
- provide support and resources for all aspects of LA.

8.5.2 Engagement in Focus Group Sessions

Although the focus group sessions were not always well attended, the discussions that ensued did prove to be effective and valuable. The benefits of social learning and peer support became evident in the focus group sessions, as did the value participants placed on the networking opportunities provided in these sessions. For example, Leslie and Keegan engaged in a conversation about the merits of nudges, each building on the other's thoughts and making suggestions for improvements for how they could both word the nudges and disseminate to appropriate students. Some prompting from myself as the researcher helped to move the discussion even deeper. These discussions and insights confirmed that including opportunities for group discussions is an essential element of an effective implementation plan and affirmed the following draft design principle:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities.

8.5.3 Engagement with Course Sites

Reports of participants' interaction with their nominated course sites were prepared for the offering of the course prior to their involvement in this study, in a similar manner to reports prepared in Phase 1 and discussed in Chapter 6. This section discusses the feedback participants provided when the reports were shared and

discussed with them in individual consultations. All participants noted that the reports were useful on different levels and that they offered insights into their engagement with their course sites. The discussions also provided contextual information for each of the course sites and teaching practice of staff and as in Phase 1, indicated a range of ways in which teaching is undertaken at USQ. For example, Jordan commented on several aspects of the course context including the team-teaching approach where they taught the first half of the course and the Course Moderator taught the second half of the course. They re-iterated comments made in Phase 1 that they had a directive from the Head of School to not respond to students over weekends because that sets unrealistic expectations for students and not all staff have the desire or capacity to work on weekends. They also noted: "We don't have a discussion forum in this course. That changes how much I access the site, I suppose because there isn't that need to be checking to see what's going wrong on the site."

Keegan commented on the insights provided by the report and visualisation provided to them:

> I guess for me, it's interesting what I do but what students are doing are far more interesting. Visualisations are very powerful; they're really powerful. Again, one thing, what I'm doing or others in the teaching team is interesting but I'd be far more interested in knowing what students are doing and particularly, I want to know who are those risk students who haven't engaged so that I can reach out to them and try to get them engaged.

The power of visualisations was echoed by Kendall when referring to pie chart visualisation: "That's a very good way presenting things. Yes. It's quite clear how that makes sense". They also noted that the graphs of daily usage:

> … clearly reveals my working pattern, because I go to StudyDesk to quickly see whether any questions are asked or anything. That's one reason I visit quickly, but then, there are occasions when I'll be working on something intensive… Some days I spend more time than others. I do not have a regular pattern… I don't know how it links with my assessment timing, but usually around that time I'm more active. This is really nice information… that brings up what's important to do to take future action. Awareness is what matters. In many

things in life, we need awareness, and this is definitely something that gives the awareness of how things are happening.

Presenting the data to Kendall in this way resulted in a detailed conversation on how this type of data could be used to change their teaching practice and course design, with Kendall noting:

> I know the reasoning behind when changes would be required. I'd like to give an example: If my assessment questions were not clear and many students ask questions, then I would spend more time on explaining them in assessment discussions. If the students' inquiries were increasing, and the reason for increasing is something's not clear to them or something is difficult, then they need lots of explanation. I would be spending more time on that. Thanks to you Hazel, looking at this diagram, my time on student engagement and assessment in Moodle could be rather less, not more, because if I could clearly communicate to them, then things become clear to students and I can spend more time on content, because at the end of the day, it's the content that I want to focus on.

The discussion continued my response of:

> My argument would be that what you're wanting to do is actually have more time engaging with the students, because your conversations with them in the discussion forum would be more about the content and the learning. Rather than just related to uploading files and things.

Kendall further commented that they appreciated my viewpoint, "That's looking from another angle. Yes, definitely, you're right too. I can't take it for granted that they have understood the content, simply because they haven't asked questions".

This combined feedback indicates that including the staff usage reports was useful for participants and offered a model for how they could examine their student data and affirmed the following draft principles:

- provide easy access to relevant and actionable LA data; and
- provide clear and timely communication of available reports, support and any changes to systems.

8.5.4 Engagement with LA Reports

Participants' interactions with the LA reports available in the LMS were analysed for their nominated course for the semester it was taught prior to involvement in this study and for the semester in which they participated in the study. This data included the number of times they had clicked on any of the LA reports and tools in their course site. For the semester in which they participated the number of clicks were further split between interactions during their individual consultations and any other times during their participation in the trial. Their interactions with the LA reports and tools during the individual consultations were often extensive as I explained the affordances of different tools and reports and participants worked through these to become familiar with their format. Working through the reports and tools provided a component of capacity building and it was considered that it would be more beneficial to include analysis of those interactions as a separate component of their overall interactions with LA reports, to provide a more accurate picture of their engagement levels. Details of these interactions for all participants are included in Table 38.

As noted in Table 38, Finlay, Jordan and Leslie all displayed increased levels of interaction with the LA reports, as measured by number of clicks, during their participation in the study, relative to the earlier offering of their course. Leslie's interactions increasing by 150%. Conversely, Jackie, Keegan and Kendall recorded a decrease in levels of interaction. All participants except Kendall though did have interactions with more of the available reports during the study than in the preceding semester, indicating broader engagement. The decrease in interactions could be attributed to reduced engagement or more targeted interaction due to increased knowledge of which reports would provide the data they needed. Discussions during the individual consultations asked participants to elaborate on this. One example of this is Kendall's decrease in use of the Engagement Analytics tool. Participants were recommended not to use this as it required manipulation and input to provide useful data and the new USQ Analytics tool provided similar information with no input needed.

These insights confirmed that building staff awareness of the full range of LA reports and tools available in the LMS, and providing training and support in how to use

them are important elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA; and
- provide easy access to relevant and actionable LA data

Table 12

Participants' Engagement with Learning Analytics Reports

	Finlay			Jackie			Jordan			Keegan			Kendall			Leslie		
	Pre	During	Meet	Pre	During	Meet	Pre	During	Meet	Pre	During	Meet	Pre	During	Meet	Pre	During	Meet
Activity report viewed	0	0	0	0	4	1	1	0	0	0	0	1	3	1	0	0	0	0
Choice report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Communications report student details viewed	0	0	0	0	0	1	0	0	0	0	1	2	2	0	0	0	0	0
Communications report viewed	0	0	0	0	0	4	0	0	0	0	0	1	1	0	0	0	0	0
Course activity completion updated	0	0	0	0	0	0	40	40	0	0	0	0	0	0	0	32	64	0
Engagement analytics report edited	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
Engagement analytics report viewed	0	0	0	0	6	1	0	0	0	0	0	0	16	0	0	2	4	0
Grade outcomes report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grade overview report viewed	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Grade single view report viewed	0	0	0	4	0	0	0	0	0	0	0	0	2	0	0	3	0	0
Grade user report viewed	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Grader report viewed	115	67	0	17	3	3	3	1	0	11	4	0	15	3	0	6	6	0

Live log report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Log report viewed	97	167	7	0	2	0	0	3	0	0	0	0	0	4	0	0	2	0
Outline report viewed	0	0	2	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Participation report viewed	0	5	0	0	38	4	0	0	0	0	0	8	0	14	44	0	0	0
Quiz report viewed	31	21	0	0	0	0	20	30	0	7	10	0	7	1	6	13	62	17
Recent activity viewed	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	1	0	0
Statistics report viewed	0	2	0	0	6	3	0	4	0	0	0	3	4	0	11	0	0	6
User list viewed	24	45	0	113	40	0	3	13	0	29	18		152	187	9	27	64	21
User log report viewed	0	0	0	3	0	0	0	0	0	0	0	1	13	3	3	0	0	0
User profile viewed	9	9	3	13	3	0	2	5	0	17	15	2	14	14	3	32	99	0
User report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
User statistics report viewed	0	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
USQ analytics aggregated course modules detail viewed	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
USQ analytics course module detail viewed	10	11	2	0	10	0	5	9	0	0	1	1	55	37	0	2	7	0
USQ analytics report viewed	24	14	4	0	8	2	4	12	0	0	2	4	60	52	5	8	5	2
USQ Low grade report viewed	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	310	341	19	160	126	19	78	119	0	64	53	23	355	316	81	126	315	46
Count (total available =28)	7	9	6	8	13	8	8	11	0	4	9	9	15	10	7	10	11	4

8.5.5 Engagement with Support Site

There was minimal engagement from any of the participants with the support site. When discussed with them, the main barrier to this was identified as time limitations. As shown in Table 39, Finlay had the most engagement, interacting with the site on seven different occasions for a total time of 65 minutes. Whist Leslie interacted on five different days this was very superficial over a total of only nine minutes.

Table 13

Participants' Interactions with the Support Site

	Total days	Total clicks	Total time (min)	Feedback survey (min)	Comments
Finlay	7	65	63	23	
Jackie	5	49	45	8	
Jordan	2	9	31	20	both days occurred after final interview
Keegan	3	16	6	3	1 additional view after participation in study - view front page only
Kendall	2	16	32	21	
Leslie	5	9	9	1	view only did not complete

Leslie noted that the lack of interaction with the site was not any judgement on content but rather just because they had not found the opportunity to look at it. Conversation between Leslie and Keegan led to the suggestion of the information being included on TeachDesk. Whilst Leslie was well aware of this university support site for teaching academics, and actively promoted it with their colleagues, Keegan had not even heard of it. Jordan noted that, had they been able to find time to engage with the content on the support site, it would have helped with levels of understanding of reports available. These comments and feedback suggest that there is a benefit in the information contained in the support site, though consideration needs to be given to how best to convey that information to participants, and the wider university community such that it can be quickly accessed and easily

understood and applied. These discussions and insights also affirmed the following draft design principle:

- provide support and resources for all aspects of LA.

8.6 Iteration 1 Findings

The following sections present insights gained from deductive and inductive thematic analysis of transcripts from the individual participant consultations /interviews and focus group sessions. The deductive analysis focussed on the same themes as in Phase 1.

8.6.1 Participants' Questions

Participants were asked to consider a question they would like to investigate through their involvement in this study. Their responses, as shown in Table 40, were categorised in a similar manner to the participants' questions raised in Phase 1 of the study. The student experience and engagement with the course site were the dominant themes, whilst teaching practice was the least mentioned. This suggested that focussing discussions on the benefits of engaging with LA would provide for strategies to improve student engagement would be beneficial for this group of participants, and then linking those strategies to changes in course design and/or teaching practice. Jordan and Kendall mentioned temporal data in relation to when students attempted quizzes and whether this had any correlation to grades and levels of engagement.

Table 40

Participants' Initial Questions

	Question(s)	Student experience and engagement	Course Design	Teaching Practice
Finlay	What students use of the materials, because there's a fair bit of materials on the StudyDesk? I'm a little concerned in this particular course that students aren't following or aren't engaged enough that they know what to do at anytime	✓		
Jackie	Is there some strategy I can use that would capture more student involvement consistently through the entire semester that will help students prepare for the GTPA at the end of next semester?	✓	✓	✓
Jordan	What resources are students engaging with? When did they attempt the transitions quiz? what I would like to research again is their engagement with the recorded lectures. Because I put a note on the study desk that I think that the most important thing for them to access is the them to access is the recorded lectures, as a way of tracking through quite a deal of information,	✓		
Keegan	How to handle differences in engagement levels between students who are straight out of high school and those who have industry experience? How to increase the number of students who engage with quizzes?	✓		✓
Kendall	How students are engaging with discussion forums – not many seem to post and are just lurkers? When do students attempt quizzes?	✓		
Leslie	Has a change in course design improved student engagement with introduction forum and weekly quizzes and if so how does improved engagement impact exam performance and levels of critical thinking?	✓	✓	

Because student engagement was a strong focus and a broad topic, subsequent discussions with participants began with a series of questions aimed at prompting to think more deeply about what they were wanting to investigate. These questions were:

1. What do you mean by student engagement?
2. Why is this important in your context?
3. How will you measure student engagement?
4. How will you use that information to change your course design and/or teaching practice?
5. How will you measure the impact or success of that change?

8.6.2 Deductive Thematic Analysis

Deductive thematic analysis was conducted on transcripts from all individual consultations/interviews and focus group sessions with themes coded to match those identified through Phase 1. An overview of that analysis with exemplar quotes is now provided for each of the main themes. Training and support, which was identified as one of the main themes in Chapters 4 and 5, is not included as a separate theme here as that was the main purpose of the LA implementation and was inherent in all the activities, rather than a specific topic of discussion. 'Institutional policy and guidelines' is also not included as a separate theme for this iteration, as there was little mention of this in discussions.

8.6.2.1 Knowledge and Skills

The nature of conversations in this iteration of the trial was more on application of LA to each participant's context rather than specifically regarding the question of "what is LA?" Hence, there were very few specific comments related to knowledge or skill. Development of the knowledge and skills were built as part of the process in the individual consultations, and supported through the resources on the support site, rather than being the focus of discussions.

However, in their final interview, Finlay noted that although they may not have had time to change anything in a concrete way, the *how* and *when* to use LA had become much more intuitive:

> Probably the use of some of these USQ analytics and the logs has kind of become almost second nature to me in terms of, "I'll just have a look and see what's going on". It's in more of the intuitive interpretation of what's there. I can look and say, "All the graphs are

really low and the next assignment it's already a week in. I probably need to ramp it up in my lecture to mention the assignment and send out an email reminder". In that sense it's intuitive.

These discussions and insights confirmed that building staff capabilities in all aspects of LA through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities; and
- provide support and resources for all aspects of LA.

8.6.2.2 Time

All participants noted lack of time to engage with LA and the study as a barrier to engagement with LA, with several noting a sense of frustration at not being able to find more time. For example, Jordan noted "I suppose because I'm doing all my teaching together there's no time to fiddle around". Leslie was more detailed in their description:

My use of USQ analytics has been rather limited, mainly because I couldn't focus too much on using it or at least I couldn't take it to the learning and teaching study type of work. I'm using just as a regular user and mainly for getting information, what's happening, to see how things are going, and informing students from time to time or prompting them to do something. That's the kind of limitation I have.

Leslie also suggested that using professional staff to undertake some of the administrative tasks of accessing and collating data, particularly with identification of students at risk could "free up some of the academic time and then people identify the real academic issues. You could spend that time working with them (*students*) one on one or in smaller groups or something like that".

These discussions and insights confirmed that providing support for some of the administrative tasks associated with use of LA and for academics to use

LA in efficient ways are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide support and resources for all aspects of LA; and
- provide easy access to relevant and actionable LA data.

8.6.2.3 Accessibility of LMS Data

All participants noted some issues with accessibility of LMS data in a format that was easy to download, analyse and interpret. Jordan identified an issue with mismatch of data from different reports. Those types of concerns can erode confidence in the efficacy of LA and raised questions for USQ and Moodle as to which data and reports are reliable and how such discrepancies arose.

Discussions with Jordan also focussed on the quiz analytics and after showing how to use these in one consultation, they went and experimented with the data and during their next consultation they noted that because of the randomisation of questions in the quiz, they were unable to gain the data in which they were interested. They had followed up with ICT who escalated this through their tiers of support and advised that what Jordan was trying to do was not currently possible. This is a further question for consideration by LMS developers at USQ and Moodle.

Jordan and Keegan both expressed a desire to be able to access data on which students were accessing the video recording of lectures, something which at the time of this study was not able to be done easily, if at all. Keegan added that it would be useful to have the information provided in push notifications.

Leslie engaged in a detailed discussion on whether and how it was possible to filter information on students based on their demographics such as campus, program, as their course serviced several different programmes. They also noted that comparison across different cohorts would therefore be useful:

> I started having a look at that and I think at a high-level, the log files
> as they are presented don't differentiate at all in terms of any cohort
> so you can't filter from the log files on campus or cohort or major or

233

discipline that they are enrolled in. So you can do it as a full class but then to do the differentiation and comparison across different groups of students, you would need to be pulling in the data from another report, and maybe adding that to it as a column to log data spreadsheet before you can do any filtering which was a bit of a disappointment when I was looking at that.

These discussions and insights indicated that once start to become confident in using LA they are inquisitive and looking to use the full affordances of data in ways that may not currently be available to them. These conversations and ideas added further insights to be included in the list of recommendations to be sent to USQ and Moodle on the information that would be most useful for staff:

- ensure a consistency of data across all reports and tools;
- improve the data available through quiz analytics when randomisation of questions is adopted; and
- enable easy filtering of log data on a range of demographic factors;

8.6.2.4 Interpretation of LMS Data

Most participants did not specifically discuss interpretation of their data, which was in part due to many of them not having the time over the course of the study to reach that detailed level of engagement. Finlay though, suggested the development of an Excel spreadsheet template that could be used to aid analysis and interpretation of data indicating that they were looking for more effective ways for themselves, and others, to be able to engage with the data:

It might be feasible to have a mechanism for exporting from StudyDesk, but importing to a pre-organised spreadsheet that has some standard terminology which we know will be used in StudyDesk so that they are predefined slices in the spreadsheet. Then the staff could go, "What if this and this happened?" or, "If students who didn't look at this material, what happens to them in the next assignment?" or, "Students who looked at the math support, did that

234

seem to have any effect on the next assignment." Maybe something along those lines could be potentially useful.

These discussions and insights confirmed that building capacity to interpret data in effective ways and support to achieve this are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide support and resources for all aspects of LA; and
- provide easy access to relevant and actionable LA data.

Finlay's idea of an Excel spreadsheet template is another suggestion to be included in recommendations to USQ and Moodle.

8.6.2.5 Nudges

Nudges were a topic of discussion with all participants and in many sessions with a range of perspectives and ideas offered. Whilst participants noted some positive perspectives and suggestions on how the mechanics and effectiveness of nudges could be improved, there were also notes of caution of over-use of nudges and pressure from management to use nudges. Participants also noted that they generally had few direct responses to nudges, though there was little, if any, discussion of measuring impact of nudges on future engagement or outcomes. Participants did acknowledge that they could see the benefits of delving deeper, it was more they had not yet had time, for example Kendall who noted: "All right, that would be good, I haven't investigated much, but with your help, it would be good." These are areas for further discussion and development and specific resources on how to use nudges effectively could be a valuable inclusion to the support site.

Jordan noted that when they sent a nudge early in semester, it did reduce the number of students who hadn't looked at the StudyDesk, commenting that "It hasn't totally reduced it but then you've always got the, what I call, those "angelic" ones." They added that early nudges are beneficial to encourage students to withdraw from courses before the dates for financial and academic penalties:

You can send them out a note saying, "You haven't looked at the StudyDesk. This is now week three. The drop date is this." Trying to deal with the disengaged people. Getting them to not keeping enrolling, is a thing.

Kendall discussed how they offered nudges through supportive feedback in in the discussion forums noting:

I look at what they have provided and if the answer is right, I nudge them (through praise), if the answer is not quite correct, I correct them. That's a kind of nudging as well that encourages them to come back again and help others in that process. When somebody is helping others, they learn themselves better and other students seem to take some answers from fellow students much better than from us.

They did though have a note of caution that some students could react negatively to seeing other students being praised for doing something good.

Leslie suggested that nudges would be more beneficial if we explained to students what would be useful for them to do next, rather than focussing on what they hadn't done so far. Jordan also commented on this point noting ways they used a general nudge to all students through the announcement tool:

I have put a note [on the weekly announcement] this time saying, "If you want to look at one thing, you should be listening to the recorded lectures. That sort of thing helps because people who do that on a regular basis achieve higher results.

Jackie discussed the culture of pressure around using nudging, even though they had doubts as to its effectiveness noting that:

We've had a learning and teaching person representative for the last two years that's been banging on about nudges for a very long time and almost to the point where we've been told you will do it [giggles] even if you didn't think it was the best strategy in the world. But anyway, it is what it is.

And in a later session:

> I haven't been a big fan of nudging anyway but we were prompted to
> do that last semester, so I did have a couple of shots at it and I tried
> to do it very gently. I'm not going to make it hard. Sort of like I know
> some people who have actually drafted a very forceful push for
> students to feel super guilty. I've tried not to do that....That's not my
> style. I just prefer to build some sort of collaborative space where
> people can talk but with the nudging that I did earlier this year, it was
> probably towards the end of week two so for me, I'm worried because
> there's only three weeks of content before you go out on placement
> and I got a very frosty email back from one particular mature-age
> female student who actually said, "Thanks for the reminder but the
> reason that I do online is because it is an asynchronous environment
> and I am able to choose when and how I operate the content."

Several participants raised concerns on the mechanisms for sending nudges
as the main options at present are through a Moodle message or to their
university email address and sending to the university email currently
requires considerable manual input from the academics. Not accessing the
StudyDesk is often a trigger for nudges and if students have not accessed
StudyDesk, they will not receive the Moodle message These students often do
not access their university email accounts, preferring to use personal email
accounts, which is contrary to USQ policy and guidelines. Leslie noted one
option which stemmed from student suggestions of using SMS to send
nudges. Over-use of nudges was also raised as a concern by several
participants for example Kendall who succinctly noted: "I'm worried about
nudges becoming nagging." Another perspective of concern of overuse of
nudges was that the university wants to develop students who meet graduate
attributes including being knowledgeable and skilled with critical judgment,
and innovative thinkers, independent learners. The risk, if too many nudges
are used, is that students could wait for the nudges before they engage, and
do not develop these skills and agency.

The communication gaps in ensuring students receive nudges in a timely manner and through effective and appropriate channels are further issues that could be addressed by USQ and Moodle.

8.6.2.6 Learning Analytics Usage

As noted above, participants commented that they had not been able to find the time to engage with LA to the extent they would have liked and this impacted on the ways in which they used LA. Jordan, for example, commented "I've looked at how many people have accessed the recorded lectures, but I haven't done anything with that." Much of participants' LA use was to gain a broad understanding of what students were doing in their course sites, rather than targetted at their specific questions, and in many cases was reactionary to requests from students for extension on assignments or special consideration. For example, Kendall noted that understanding levels of student interactions with the StudyDesk would help with determination of final grades. "When they are in borderline case, I can use that as a reference, how they were engaging and whether I need to put them over the line or under the line". Similarly, Finlay noted "I did have a look at some of the stats just to keep track of how many students have looked at the online test and also if they've accessed the extension application, just keeping a track of what was going on."

Discussions in the individual consultations were designed to support participants to think beyond just the click data and consider more deeply what the data was telling them and how they could use that information more effectively. For example, Kendall noted that whilst the data indicated students had clicked on something, this did not indicate how the students had explored that resource. The discussion led to assessment design and whether increased numbers of assessment items might attract students to the StudyDesk more often and whether that would be seen by students as a positive or negative if in turn that would impact student learning outcomes. Whilst no answers to these questions were easily obtained over the course of this iteration, these shifts in ways of thinking about the data were an important outcome from the study.

Jackie commented that participation in this study had improved their level of knowledge of what LA data was available and changed their pattern of use of data. In past semesters, they had not downloaded analytics data on a regular basis, nor compared results between active and non-active students, as measured by number of interactions on the StudyDesk. As a result of participation in this study though they commented that they would continue to use the data on a weekly basis, to nudge students as needed:

> I'm really now doing a checking to make sure that they are actually interacting with materials. I will continue the practices that I've already undertaken. I'm very happy with the amount of data that I've been able to download on a weekly basis as informing me.

One discussion with Leslie focussed on use of the LA data to consider in more depth the ways students had engaged with non-compulsory quizzes during the semester. On a superficial level they could see from IP addresses that some students had completed the quizzes at the same time and on same computer, with possible collusion implications, whilst other students had attempted by themselves and not received high marks. However, they were not sure what to do with that information and commented, "I could do a proper research project and all that, but at the teaching level here and now?"

These examples show that whilst participants were thinking about different ways use of analytics could inform and enhance their teaching practice and student experience, they were not yet confident in implementing changes. This points to a need for ongoing support and provision of opportunities to further explore. These discussions and insights confirmed that building staff capabilities in all aspects of LA through an encouraging approach and providing ongoing support are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA;
- provide easy access to relevant and actionable LA data; and

- nurture a workplace culture that encourages and enables use of LA through structures and discourse.

8.6.2.7 Benefits of Using LA

Whilst there were only a few specific mentions of benefits of using LA in this iteration of the trial, further comments are included in other sections of this chapter as they related directly to those themes.

Jackie noted benefits of understanding levels of student interaction and for their own teaching practice and academic recognition:

> I guess as we go through the semester, it'll be about involvement. I'll know if there are ebbs and flows in the students' interests, and maybe even be able to work out what the problem is to try and recapture. Then again, I don't know but it'll be interesting. Accountability. My own accountability, I guess, for what I do as a lecturer. This gives you some other way of trying to measure your effectiveness other than rely on SET (*student evaluation of teaching)* results.

Keegan suggested that a benefit for them would be to be able to receive the data and information through push notifications, adding impetus for dashboards and other notifications to be considered by USQ and Moodle.

> I really like systems that push information at you like dashboards, like things popping up in the corner to tell me stuff that I should be aware of. If this could be dialled on my viewer in StudyDesk that would be good.

These discussions and insights confirmed that providing easy access to relevant data through timely and actionable reports is an essential element of an effective implementation plan and affirmed the following draft design principles:

- provide easy access to relevant and actionable LA data; and
- provide clear and timely communication of available reports, support and any changes to systems.

In their initial consultations, participants were asked what success meant for them regrading use of LA to influence their teaching practice and student experience as well as involvement in this study. Their responses are summarised in Table 4136 and show that whilst the main focus was student experience and engagement, participants were also interested in aspects of course design and teaching practice that would enable improved experiences. In contrast to Iteration 1, participants did not focus on academic recognition in their discussions and this sub-theme has not been included in the summary. The same questions were also included in the final feedback survey and participants' responses to those questions are included in Section 8.9.

Table 41

Participants' Meaning of Success

	Measure of success	Student experience and engagement	Course Design	Teaching practice
Finlay	That students do respond to recommendations of how they could best engage with the course site and material	✓		✓
Jackie	Knowing that students are better engaged, getting feedback from students during semester.	✓	✓	✓
Jordan	Number of students participating in PASS sessions as a result of nudges and the impact on student grades Did changes to quizzes impact student responses and grades	✓	✓	
Keegan	Increased numbers of students completing quiz	✓		✓
Kendall	Increased student use of resources	✓	✓	✓
Leslie	Improvements in students' levels of critical thinking In the end my intention is to have a higher level of certainty that the students that pass actually deserve to pass or if they're failing that they know why they're failing	✓	✓	

Keegan did note that they were not really sure how to respond, and whilst not directly related to LA, the concerns are an indication of the complex nature of

an academic's work environment and the need to embed LA into more general pedagogical discussions.

> I really don't know because I don't know what's available, ...What could I be doing? I know what I'm doing at the moment. It's always good to know what other people do and what works for them. What are some trends internationally? What's the research say about what's effective? We've been saying for decades how inefficient a lecture is as part of learning, but we still do it. What's the option here and that's part of my workload of course is to deliver lectures. If the objective is effective learning, what could or should I be doing?

Some participants also expressed concerns that they would not be able to finalise their investigation within the timeframe of the study. Whilst not feasible within the scope of this study this does suggest that the length of the implementation plan could be increased to two semesters or even a 12-month period.

8.6.2.9 Support

Mentions of support were focussed on the role of different professional staff in increasing use of LA. Participants commented that much of the work of accessing data, identifying and contacting students at risk, could be undertaken by professional staff, freeing academics time for interpreting the data and implementing changes as a result. There was a general lack of understanding amongst participants, of which professional staff they could approach for advice or which roles could and should provide support and at what levels. A range of roles were mentioned as possibly providing support including Educational Designers, Student Relationship Officers, Manager, Learning Analytics, ICT staff responsible for maintenance and development of Moodle, and School Administration Officers. To assist participants, a list of contacts was added to the support site and this could be further developed and maintained by USQ in the future.

Leslie suggested a pastoral care role:

> A lot of it is not academic at all. It's just making sense of the data. If you identify some milestones and talk to some administrative person

about it, they could do all that work relatively easily. I know from other universities. They had somebody employed there, not an academic, I guess, it was a pastoral care person. That's all they did. They went through courses, sent students emails, picked up the phone, and did a lot of that work, and they had some great results with that.

Jackie commented on the need for resources to support the processes, and it is noted that some of these were included on the support site.

I guess the data that is available, in the first instance, will be very useful. Even, I guess, instructions about where to find it, or reinforcing where to find it, what it can be used for. I don't even know if it's going to answer that question, but I need to make sure that I'm using this to the very best. I need probably somebody to go, "There is all of this available." Then I need to have time to go, "Okay. Well, these are the ways that I can use this," or, "This is how I would reinterpret this."

The main learnings from these comments were that there needs to be clearer communication of support available as well as a coordinated and university-wide approach to provision of that support. These discussions and insights affirmed the following draft design principles:

- provide support and resources for all aspects of LA; and
- provide clear and timely communication of available reports, support and any changes to systems.

8.6.2.10 Data

Much of the discussion around data - what is available, and how to access, analyse and interpret it - has been included in other sections of this chapter, as there are direct links to other themes. Some further comments included the value of visualisations, for example Keegan who noted:

It'd be useful to see visual representations of activity both for all the students but it'd be also good to be able to highlight the students who

> I need to be worried about which are not the students that I talk to, not those students posting up to three times a day and linking in.

Kendall discussed an initiative of USQ conducting mid-semester course check through feedback from students and noted:

> I have been part of that, and I got the feedback, but the mid-semester feedback is not that extensive...There is some useful information, but not as much as I expected but it's still pretty good because it's better than nothing because they prompted me at least two different things that I should do differently.

These comments affirm the mid-semester initiative and offer suggestions for expanding the information provided and opportunities for presenting information as visualisations.

8.6.3 Inductive Thematic Analysis

Overall, there were no major new themes that emerged during the individual consultations/interviews or focus group sessions, indicating that the themes coded through Phase 1 of this study provided good coverage of the concerns and perspectives of participants in this iteration of the trial. One interesting finding was common in discussions was the range of sentiments expressed by participants. Whilst participants generally expressed positive sentiments and were grateful for the support and opportunities provided through involvement in the study, there were also negative feelings of guilt and frustration at not being able to participate more. Leslie also noted frustration at lack of response to nudges from students. Surprise and relief at the information that was available from the learning analytics data was another area where positive sentiments were expressed.

8.7 Feedback Survey Response

Participants were asked to complete a final feedback survey at the conclusion of their involvement in Phase 3 of this study. The request to complete was made during their final individual interviews/consultations, and where necessary a reminder email was sent. The survey was administered through the Support site and responses were not anonymous to allow comparison

with comments made throughout the interviews and with their level of interaction with the support site. Five of the six participants completed the survey, with Leslie not responding at all with no reason given, despite requests in the final individual consultation and follow-up email. Collectively, the questions in the survey were designed to address all of the research sub-questions for this study: seeking insights into which of the intervention functions and BCT of the BCW were most effective; eliciting final reflections on their participation in this phase of the study; and their plans for on-going use of LA. Participant responses were grouped to represent positive and negative aspects of their participation in the study and their expected future use of LA. Analyses of responses are now discussed.

8.7.1 Positive Aspects of Participation in this Study

Four questions in the survey focussed on positive aspects of involvement in this study, focussing on what participants had found rewarding, beneficial and helpful through their involvement. Three main themes were evident in responses: building awareness of the LA data, more regular and different ways of using that data; and the personalised support provided in the individual consultations. Jordan also noted the benefit of the individual consultations. The capacity building opportunities and support provided also led to participants gaining a better understanding of student engagement with their course sites. Keegan's responses were concise and focussed mainly on awareness building and the other four participants offered detailed responses, all with slightly different foci, supporting the notion that a successful LA implementation plan needs to include a degree of personalisation and consideration of each participant's context, capabilities and motivations.

Jackie commented that: "The structuring of the process ensured connection to undertaking the actual analytics", indicating that extending support and training over an extended period was an important component of the implementation plan. Finlay's focus was on the benefits of considering different ways of using the LA data:

> My re-evaluation of which analytic data I was using and how I was using it. I had used logs to check how active a student had been,

which resources they had accessed and when- generally in response to enquiries for direct assistance, an extension or checking background when suspect submissions were received. I still do that, but now realise that perhaps I could also compare that pattern of access against other student patterns.

Jordan's responses brought a combination of aspects of the personalised support and training together:

Being able to have one-on-one sessions so that I could learn more about the various analytic reports and reading a document about using the data is never as helpful as someone showing you what to do. There are certain useful reports that the average staff wouldn't know about without interactive assistance. The sessions with Hazel advanced my knowledge of learning analytics so that I could use additional tools. Also the practical advice (eg reminding the students to revisit the tutorial and quiz again prior to the exam if they wished to apply for a deferred exam).

Kendall also commented favourably on the individual training and support and how this would influence their future use of LA.

I became aware of various ways of interpreting USQ Analytics. It was rewarding become I did not know the availability of those options before. Using the USQ Analytics to obtain information that can help me in improving my teaching practices. It is useful to find out where my future emphasis should be placed in terms of teaching the course Hazel's support and demonstrations were excellent. It is my own fault that I could not attend every session.

It was gratifying that four of the five respondents noted the support and advice offered by the researcher as the most helpful aspect. This suggests that having staff with appropriate levels of knowledge and skills to facilitate the implementation plan will be an important consideration. and indicates an additional design principle.

There were mixed foci in responses to the question on what participants considered successful use of LA meant to them. Finlay and Jackie commented on the ability of LA to inform their teaching practice whilst

246

Keegan's response had a focus on understanding student engagement. Kendall noted the need to find the time to engage with analytics whilst Jordan had a specific focus on nudges and how using these could have a positive impact on their reputation through reducing the number of non-completing students. These varied responses point to a need to understand the foci of individual staff to allow support and opportunities to be personalised.

8.7.2 Negative Aspects of Participation in this Study

The questions in the survey with a focus on negative aspects of participation in this study asked respondents to comment on their frustrations and the least helpful and rewarding components. Responses to these questions provided further insights into the continuing parries to uptake of LA. All participants except Finlay mentioned finding the time to engage in the study and with LA in their responses to these questions. Jordan elaborated: "Because this study took place in my busy teaching semester, I didn't have the opportunity to participate in the group discussions as fully as I would have liked." Kendall linked the lack of time to competing tasks: "Forgetting things. Because too many other things to do. Consequently, not spending enough time to continue using the tool". Finlay, in contrast, focussed on the technical aspects of exploring the data: "not being able to experiment much. I find that experimenting with various slices or combinations of data, allows one to explore what might be hidden and potentially identify useful trends or features. Having limited selectability/control doesn't allow this."

Jordan and Kendall both noted issues with access to data as the least rewarding aspect, with Jordan commenting, "The limitation that is inherent in the USQ analytics program, e.g. getting data on the online tests and getting data on how much of the lectures had been viewed." and Kendall, "Pulling out some of the information is not easy. Lots of steps to go through to extract useful information". Keegan focussed on their "inability to find the time - and forgetting how to get in and use it", whilst neither Finlay nor Jackie had anything to add. Keegan was the only participant to note any comments in response to the least helpful aspect, noting it "would be good if access could be easier - or more in your face to remind me."

These responses were consistent with earlier insights into the barriers and again affirmed all the draft design principles.

8.7.3 Future use of LA

Participants were also asked how they believed involvement in the study would impact their future use of LA and whether they had shared any learning with colleagues. These questions were designed to provide a measure of the value participants placed on their involvement, and of using LA.

Improved awareness of ways of using LA was the main theme of responses to this question which corresponds to the first three level of values espoused by Wenger et al. (2011), of immediate, potential and applied value. Jordan's comments regarding sharing with colleagues also points to transformative value: "Yes, I have made more use of the Analytics and showed some colleagues, who have also made use of them."

Participants offered a range of suggestions for further supports that would enable them to continue to use LA, with access to more detailed data being mentioned by three participants. Finlay for example focussed on technical aspects, noting it would be useful to have, "More tools embedded with the analytics to experiment with various slices and combinations of data." Whilst both Keegan and Kendall commented on a need for further support resources, it is noted that this information was included in the Support site. This suggests that whilst the information in the support site was useful, it needs to be presented in a more accessible format. The inclusion of explanatory videos, as suggested by Kendall, is certainly a suggestion worthy of inclusion in support resources, "A short step-by-step written guide (user manual) and/or YouTube type video demonstrating the ways of extracting information from Analytics data would be helpful". Jordan was interested in inclusion of data external to the LMS, indicating they were looking for a more holistic understanding of student learning than is currently available, "More data is needed. For example, it would be very useful to easily pull a report on a particular student - not only if they clicked on the lecture, but if they actually listened to it."

Keegan and Kendall noted that time was still a barrier and Finlay expanded on this, commenting. "time to experiment, the flexibility to do so", whilst Jordan mentioned two areas of concern:

> In a way, the 'so what' factor. I can tell students to review certain material in lectures and post material on the study desk telling them to do so - and I can now see that they haven't done it, but that doesn't assist them in passing if they won't comply. It would be good to be easily able to access reports for online students - i.e. with the ability to run a report excluding on campus students.

These responses affirm the concern of lack of time as the main barrier to uptake of LA and finding ways to help minimise this barrier will be an ongoing area for research and support.

All participants, except Finlay, noted that they would benefit from continued use of LA if the identified barriers could be minimised. Jordan said,, "it's useful as a forensic tool to perhaps explain results and for 'nudges'". Finlay was more sceptical noting: "I believe I would, but without a properly developed methodology based on proven outcomes that could be linked to certain 'data' trends etc... hhmmmm?". These responses show that whilst there is still some scepticism, most participants can see benefits in continuing to use LA and it will be important to continue promoting the benefits to all staff.

Neither Jackie nor Keegan had discussed LA with any of their colleagues and Finlay had only suggested others "give it a try". Kendall had discussed informally with colleagues "about various aspects of analytics during meetings and personal discussions." Jordan had shared "Just basic information, such as the ability to see who hasn't opened the study desk and who hasn't engaged with various resources." These responses suggest that there is still a way to go before LA will be considered business as usual and penetrate collegial conversations.

A final question asked participants if there were any recommendations they would make for changes to the implementation plan. Participants offered different perspectives to this question though Jordan noted that the

combination of the support offered had worked well for them. Kendall's suggestion of a guide suggested that while the information provided on the support site was useful, it could be provided to staff in a more accessible manner. Finlay and Keegan focussed on aspects of access to data which are points to be included in recommendations to USQ and Moodle developers, rather than changes that could be made to the implementation plan.

Taken in combination, the responses to the feedback survey affirm all of the draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA;
- Provide easy access to relevant and actionable LA data;
- nurture a workplace culture that encourages and enables use of LA through structures and discourse;
- provide clear and timely communication of available reports, support and any changes to systems; and
- facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

8.8 Discussion

The results outlined in this chapter have shown that there were many positive aspects to the first iteration of the trial of the implementation plan. They also highlight suggestions for ways the implementation plan could be improved. The final section of this chapter links these findings back to the Behaviour Wheel and I Framework, and examines the relative success of each of the components of the implementation before briefly discussing changes to the draft design principles and implementation plan that will be incorporated in the second iteration of the trial.

8.8.1 Links to BCW and I Framework

The analysis of the results and feedback from all of the components of this iteration of the trial of the LA implementation plan highlight that the most effective support was the personalised and contextualised support and training provided in the individual consultations. This suggests that for

participants in this iteration, the intervention functions of *education*, *modelling* and *training* from the BCW were all effective components of the LA implementation plan. *Enablement* was more aligned with the group discussions and still an effective component though to a lesser degree. Education in this iteration of the trial included increasing participants knowledge and understanding of the LA tools and reports available to them in the LMS, and how to access, analyse and interpret data in their course context. Most of this learning occurred in the individual consultations with some capacity building also occurring in the group discussions. Modelling was provided through the reports of staff usage in their course sites as that type of report could also be generated for student use. Additionally, the support site was designed to maximise potential for use of LA tools and reports and these were demonstrated to participants in their induvial consultations. Training in the individual consultations varied depending on participants' skill levels and the ways in which they wanted to use the LA data. This generally though included ways of downloading data from the LMS and manipulation of that data using spreadsheets.

Participants were able to work through the first two steps of the I Framework: *impetus* through development of their specific questions, and *input* through discussions of what data would be appropriate for them to investigate. However not all participants were able to work through the *interrogation*, *intervention* and/or *impact* steps to a deep level, due mainly to a lack of time. This lack of time was reported on two levels, firstly that participants had competing priorities on a day-to day basis which did not allow them to investigate their question fully and experiment with different ways of using LA data. Secondly, the 20-week duration of the trial meant participants did not have sufficient time to design and implement an intervention and determine the success of that intervention. This suggests that there would be benefit in extending the length of the implementation plan and support to allow more engagement with these latter steps of the I Framework as part of their LA implementation.

8.8.2 Changes to Draft Design Principles and Implementation Plan

As a result of the findings from this iteration two major changes to the design principles and implementation plan were made, although these were not able to be implemented for the second iteration of the trial due to time constraints within the study. The main change to the implementation plan was to extend this to a 12-month program to allow participants more time to work through each step of the I Framework, and hence fully engage with all aspects of LA from choosing a question to investigate through to evaluation of the impact of changes made to course design and/or teaching practice. A further enhancement to the implementation plan would be to commence the implementation two months prior to the start of the teaching period in which the investigation would occur, as this would allow academics sufficient time to gather and analyse baseline data, then plan and implement the change.

More structure in the individual consultations could also be beneficial to ensure the facilitator could direct the discussions and work more explicitly with participants on building their capabilities. A minor change of scheduling the individual consultations for 30 minutes, rather than an hour would also be implemented for the second iteration with an aim of improving availability and scheduling.

8.9 Chapter Summary and Conclusion

This chapter has outlined the results from Phase 3 of this study which began with a workshop and discussions with a group of staff from USQ with expertise in learning design and academic development. Insights from discussions with participants in the first iteration of the trial of a LA implementation plan were also provided. Participants' levels of engagement with the different components of the LA implementation were also analysed. Feedback from the workshop affirmed the design of the implementation plan, with no changes made to design principles as a result. The first iteration of the trial, involving 6 participants, proved successful with all participants engaging in all elements of the plan and noting increased awareness of the benefits of LA at the conclusion of their involvement.

The individual consultations were found to be the most beneficial components of the implementation plan, with participants appreciating the personalised and contextualised support and guidance. The focus group sessions helped to build a sense of community and provided opportunities for participants to share their experiences and build on each other's learnings. The support site was not used much by any of the participants although feedback was that the information was important and useful.

From the lens of the BCW these findings suggest that for this iteration of the trial the most effective intervention functions were *education*, *modelling*, and *training*, with elements of *enablement* also being effective, though less so than the other intervention functions. Individual consultations proved to be the most effective mode of delivery, followed by group discussions, with the format of the support site being the least effective.

Overall, there was a much more positive attitude from all participants than evident during Phase 1. The main focus in Phase 3 discussions was on what participants had been able to achieve, changes they had made, and further actions they would consider, rather than discussions of the barriers. In this way they displayed a willingness to embrace the learning opportunity. Unfortunately though, this did not always translate to change of practice, as the barriers were not able to be reduced sufficiently.

The results from this iteration of the trial implementation plan also informed each of the sub-questions of the research question for this study in the following ways.

What are the requirements and characteristics of an effective LA adoption strategy in a regional Australian university?

　　1. What do academics identify as the barriers and enablers to the implementation of LA in their teaching practice?

The main barrier to implementation of LA was noted as lack of time to engage with the processes of implementing LA, which was consistent with results from Phase 1 of the study. Access to data in a format that was easy to download, analyse and interpret was a further barrier and this was also consistent with findings from Phase 1. These two barriers are interlinked, as

the lack of accessible data meant that participants had to expend more time working with the data and seeking support so that they could use the data effectively. The main enabler to LA implementation was reported as the personalised and contextualised support provided by the researcher in the individual consultations and it will be incumbent on USQ and other institutions to provide this level of support to empower more widespread uptake of LA.

2. *Which aspects do academics engaging in a LA adoption strategy identify as enhancing their implementation of LA?*

In addition to the individual consultations, participants noted that the social learning and collegiality generated in the focus group sessions enhanced their implementation of LA as they provided opportunities to build on each other's knowledge and learnings and a sense of belonging.

3. *How is the LA adoption strategy effective in stimulating and supporting the usage of learning analytics by academics?*

Participation in the LA implementation plan improved academics' awareness and knowledge of the benefits of using LA and of the range of data and reports available to them, although the barriers noted above did impact on their levels of uptake and engagement in the study. Most participants did note that they would continue to use LA in the future and several noted that they had shared ideas with colleagues. As noted above, the findings also led to changes to the design principles for the implementation plan, including extending support for a full year and a different format to resources and guides, including pushing information to participants on a regular basis.

4. *What are the transferable design principles that underpin an effective LA adoption strategy?*

As discussed throughout this chapter, insights from discussions with the expert group and participants in this iteration of the trial affirmed all the draft design principles developed in Phase 2 of this study, namely:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA;
- provide easy access to relevant and actionable LA data;

- nurture a workplace culture that encourages and enables use of LA through structures and discourse;
- provide clear and timely communication of available reports, support and any changes to systems; and
- facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

Chapter 9 continues the discussion of Phase 3 of this study, with analysis of the results from the second iteration of the trial of the LA implementation plan and concludes with a comparison of results across the two iterations.

Chapter 9 Phase 3: Trialling of Implementation Plan Iteration 2
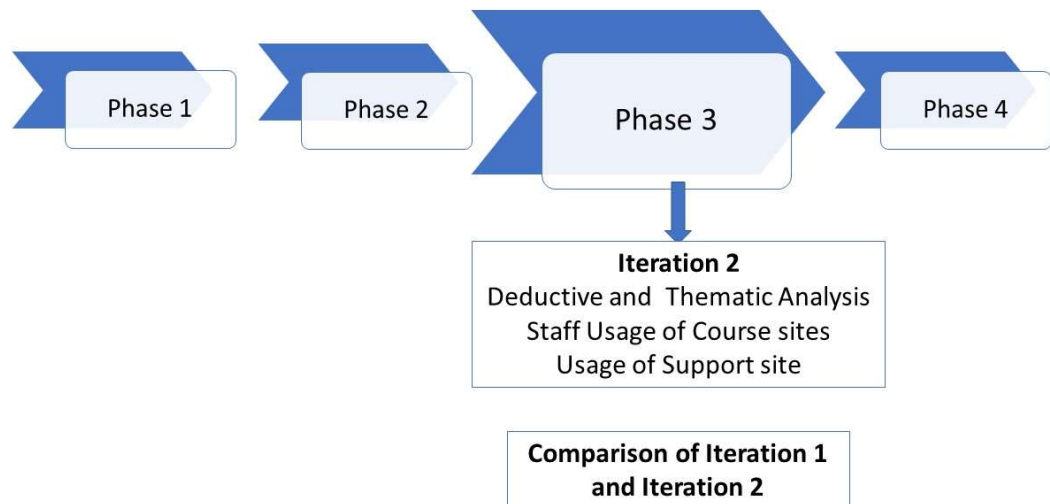
9.1 Introduction

This chapter continues the discussion of Phase 3 of this Design-based research (DBR) study and examines the iterative trialling of the Learning Analytics (LA) implementation plan developed in Phase 2 as described in Chapter 7. The focus of this chapter is discussion of the second of the two iterations of the trial intervention conducted during 2019 which was held in Semester 2 with seven participants, one of whom had been involved in Phase 1 of this study.

This chapter begins with a brief description of the participants and their contexts, followed by an in-depth discussion of the second iteration of the trial of the LA implementation plan, including deductive and inductive thematic analysis undertaken on transcriptions from all individual consultations/interviews and focus group sessions, and discussion of participants' interaction with their course sites and the support site. Evaluation of participants' responses to a feedback survey conducted at the end of the iteration is then provided and the followed by a discussion of the

success of the LA implementation plan and changes made to the draft design principles and implementation plan resulting from the insights gathered throughout the second iteration of the trial. The chapter concludes with a comparison of the results from the two iterations, noting which themes were common and prominent across both iterations and areas where differences were noted.

Through these analyses and discussions, the chapter provides further insights into the research question and all sub -questions for this study:

What are the requirements and characteristics of an effective LA adoption strategy in a regional Australian university?

1. What do academics identify as the enablers and barriers to the implementation of LA in their teaching practice?

2. Which aspects do academics engaging in a LA adoption strategy identify as enhancing their implementation of LA?

3. How is the LA adoption strategy effective in stimulating and supporting the usage of LA by academics?

4. What are the transferable design principles that underpin an effective LA adoption strategy?

9.2 Iteration 2 Participants

The seven participants for this iteration of the trial of the LA implementation plan were recruited as per process outlines in Chapter 8. Two participants had roles that were different to the Course Examiner role, with Hunter having a senior role within their school in addition to being a Course Examiner. In their words this meant that "I'm not actually teaching in them, so the use of the analytics is a little bit different than probably for a lot of people". In addition, they, along with Phoenix, were involved in an on-going collaborative research project which included use of LA. Morgan was involved in the facilitation of a support course for a large group of students which had no summative assessment attached to it and for which student engagement was not compulsory. These different roles brought different

perspectives and insights to this study and highlighted the diversity of uses for LA across USQ.

9.3 Participants' Engagement Through Iteration 2

The following sections detail the ways in which participants in Iteration 2 of the trial of the LA implementation plan engaged with each of the components of the plan in a similar approach as adopted in Chapter 8 for iteration 1.

9.3.1 Engagement in Individual Consultations/Interviews

A minor change was made to the individual consultations in this iteration in that appointments were scheduled for 30 minutes, rather than an hour as in the first iteration. This made scheduling of the sessions easier and resulted in less postponements and cancellations of sessions. The discussions in the consultations/interviews were also more focussed, although several of the sessions did run over time, which was an indication of the usefulness of these to the participants.

As with the first iteration, the main benefit of the individual consultations was the opportunity to personalise the discussion to each participants' context. This proved to be particularly the case for Morgan, because of the different nature of their course site and expectations of student engagement with that site. Despite those differences, their general concerns and the themes of the discussions were the same as for other participants. This insight suggested that whilst the same barriers existed for many participants, it was the ways in which solutions to those barriers were discussed through contextualisation of the training and support in the individual consultations that proved to be an important factor in the success of this approach.

These discussions and insights confirmed that providing personalised support and training through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities; and
- provide support and resources for all aspects of LA.

9.3.2 Engagement in Focus Group Sessions

Similarly to the first iteration, the focus group sessions were not always well attended and in contrast to the first iteration, there were occasions when the discussions became negative and slightly off topic with participants using the opportunity to vent about a number of issues that had impacted on their ability to engage with LA and the processes of involvement in the study. This though was considered as an indication that the participants felt they were in a safe and nurturing environment in those sessions. The support for each other and collegiality were also evident in all the focus group sessions and there was a genuine willingness to learn with and from each other, for example, when Morgan said: "I've just been really enjoying the conversation. I feel it's still a work in progress [chuckles] from all of us". This collegiality and sense of collaboration was evidenced in all the focus group sessions when different participants would ask probing questions of each other and openly share their varied experiences

These discussions and insights confirmed that including opportunities for group discussions is an essential element of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities; and
- nurture a workplace culture that encourages and enables use of LA through structures and discourse.

9.3.3 Engagement with Course sites

All participants provided positive feedback when shown the visualisation of their interactions with the course sites, with discussions focussing on different ways they could use the information provided. Shannon commented specifically on the invisible versus visible actions visualisation and how they could share that information with students:

> I think that that in its own right would be interesting to have the students be aware of because generally, they're kind of vague on how much energy and effort you're expending on this kind of thing is what is visible to them.

Quinn in response to the *Time on Site* visualisation, commented that the graph was an accurate indication of the fact that they had worked long hours at weekends, and they could use that data to seek recognition during promotion and annual performance review discussions. They further discussed how they believed their interactions would exhibit a different pattern for the current semester, showing interest in the reports on a range of levels:

> I was writing the course as I went and that's the only time I could do it was Saturdays and Sundays, yeah? And that's the story. And it's a sad part of the academic life that that work. Isn't often recognised. It gives us evidence and a little bit of a leg to stand on. I felt my interaction with students would be higher, but I suppose that was one that was on campus as well as just online. So I think this semester would look quite different. My weekend to be lower because I've been sick. I haven't had to write their course enough. Pretty much set it up so it can run fairly well on its own, but I think my interactions with students will be higher this time, but I've also picked up the phone a lot more now too, which obviously doesn't register.

When I commented to Riley on the number of short sessions at one particular point in the semester, and queried if that was effective use of time, their responses showed the importance of understanding the context for each course and participant:

> I can tell you exactly what it is that I'm doing and why I'm doing that. It's the Wiki where they have to go in and they nominate their preferred learning theory. Then, I allocate them a second one. I have to check to make sure in case somebody's put their name down because I have to get in really quickly and allocate their second one so that they know which groups they're in. What I'm doing is checking the Wiki. That's all I'm doing.

They did note that they would probably only use these reports for informing major changes, rather than on a day-to-day basis:

> The graphs are still interesting. I haven't taken that to the next level
> of doing something with it. However, that's understandable because
> to my way of thinking those kind of bigger-picture things are more
> likely to come into play less regularly perhaps when you're doing
> course updates or thinking about design and whatever.

These discussions affirm the usefulness of these types of reports as a conversation starter on teaching practice and the insights from the discussions affirm the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA; and
- provide easy access to data.

9.3.4 Engagement with LA Reports

Participants' interactions with the LA reports available in the LMS were measured using number of clicks and comparisons made for the offering of their nominated course prior to their involvement in this study and the semester in which they participated in this study, as shown in Table 42. Morgan and Riley were the only participants whose interactions with the LA reports in the LMS increased significantly during their participation in this study. Morgan also had significantly higher usage of the reports (710 views during the study) than the other participants, which could be in part due to the different nature of their role and the purpose of their site. The lower levels of use from other participants were explained in different ways, for example Hunter was not teaching into the course during Semester 2, 2019 and hence was not as active on their site. Shannon noted that the prior offering was their first-time teaching and that they had no idea what any of the reports were at that time so much of their interaction was exploration. Their use during their participation in the study was more targeted and deliberate, as evidenced by the lower number of reports that they viewed.

Quinn noted that their interaction with the reports has generally been reactive and that they had not spent much time exploring the reports adding:

It's not that there's no desire. It's not that it's hard to do. It's just one of those jobs that tends to be almost a wish instead of an urgent priority. Just to maybe be a little bit more proactive in what I do. At the same time though, I come up with a conundrum that at the end of the day, it's not me that passes the course.

Phoenix noted reliance on the USQ Analytics reports and this is reflected in their usage pattern. The low levels of interaction with the reports in general and in terms of the number of reports used suggests that more promotion of the information available and benefits of using each report will be needed to increase use of the reports. These discussions and insights confirmed that building staff capabilities in all aspects of LA through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA;
- provide easy access to data;
- nurture a workplace culture that encourages and enables use of LA through structures and discourse; and
- facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical consideration.

Table 42

Participants' Engagement with Learning Analytics Reports

	Hunter			Morgan			Parker			Phoenix			Quinn			Riley			Shannon		
	Pre	During	Sessions	Pre	During	Sessions	Pre	During	Sessions	Pre	During	Sessions	Pre	During	Sessions	Pre	During	Sessions	Pre	During	Sessions
Activity report viewed	0	0	0	0	3	1	1	0	1	2	2	0	0	0	0	0	1	0	3	2	0
All Responses report viewed	0	0	0	45	51	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
Choice report downloaded	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choice report viewed	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
Communications report incident thread viewed	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Communications report student details viewed	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Communications report viewed	0	0	0	0	9	0	1	0	0	0	0	0	2	0	0	0	0	0	1	0	0
Completion report viewed	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Course activity completion updated	0	0	0	6	5	0	42	69	0	0	0	0	2	3	0	0	3	0	24	33	0
Engagement analytics report edited	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Engagement analytics report viewed	0	0	0	3	4	0	2	0	0	0	0	0	0	1	0	0	0	1	7	1	0
Grade outcomes report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grade overview report viewed	0	0	0	2	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grade single view report viewed	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Grade user report viewed	0	0	0	0	0	0	0	0	0	0	11	0	4	13	0	0	0	0	0	0	0
Grader report viewed	7	8	0	0	0	0	11	13	0	6	0	0	2	0	0	5	3	0	15	7	0
Individual Responses report viewed	0	0	0	19	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live log report viewed	0	0	0	0	1	6	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Log report viewed	0	0	0	5	6	0	2	3	3	0	1	0	0	1	1	0	0	0	5	1	5
Non-respondents viewed	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Outline report viewed	2	0	0	1	6	2	2	21	1	0	0	0	3	1	0	1	17	1	0	0	2
Participation report viewed	0	0	0	0	0	3	3	0	8	0	6	0	0	0	0	0	0	3	2	1	13

Quiz attempt summary viewed	0	0	0	20	2	0	7	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Quiz report viewed	0	0	0	31	55	2	78	81	0	0	0	0	0	0	0	0	0	0	0	0	11
Recent activity viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Statistics report viewed	0	2	0	2	0	5	3	0	0	0	5	0	0	0	3	0	0	2	9	0	6
User list viewed	113	21	0	271	312	15	167	90	0	0	0	0	94	25	0	98	121	0	19	31	1
User log report viewed	0	0	0	8	3	2	36	11	0	0	0	0	12	0	0	0	0	0	0	0	
User profile viewed	23	0	0	42	111	7	52	45	1	14	7	0	37	4	0	47	104	1	19	2	2
User report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	124	134	0	0	0	0
User statistics report viewed	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
USQ analytics aggregated course modules detail viewed	0	15	0	0	3	0	1	9	0	3	1	0	0	0	0	0	0	0	7	0	1
USQ analytics course module detail viewed	0	9	1	35	61	0	79	39	0	31	17	0	0	0	0	0	1	2	2	1	0
USQ analytics report viewed	0	23	1	23	62	1	42	37	1	43	28	0	0	0	0	0	2	4	4	1	1
USQ Low grade report viewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	145	78	2	527	710	44	542	420	15	100	79	0	159	48	4	276	386	14	137	82	44
Count (total available = 35)	4	6	2	18	19	10	21	12	6	7	10	0	10	7	2	6	9	7	18	11	10

9.3.5 Engagement with Support Site

Participants in this iteration had low levels of interaction with the support site developed as part of the implementation plan, as outlined in Table 43, with total time on site ranging from four minutes on one day for Quinn to 42 minutes over five days for Morgan. Parker logged on to the site on the greatest number of days (eight) and had the most clicks, indicating a more exploratory approach than Morgan. The only time Phoenix accessed the site was to complete the final feedback survey and Hunter, Riley and Shannon all only accessed on one other occasion than completing the survey. These results were disappointing and indicated that this was the least effective component of the LA implementation plan. Phoenix was the only participant to contribute a resource for the site and they did that through an email discussion rather than directly to the site, suggesting that this was a more familiar way of corresponding with colleagues. Participants though did note that the information provided was valuable and suggested that having the information provided in regular push notifications would have increased their interaction with the site. This aligns with the

Table 43

Participants' Interaction with Support Site

	Total days	Total clicks	Total time (min)	Feedback survey (min)	Comments
Hunter	2	10	12	9	
Morgan	5	39	42	12	
Parker	8	77	34	8	1 view post involvement
Phoenix	1	7	15	15	
Quinn	1	8	4	0	
Riley	2	17	23	11	
Shannon	2	11	13	6	

Participants suggested different ways that information on the site could be more effectively shared, and that this be shared more widely across the

institution. These are ideas that will be incorporated into the final implementation plan and shared with appropriate staff at USQ as recommendations. Morgan for example noted that the information provided was unique and suggested embedding into TeachDesk, as well as including in learning and teaching induction and orientation sessions.

Phoenix suggested regular prompts or weekly reminders, noting this as a strategy they had used as a way of promoting resources with students:

> We promote it, we reinforce why it's a value and we're very strategic in not saying there's a bunch of stuff there, but just consider even looking at this thing. Prioritising the promotion of a resource. I think that would have been helpful. The little prompt comes up at the beginning of each week ... here's something. In like three step process think about this, it would be a value for that.

Quinn noted that they preferred paper versions of resources:

> If it's possible to be done in some sort of handbook or something that could be printed out, so I've just got it at my desk, that would be really helpful. I know videos and stuff are great for others, but that's just not quite the way I work. I prefer to go, "Oh, I need that". I don't really want to sit through videos and stuff. Not that there's anything wrong with anything like that. I love just going, "Oh, where's that piece of paper. Okay. I'll just follow directions".

Riley noted that their lack of engagement was due to lack of motivation and a sense of comfort in the way they currently used LA:

> I haven't felt a need to go and access resources. That may well be because I'm not really engaging at a higher level with the learning analytics. Where I am being proactive about it, I'm tending to be fairly engaged at a fairly limited level. I guess that means that I'm doing what I know how to do. I'm not motivated necessarily to go and find out more so I can do more. Having said that, I guess there might be a trigger at some point. In terms of better ways to go about it, yes, that's a really good question. Learning analytics community of practice.

These insights indicate that more could be to done to enable participants and academics to get the most benefit from the information and suggests that offering this information in a variety of modalities could be effective, although this then leads to possible issues with currency of the information and version control. These discussions and insights affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities; and
- provide support and resources for all aspects of LA.

9.4 Iteration 2 Findings

9.4.1 Participants' Questions

In line with the implementation plan, and the processes followed in Iteration 1 of the trial, participants were asked to consider a question they would like to investigate through their involvement in this study. Their responses, as shown in Table 44 were categorised in a similar manner to the participants' questions raised in Phase 1 of the study and the first iteration of the trial. This approach was taken for consistency and allow comparison between the iterations. Student experience and engagement, and teaching practice were the dominant themes in the questions, with all participants referring to them. Three participants also mentioned an interest in research, including Hunter and Phoenix who noted that their involvement in this study would complement their involvement in an ongoing collaborative research project.

Table 44

Participants' Initial Questions

	Question(s)	Student experience and engagement	Course Design	Teaching Practice	Research
Hunter	How do targeted nudges improve student engagement levels?	✓		✓	✓
Morgan	How can I increase student engagement in the support site, and measure what they do, and do not, access? What are acceptable levels of improvement?	✓	✓	✓	
Parker	How do we use analytics to improve teaching and learning, and specifically is there a way that we could track whether or not students are actually reading the messages and/or the emails included in nudges?	✓		✓	✓
Phoenix	What is the impact of nudges on students who are non-engaged or have limited engagement on StudyDesk? How can I be more active in this space with my own kind of trajectories in research and contribution to what we've been doing in our research?	✓		✓	✓
Quinn	How can I improve levels of students' online engagement at the beginning of a semester?	✓	✓	✓	
Riley	How can I make best use of learning analytics to inform and improve my online teaching? How does student engagement differ for undergraduate and graduate students?	✓	✓	✓	
Shannon	How have the changes that I've made between the last delivery and this delivery impacted on the student experience? Are my students learning what they need to in a way that is agreeable to their brains?	✓	✓	✓	

9.4.2 Deductive Thematic Analysis

Deductive thematic analysis was conducted on transcripts from all individual consultations/interviews and focus group sessions with themes coded to match those identified through Phase 1 of this study and the first iteration of the trial. An overview of that analysis with exemplar quotes is now provided for each of the main themes. As per the treatment of the interview transcripts for Iteration 1, training and support is not included as a separate theme here. Institutional policy and guidelines is also not included as a separate theme for this iteration as there was little mention of this in discussions. Overall, the comments from participants in this iteration aligned with, and affirmed, the insights discussed in previous chapters.

9.4.2.1 Knowledge and Skills

Lack of knowledge of LA and the information available from the various LA reports in the Learning Management System (LMS) was mentioned by several participants and ranged from specific information through to a broader lack of knowledge. For example, Hunter commented that they did not know the difference between *logs* and liv*e logs* whilst Quinn noted "I know a little bit. I really probably know not nearly as much as I want to". These discussions provided opportunities in the individual consults to build knowledge on the aspects of LA that were important to each of the participants. Participants appreciated the personalised and contextualised way this information was provided, for example by Morgan when I showed them the different levels of reports available regarding student engagement with discussion forums "Yes. Nice. Wow, that's really cool".

Shannon noted that the level of information that had been provided by the university had been at a broad level and they offered a suggestion on how this could be improved:

> In the Learning & Teaching induction, everyone's like, "There's these analytics things and you should use them". That's the end of the discussion. It's a little bit like, "Okay, but how and why," and like, "Are they great enough for me to get the answers to the kinds of questions that I'm posing or am I asking the wrong kinds of

questions?" Just not having enough knowledge or education in that space is a really big barrier for me because while I've looked at them a few times, the one I really only look at is like, "How many people have actually looked at this thing? Was it worth the time and effort that I invested in it?"

These comments showed participants had a willingness to build their knowledge and competence of all areas of LA, provided appropriate opportunities and support were made available to them. These discussions and insights confirmed that building staff capabilities in all aspects of LA through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA; and
- provide an encouraging and enabling environment;

9.4.2 Time

All participants noted lack of time as a barrier to engaging with LA, due to competing priorities and increasing levels of administrative tasks. Shannon for example noted frustration at the increasing demands on their time:

Just so many demands on your time now with all of these different deadlines at various times and a lot of administrative work that gets-- I jokingly refer to it as unfunded mandates. You would have experienced this, that a part of the uni goes, "Oh, it's a really good idea if we do this thing and we'll get academics to do this thing". Another 10 parts of uni do the exact same thing and all of a sudden, you're wasting multiple days-- not wasting, but you're spending multiple days a week doing stuff that's not your core business and that's frustrating as hell. Unfortunately, stuff like learning analytics that could actually make our teaching and our courses better gets put on the back burner because you just got all this other crap on your plate.

Shannon further suggested that a solution for some of the mandates could be for the university to automate new processes whenever possible, thus relieving some of the administrative burden. They echoed these feelings in a later session:

> At the very beginning of this, I said to you, the one thing that I want to make as a result of being involved with this was making sure that I do carve out more time to look at the analytics and understand what they're telling me. All of this other crap that can probably be automated or done by a professional staff member, it fills those voids where you would sit and have a meaningful think about what's going on, and how did that positively influence engagement and then, learning? I know we turned it into a Shannon's rant sideways and this, again, sorry, but these are the things that will stop us using analytics in really meaningful ways. I think that's, for your project, a really important finding, I suppose.

Parker also noted frustration, this time at the lack of recognition and acknowledgement of the time needed to engage with LA, and other aspects of teaching:

> I think there's a lot of stuff we do behind the scenes that isn't captured at all, ... Nobody appreciates that. Students don't appreciate it. I don't think our Heads of School really understand or appreciate it. It's what we do to do the best we can in our courses and I think that's frustrating, sometimes.

It was gratifying for me that at the end of one of the individual consultations, Shannon noted: "That was really interesting. Now I'm tinkering instead of doing my study book". This indicated that they were finding a way to change their priorities and that they considered LA interesting enough to warrant time. That willingness, or capacity, to spend more time engaging with LA was though not echoed by all participants with Phoenix noting a preference for me to offer insights about their course to them as "I don't want to do any more work, that's all," and "in the end, I'm flat-out finding data in USQ analytics to look at and to get insights, so why would I have time to look at

anything else?" Provision of this level of support was also mentioned by Riley, who considered that would help reduce the time they needed to allocate to consideration of the insights they could gain from the data:

> I would really appreciate it if you would maybe pose two or three or four, or however many questions to me that were designed to get me to think about what the data is telling you. That would be really helpful because that means that I don't have to come up with the insights. I don't have to spend as much time to come up with insights if you're able to just say, "Well, look, have a think about these three questions," or something like that.

They further commented that they would need to be able to see the value in engaging with LA to determine how much time and energy to expend:

> That's just one question that I think I would really have to think very carefully about is a sort of return on investment. I wouldn't be wanting to spend huge amounts of time and energy on doing a lot of looking and looking and looking and looking and looking. I think I'd have to be really careful about what I was doing and why I was doing it, making sure that it was going to actually be a worthwhile exercise.

In a group discussion, Parker commented on the additional workload created by engaging with LA to which Morgan noted agreement, indicating participants had similar concerns, regardless of their discipline:

> In semester two, where I'm in analytics all the time, but it's actually increased my workload. Now that I know the number of students that aren't engaged or haven't downloaded this bit of work or this assessment, now, I'm emailing people or I'm doing StudyDesk messages. It's actually created more work for me. I love the insight it gives me, but then I feel responsible for that information, that I can't just walk away and go, "Do what you want". I have to now go, "Darn, now I have to email them and remind them to get onto StudyDesk or remind them to download that document". It has created a bit more work, actually.

These insights indicate that there is a spectrum of readiness and willingness to engage deeply with LA across the participants, which is likely to be echoed across an institution, affirming the need for an implementation plan that caters for the diverse population. Recognition of time required through workload allocations, provision of appropriate support, sharing of tasks across academic and professional staff, and automation of processes where possible were all suggested as ways to minimise the barrier of lack of time.

These discussions and insights affirmed that reducing time needed to engage with the LA processes through building staff capabilities and providing support and easy access to LA data are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide support and resources for all aspects of LA;
- provide easy access to data;
- provide an encouraging and enabling environment; and
- provide clear and timely communication.

9.4.3 Accessibility of LMS Data

Participants discussed a range of ways in which lack of access to LMS data was a barrier to deeper engagement with the LA reports, with most related to the time burden or lack of confidence in the accuracy and validity of data. Hunter, for example noted an issue when sending nudges to students and a student commented that they had received a nudge even though they had accessed the relevant resource. Hunter was though keen to follow up with ICT to try and resolve the issue. Morgan noted frustration at the number of steps needed to identify which students to nudge and then send the nudges to them. Quinn expanded on these concerns, noting that being able to receive customisable reports would be beneficial:

> If we could, at the beginning of the semester, maybe identify key pages in our StudyDesks that we'd like students to be looking at. It'd be great to have a report to see how many students have accessed those. If there was a way that we could set up a customisable visit that we'd love to see in a report. If we could say identify five pages on our StudyDesk that we'd like analytics on, either how many students,

like we could do a summary or student by student to say who's actually accessed those things, that would be super useful. Again, it would save me, but that creates more work for someone else.

Shannon suggested that guidelines on how to access LA reports and ways to use the reports could be included on TeachDesk:

That would be amazing because then I don't have to think about it. My list will go, "Hey, Shannon, this is something you need to look at in your learning analytics this week to know if students are happy or doing okay, or whatever". That would be interesting for me. If your endgame is to make sure your students are engaged, here's a recommended plan of attack for you

The concerns raised regarding lack of easy access to LA data in the LMS, extended to other components of online teaching and learning, for example Phoenix when discussing issues with accessing data on students' interaction with lecture recordings captured in Vimeo.

If we had some report that actually came to me … how long did they look at it? What percentage watched till the end? I'd be going, great but for me to actually go in there, know what I'm looking at, know how to manipulate it, who's got time? That's a brilliant idea.

Phoenix then added that timeliness of reports on student engagement with resources was important:

We need to know that data at the end of that week. Not at the end of the month. A monthly report serves a purpose but it's too late for some of that especially if it's a Module One study guide and you want to know by the end of week two how many people looked at it and who hasn't. What are the implications to that? The implications are, maybe they're struggling, and so how do I respond to that. There's the weekly awareness stuff in terms of their engagement and then there's the reflection toward the end like if you took it once or twice during the semester, you could see the key resources or whatever and then reflect on bigger pictures stuff.

They did note that concentrating on engagement with specific resources as suggested by them and Shannon could mean that you miss information about which resources have not been accessed at all by students or ones that attracted higher levels of engagement than anticipated. They saw the USQ Analytics tool as a quick way of checking that information.

Riley focussed on ways to encourage other academics to use LA through ensuring the data was easy to access:

> I think it's also, they don't know how to use them, their value ... it's just knowing what to do with them and how to make that information useful and easily accessible. I understand what our students go through when I say, "I just want it to be easy".

It can be seen from these discussions that lack of easy access to data was an issue that affected participants' abilities to use LA reports. The same concerns were raised for data outside the LMS. These discussions and insights confirmed that provision of easy access to data, including through push notifications is an essential element of an effective implementation plan and affirmed the following draft design principles:

- provide support and resources for all aspects of LA; and
- provide easy access to data

9.4.4 Nudges

Participants provided a range of perspectives on using LA data to identify students to nudge, the processes involved in sending nudges, and measuring the effectiveness of nudges. Hunter focussed on students who were not engaged with the course and on the process noting: "I have been sending nudges every week, and it's in my diary to send every week" and "I work a week retrospectively. Even though it's at the end of week three, I will be looking for who hasn't looked at week two yet and contacting them".

Morgan noted that they had used responses to a general questionnaire on student's personal contexts to take a proactive approach to offering support: "Well, you've indicated that you agree that you have caring responsibility we'll send you some support". They also noted that having the option to send

nudges by email rather than Moodle messages would be a more professional approach.

Parker suggested that it may be worthwhile being more selective in who to send nudges to, especially after an initial message, when they discussed a student who was on internship and not wishing to engage deeply with their course.

> She did write me an email saying, "This is basically my last course other than her internship, and all I want to do is get your assessments done as soon as possible so I can graduate." I wonder knowing that, is it even worth nudging her? Especially because I have a little bit of knowledge of the students and I almost envisioned this cranky email back.

Phoenix noted that sometimes nudges do not work:

> We can jump up and down and scream and shout nudge as much as we want but they're already getting tired by week five and six. Yes, there might be an escalation in engagement in the stats just around assignment time, but maybe that student fatigue is something that I think will be the next frontier in terms of how do we-- Is there anything we can do to help them to maintain a level of engagement in our cohort.

In an early conversation with Phoenix regarding the number of times students were accessing resources, I mentioned that it is not always those who had not engaged, that were important to investigate. It could also be interesting to check on those students who were accessing resources multiple times, and that it was those outliers that can be interesting to investigate. I explained how they could then undertake a comparison of final grades for different groups of students – those who did not need nudges, those who were nudged and responded and those who were nudged and did not respond. This was not something they had previously considered and made notes so that they could discuss with other members of their research group. I also noted that the information was included in the support site, so they could refer to that as well.

When explaining that data could be further manipulated and compared on a regular basis through using Excel spreadsheets, Phoenix noted that "No, I wouldn't be doing work with it. I just use it as is". Phoenix also noted that through their research project they were taking a strength-based paradigm in their nudges:

> We're saying this is a great resource, just focus your attention; that if you haven't used it yet, it's really important. We're not kind of nagging at that point because we're not kind of doing too much, annoying them. I think that maybe on a Friday or maybe every fortnight, it's great if students are receiving-- a cohort of students are receiving something that says, "Wow, congratulations for your high engagement with the assignment".

They also noted that following our discussion, they would add a comment in a paper they were currently writing that "While the emphasis or a trend is to focus on the non-engaged or limited-engaged, these strategies are very powerful for affirming the already engaged as well".

Quinn also discussed focussing on the positives in nudges and how the way they used nudges changed depending on the time of semester:

> I have had a look at the students who have accessed the course because on the first day of semester, I was going to email each student that had already accessed it just to say, "Hey, thanks for getting in already" but I haven't done that, so I'd probably like to do that maybe tomorrow and just do a, "Hey, I see that you've really engaged in the course so far. Good for you. Keep it up". That sort of thing. I was also going to send an email to my students that haven't attended the on-campus lecture just to say, "Hey, we've missed you," not a coming down on them but, "Hey, we've missed you. We'd love to see you, if there's anything we can do, let us know," and just see if I get any sort of response in terms of increased attendance from that.
>
> I guess in the first couple of weeks I'd just keep a bit of an eye on it but then it would be more of a, "Hey, I've noticed that you haven't quite had a look at the assignment yet. It's coming up close. Can I

> encourage you to get involved or is there anything I can do to help?"
> It'd be more to make that personalised contact with students.

They did though caution as to when nudges became too much:

> That's the thing. If I know who hasn't engaged in the first couple of weeks I will e-mail, but if I don't get a response at the end of the day, I shouldn't have to call and e-mail and do things three or four or five times to try and engage students that clearly aren't interested in engaging. That's kind of where my balance is and where I fight to go, "When do I actually need to let them be at and make their own choices?"

Overall, the focus of these discussions was on the processes of nudging rather than extracting data, suggesting that accessing that level of information from the LMS was beginning to become second nature to participants. There was though little discussion on measurement of the success of nudging, suggesting this is an area that needs more time and support. These discussions and insights confirmed that building staff capabilities in all aspects of LA through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA; and
- provide easy access to data.

9.4.5 Interpretation of LMS Data

There was little discussion on interpretation of LMS data, which could suggest that participants had not had the time or opportunity to progress to this level of thinking about their LA data. When looking at a report that showed how many times students had accessed a particular resource, Phoenix noted that some of the students who had accessed multiple times were high achieving students. They queried why this might be the case and noted that it would be interesting to ask the students why they had accessed so many times. Riley had a note of caution that LMS data is only part of the

student (and staff) picture: "Sometimes as a teacher you might get carried away with your learning analytics data and forget that it's actually not telling you the full picture". These are both examples of participants realising that it is important to understand the context of data and that the numbers of clicks are only the starting point to interpreting data.

9.4.6 Learning Analytics Usage

Participants discussed several different aspects of LA usage ranging from preference to use tools with which they were familiar to comparing across courses. Phoenix noted that they had focussed on using the USQ Analytics tool and believed that offered the most benefit for them and indicated a reluctance to move out of their comfort zone and trial new tools. They did though discuss how they had shared some basic information with colleagues, indicating they did see value in LA.

> I haven't referred to some of those other significant analytics that you went through with me. I think I did share them with my colleagues and I'm doing the nudging project with it at one point. Even now, in the back of my mind, to quickly explain to someone some suggestions on which one to do for what, I wouldn't be able to remember which of those tools does what, and then being able to know how to drop down the menu to use them quickly. I still think in all honesty that the USQ learning analytics is the quickest no-brainer. Maybe it's because I'm used to using it now. I revert to it now as much as possible. Sometimes giving too many options to staff leads to them using none of them.

Quinn and Phoenix both discussed ways they could compare across courses, with Quinn noting:

> Yeah, I think it would also be really interesting to see the difference between a first-year student and a fourth-year student. Yes? That would be very interesting 'cause I'm just about to change the way I assessed my first-years next year to be instead of two high stakes assignments to do engagement task throughout the entire semester to get them in the habit of actually doing something for uni every

week. And I think something like that would be really interesting to see whether that that works and to use the analytics to see whether they are actually engaging more and more regularly, I think would be really interesting.

Phoenix also discussed differences in cohorts in the same course:

I think we need to talk about the mystery, I suppose of context or contextual influences, or varying cohorts of students. It may be just a very enthusiastic bunch of students in a cohort that helps to motivate the rest of the cohort into engaging, oh, she's doing something, I better do it and it starts a momentum, which is not planned for and has nothing to do with us as such apart from some bits and pieces that we perhaps set in place initially. That's what's happening in one of my courses, that it's a first-year course and traditionally, this particular course has been probably the slackest in terms of evidence of engagement with different resources or access to resources from this nudging. Yet this first-year cohort, this semester is like 20%, 25% better than my other two second-year courses. I think we need to be open to the unknown in terms of appreciating that there's a number of factors that are beyond our control.

Quinn discussed how LA had enabled them to understand when students were engaging with the course site and how this helped them be more effective and efficient:

That's where I find it a really useful tool in seeing where my students are at, seeing how their engagement is if I've noticed from that it's really helpful if I put the things for the week up on the Friday afternoon because I have had a decent amount of engagement over the weekends, which I wasn't aware of previously. I knew that some students would, but I didn't realise there would be quite as many as there are. Things like that have been really helpful. It's not something that I go in and check every week to see where everyone's at and how many students need doing what and do a lot of personalised contacts

based on that. I don't need to wait on their feedback at the end of the semester. They say I wish you'd put things up earlier. If I've done something and I actually let them know, I did put a forum post up saying that it seems as though a lot of students are choosing to access this course over the weekend. I'm going to try and put things up on a Friday for you. I have had some really nice emails responding and saying, thank you and that stuff.

These discussions and insights indicated the importance of building staff awareness of the full range of LA reports and tools so they could then choose the most effective ones to use in their context. The discussions confirmed that building staff capabilities in all aspects of LA through an encouraging approach are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA; and
- provide easy access to data

9.4.7 Benefits of Involvement in the Study

Participants mentioned different aspects of the benefits of being involved in the study during the individual and group discussions and in their responses to the final feedback survey. Exemplar responses are included here to highlight the main foci of those comments, all of which affirm the format and processes involved in the implementation plan as being effective. Improved knowledge and awareness of the different reports was a common theme, as was more active and proactive use of LA. For example, Morgan commented:

I was probably quite passive where I would actually review the report, review the data and then make a change for the following semester. While, this semester, I probably moved to a more proactive, in where I was maybe viewing the reports analytics at that time and trying to respond in this semester. Communicating with students based on that report, rather than just purely viewing.

Morgan also noted the need to ensure there were benefit to students from their engagement with LA: "How do I do their follow up activity to get the best outcome for the students and for, giving us feedback that what we're doing is a benefit to the student".

Parker noted that the individual and personalised support had improved their knowledge and would lead to greater use of LA

> I love the analytics side. For me, it's a time thing, how much time I have to play with it. It's great to have somebody like yourself go, "Go over here and click this and do that". Now that I know how to use this and what this is, I'll probably use it more now.

Morgan commented on the benefits of the group discussions in developing their confidence and building a sense of not being alone.

> The confidence. It was good to hear from other people. I feel I'm still quite new in this space, being an academic and being at USQ however, hearing from other staff who I feel have been here for a while or are in their career longer, it made me feel, "Yes. They were all at a similar stage". It's still quite new. We're still all learning how we can use this report and the data". There's so much data out there but how we actually use it to help us in our teaching capacity. Ultimately, give the student a good experience and hopefully lead to a positive outcome. They passed a course, to have a good student experience, and they can move forward confidently and have developed likely some new skills and acquired some new knowledge. I'm wanting to see that there is that change.

The group discussions also provided opportunities to deepen the conversation and thinking, with participants looking at synergies and similarities in approaches and building on each other's perspectives and comments. The deliberate inclusion of participants from different disciplines allowed them to build on these different perspectives and expand their networks. The collegiality displayed and peer learning that occurred indicated that there were benefits in bringing together participants from different disciplines and that group interaction is an essential aspect of a LA

implementation plan. There was a genuine interest in learning from others and sharing ideas and a seamless switch from being the learner to the teacher when opportunities arose. As an example, Shannon noted in one focus group session:

> It's interesting listening to everyone because I'm not-- My background is xxx. I'm only coming to the Learning and Teaching thing in the last 12 months. The thing that I still find very difficult to grasp and no one's really been able to give me a good answer is what's that success actually look like? Is it that more of our students know the content by the end of the semester? Is it that they learn it faster? Or that they learn more content in the same time frame? What is it? I find with the analytics stuff, sometimes a little bit hard-- I'm a little bit sceptical, I suppose I can say about what it's actually telling me.

In a later focus group session, Shannon took the role of expert, sharing knowledge and information when they explained how they had successfully used Slack, a collaborative discussion platform, (https://slack.com/) to increase student discussion and collaboration, with other participants keen to learn from their experience.

The group conversations were focussed on the learning happening in their courses rather than the processes of learning analytics - what was the data telling them rather than how to access the reports. It was in the individual consults that the *how to* conversations were more common. The approach I took in the focus group sessions was to let the conversation flow and treat the participants as equal partners, thus creating a different environment to a workshop or webinar. This resulted in the creation of a safe environment away from the hustle and bustle of everyday work that allowed each participants' enthusiasm to come out. This also led to discussion about LA becoming automatic and embedded. The spirit and tone of these sessions is exemplified in the following summary I provided at the end of one of the focus group sessions:

> In so many ways you're using learning analytics without really acknowledging and realising that that's what you're doing. Because

you've put in an intervention. You've noticed a huge change in engagement, in results, in student learning. You've measured that through their grades, through how many posts there are. So there's so much of what you've just said is exactly what I wanted to be happening from this study. Also, the fact that now Parker is asking you questions about it is the sharing and caring across disciplines, which people have been saying is really important. Please do not apologise for anything that's gone before because this is just wonderful from my point of view.

These discussions and insights highlighted the importance of a combination of group and individual components with the group discussions providing opportunities for networking, sharing experiences and practices, forming a community across the university and peer learning. The main benefits of the individual consultations were the opportunities to discuss each participant's course and build their capabilities in areas that were relevant to them. The insights from these discussions confirmed that building staff capabilities in all aspects of LA through individual and group discussions are essential elements of an effective implementation plan and affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA;
- nurture a workplace culture that encourages and enables use of LA through structures and discourse; and
- facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

9.4.8 Meaning of Success

Participants identified student experience and engagement together with teaching practice as the main indicators of successful use of LA, with most participants identifying two or three themes, as areas in which they measured success, as shown in Table 45. The exception was Parker who offered a very broad though short perspective on success. The conversations and different

284

perspectives on success also pointed to the motivations for wanting to engage with LA. Each participant had different meaning of success ranging from Shannon who focussed on positive outcomes for students, to Morgan who had two strands to their discussion, building their own capacity and confidence, and expanding use of LA across their area and involving colleagues. These differences affirm the importance of understanding academics' motivations and aims to be able to support their different approaches.

Table 14

Participants' Meaning of Success

	Meaning of success	Student experience and engagement	Course Design	Teaching practice
Hunter	Being able to personalise communication with students based on access data	✓		✓
Morgan	Being able to extrapolate what I am doing in this site across the wider program - all our Course Examiners using the analytics consistently. For myself, getting more confidence to explore the variety of reports available and be more proactive in this semester.	✓	✓	✓
Parker	improve teaching and learning.			✓
Phoenix	Being very strategic about what you are tracking and when you are tracking, how you are tracking those things, those more pedagogical considerations rather than the technical considerations. Bottom line is the minimum that we want to know is whether they've accessed something. It would be great to see for how long they accessed and how often they accessed.	✓		✓
Quinn	I want to see if intentionally spending time with the learning analytics has any sort of impact. It's probably just more observational or kind of gut feeling about how well people are interacting as opposed to me really wanting to get down and say, "Well, I've had a 20% increase" Because obviously cohorts are different and classes are different as well, so it can't obviously just be based on the analytics. I think if I see more engagement, if I see more students turn up to online classes and that sort of thing, then I can say, "Well, obviously this has had some sort of effect".	✓		✓
Riley	To get a good sense of levels of student engagement with the various resources at particular points in time; to have a better understanding of the different needs and behaviours of undergraduate and postgraduate students.	✓	✓	

| Shannon | I want the students to be able to engage with the learning in ways that makes sense for them. I want there to be enough depth in materials or presentation or whatever it is, that if they don't understand a concept in bucket A, then they can go to bucket B and try and get a different perspective or a different approach to it. Ultimately, I would love that every student in my course walked away knowing 100% of what I want them to know. I don't want there to be any barriers for them being able to achieve that. If I can take away as many of those barriers as I can and give them whatever it is that they need to learn it in their particular way, then that's a success for me. It might be, have a bit of fun along the way. Learning is uncomfortable. | ✓ | ✓ | ✓ |

A conversation with Shannon focussed on the longer-term success and if/how changes made in a first-year course may impact students throughout their program and beyond and how this could be measured:

> Yes, it'd be interesting to see them once we've got like next year's xxx class will be the first one that might've had me last year. I'd probably wait until the year after to go, okay, how much of this is still in your brain before we start the semester? Just do like a little formative assessment on it. Tell me where you're at and how much of this actually stuck because that would be good measure of how successful I was I suppose.

And my response:

> Yes, there's nothing wrong with doing that because as much as anything, it's helping you then personalise for that cohort that if there's something in that pre-test, checking of prerequisites of prior knowledge, whatever you want to call it if there's something that they still aren't getting that they really need to get before you can move on then you can do quick recap. But if it's only 10% that have got that need, then you could send them to a resource and say go and have a look at this, or we'll have a special tutorial this week.

Having conversations with participants about their meaning of success allowed me to personalise the support and training provided. These discussions and insights also affirmed the following draft design principles:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA;
- provide easy access to data;
- nurture a workplace culture that encourages and enables use of LA through structures and discourse; and
- facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

9.5 Inductive Thematic Analysis

No additional themes were identified through coding of the interviews from this iteration of the trial of the implementation plan.

9.6 Sentiment

Participants frequently expressed frustration during the individual consultations and group discussions and as noted by Morgan this did occasionally lead to "vent" sessions in the group discussions. I did allow those conversations to flow as it was an indication that participants felt they were in a safe environment and showed that a level of trust and belonging had been built up across the group. The frustrations were also indicative of the work environment, the pressures under which participants were working, and a desire for improvement. Frustrations were noted on several levels:

- their own inability to engage more with LA and the processes of this study due to the competing priorities;
- the increasing numbers of tasks and processes being forced on academic from all areas of the university; and
- lack of recognition of the amount of time needed to engage with LA,

Whilst resolution of any of these concerns is outside the scope of this study, it is important to acknowledge these as they contribute to the level of success and will impact on more widespread implementation of LA. The sense of

frustration was countered by gratitude for the level of support provided to participants during the study and excitement at the insights they gained.

9.8 Feedback Survey Responses

As in the first iteration, participants were asked to complete a final feedback survey at the conclusion of their involvement in the trial. Six out of the seven participants completed the survey, with Quinn not responding at all, despite requests in the final individual consultation and follow-up email. Analysis of responses to the questions were grouped in the same way as for the first iteration and are now discussed.

9.8.1 Positive Aspects of Participation in this Study

Participants' comments fell into three main themes of positive aspects:

- being introduced to the variety of analytics available and ways they could be used, to improve teaching practice and course design and for the benefit of students;
- opportunities for collegial conversations; and
- the different modes of engagement and the personalisation of support.

Riley's comment regarding the collegial conversations highlighted the benefit of using LA as the conduit to pedagogical conversations:

> The opportunity to have professional conversations about my teaching and others' teaching using learning analytics as the vehicle for and focus of these conversations. It's actually easier to reflect on and talk about your teaching when there is a specific 'thing' to focus on, rather than making 'reflecting on and talking about your teaching' the focus of the conversations!

The use of analytics though was considered a potential, rather than realised, value by Morgan and Phoenix, affirming the recommendation discussed in Chapter 8 that the implementation plan be extended to a 12-month period. Phoenix, for example, commented that there had been little opportunity to discuss how to use the insights gained from the LA reports and link this to pedagogical concerns, in some ways echoing the comment above from Riley.

Perhaps this is the main gap that was not addressed during the project, however I do appreciate that it goes beyond the scope of the project. It does however highlight a gap in the literature and a frustration for academics in terms of lack of direction as there is limited information regarding what to 'do' with the knowledge of Course Learning Analytics.

Riley provided a succinct explanation of their meaning of successful use of LA, which echoed the perspectives of other participants: "Successful use of learning analytics is using learning analytics to enhance learner engagement, connections between learners and the course content and between learners and teachers and responsive teaching practice". Other participants also elaborated on particular aspects, including Morgan who noted more consistent use and taking a proactive approach: "I can be proactive during the semester rather than viewing at the end as to what students viewed - make instant changes", whilst Shannon noted that they would "continue to refine my questions about what I want out of them".

9.8.2 Negative Aspects of Participation in this Study

All respondents except Riley noted lack of time as the most frustrating aspect, with Riley noting frustrations. Phoenix also reiterated their response from the previous question of frustration at lack of direction of what to do with the insights from the LA data. They also noted that they found the introduction of numerous LA reports overwhelming, suggesting that offering more targeted information on the most relevant reports for a particular context would be more effective for some staff. Morgan, Parker, Phoenix and Shannon elaborated on their frustrations, linking lack of time to lack of ability to engage in aspects of this intervention and to build their knowledge and skills to engage more deeply with the LA. The following comment from Parker, exemplified the responses:

Not having enough time to really get my head around the range of analytics available. I'd like to be familiar enough with what is available that I can easily use them on a regular basis but to do that I need more time initially to understand what's available and how to use this information in a relevant and useful way.

Shannon commented on how lack of time affected their ability to engage with the resources, noting "I felt like I didn't contribute enough time to using the amazing resources Hazel produced, and so probably covered a lot of the same ground". This echoes comments noted above in the positive aspects, and highlights the need to provide resources in accessible formats and over a period of time, to reinforce the information provided. Hunter, Parker and Phoenix also noted lack of time as an ongoing barrier to further engagement with LA, with Morgan, Phoenix and Shannon commenting on the inaccessibility of reports. An exemplar comment from Shannon was "The awful reports that are auto generated. Most often I download the logs and filter what I need/want from there".

Morgan noted that the least rewarding aspect for them was the fact that "Sometimes group conversations turned to a 'vent' session although useful, not always enough time to allocate to that activity". This response suggested there is a need for facilitators to be aware of the mood of group sessions and ensure that the needs of all participants are met.

9.8.3 Future use of Learning Analytics

The notion of creating and nurturing a Community of Practice for Learning Analytics was suggested by several participants as a means to continuing the support networks developed in this iteration of the trial of the implementation plan. Whilst extending the implementation plan to twelve months and providing further opportunities for group discussions could be a catalyst for this, there would need to be ongoing commitment from participants and the institution to develop a full Community of Practice. Riley's comment is included as an example: "It would probably be good to have a Learning Analytics community of practice or special interest group, I think, that people who were interested could link in with to move their practice forward in this area via social learning".

Several participants suggested different ways in which the resources provided in the support site could be shared to make them more accessible and increase their impact, including short "How to" videos, and tip sheets, with Shannon suggesting the information could be included in the TeachDesk site. Phoenix, for example commented:

> I'm actually thinking that a short 2-3 minute video on some of these
> LA tools and how to use and examples of the benefits of using them
> that we could access at a time convenient to us may be one way to
> move forward :). Perhaps even nudging us and including a link a 2-3
> minute to a particular type of LA that you profile for the
> fortnight.....and drip feeding us this info in small chunks every
> fortnight or so.

Morgan suggested that ongoing training, including annual updates could be offered to all staff as a way of encouraging on-going use and increasing levels of uptake of LA use.

All participants agreed that involvement in the study had positively impacted their knowledge and use of LA and they planned to continue using LA if the existing barriers could be minimised. Hunter for example noting "Often the relearning of what is available removed barriers (esp of my memory)" and that "It reminded me not to rely on the new USQ analytics. I see my learning in this space on a continua and I hope to advance on the continua over time". Riley was the most enthusiastic, noting LA were now integrated into their practice: "I think use of learning analytics is now more integrated into my practice - albeit in a very basic way. It's another tool that I have in my toolbox".

Participants generally commented that they had not as yet shared much information about LA with colleagues, although they planned to do this in future. Hunter was the exception having shared with colleagues in their complementary research project: "I think doing this at the same time as the USQ commissioned project on engagement had benefits for both projects and enables learning from parties in one of the projects to be shared wider". Shannon's comment that "Yes - that they can be useful, but you need to know what the question you want answered is to get something really meaningful from them", links with the approach adopted in the I Framework, of starting with a question.

These combined responses indicated that all participants had benefited from participation in the study and that the implementation plan had been

effective, with the support site being the least effective component of the plan. These discussions and insights confirmed that all aspects of the implementation affirmed all the draft design principles and provided suggestions for refinement to the design principle regarding provision of resources:

- provide support and resources for all aspects of LA, with resources being provided in different modalities, including regular newsletters, a central site and self-help videos.

The insights also suggested a change to the implementation plan to a 12-month plan.

9.9 Comparison of Iterations

Comparison of the effectiveness of the two iterations of the implementation plan was undertaken on levels of participant responses and approaches, and engagement with the LA reports and support site. Overall, there were many similarities in the reported barriers, enablers and themes discussed by participants, in the levels of engagement with the support site, and their responses to the feedback survey. These similarities suggest that the identified barriers and enablers are likely to be similar in a range of contexts and that the strategies employed in this study have been appropriate and also likely to be relevant for more widespread LA implementation.

There was more conversation and focus in the second iteration around research than in the first iteration, which was to be expected, as Hunter and Phoenix were already actively involved in an ongoing collaborative research study on using learning analytics to measure the effectiveness of nudges. Apart from these conversations, academic recognition was not a focus for participants.

The main difference between the two iterations was in the levels of engagement with the LA reports. Participants in Iteration 1 generally had an increase in number of reports viewed during their participation in the study, compared with the offering prior to involvement. In contrast, participants in Iteration 2 generally had a decrease. This difference can be explained as Iteration 1 participants exploring the full range of reports available whilst

Iteration 2 participants were becoming more targetted in their use and reported that they were overwhelmed by the number of reports. These differences affirm that personalised and contextualised support is important for an effective LA implementation plan. These different approaches also suggest the importance of including general information on the range of reports available and the types of information they can provide, followed by more targeted and detailed information when participants have determined their investigation question and focus of their use of LA. This latter information could include links to pedagogical considerations as well as the how to use - ideally this could include a full website with filters based on the questions being investigated and context of the course however this was beyond the scope of this study but can be included in recommendations and aspects of the design principles.

9.9.1 Values

Participants in both iterations of the trial indicated through their discussions that they had taken value from their involvement in the study. Using the lens of the value creation framework (Wenger et al., 2011), it can be seen that while all participants had taken immediate and potential value from their involvement, there was little realised or reframing value. The suggested increase in length of the intervention could be one way to reach these levels of value. Examples of ways in which each of the levels of value were noted include:

Immediate value: all participants were engaged and attended most, if not all, of the scheduled individual consultations/interviews and focus group sessions and noted that they had appreciated the opportunities for discussion and learning from others

Potential value: all participants noted that they had learned something through their involvement with human, social, tangible and learning capital all being realised. However, there was little if any evidence of reputational capital being realised.

Applied value: some change in practice was observed, for example Riley who noted:

The first thing that I've noticed is that it seems to have moved from being something that I've just done once before and should be doing more often to something that I dip into now and again as part of my practice. I think there's been a shift there, so even though I might not be the holy grail of learning analytics, I can see that it has actually changed-- It has infiltrated into my practice

Realised value: there was some performance improvement as measured by the ways in which participants engaged with the LA reports and reported increases in student engagement and outcomes. However, this is one level where there could be further achievements.

Reframing value: there was some redefining of success as evidenced by changes in reported meanings of success at the beginning and end of involvement in the study. For example, Jackie whose meaning of success moved from "Knowing that students are better engaged, getting feedback from students during semester," to "If the analytics support you to approach considerations of course interactions in a more informed light!", indicating a more holistic approach.

9.10 Discussion

The insights gleaned from discussions outlined in this chapter have shown that there were benefits for all participants from their participation in the implementation plan. Through discussions and responses to the final survey, participants offered suggestions for improvements to the implementation plan, particularly regarding format and dissemination of support resources. These changes will be incorporated into the final implementation plan. Conversations in the individual consultations and group discussion commonly had multiple foci, indicating the themes are interlinked. The challenge for facilitators is to discover the main focus and area of interest for each participant and lead discussions from there to a more holistic approach to use of LA in order to help them help find ways to address the questions they wish to investigate. The final section of this chapter connects these findings back to the Behaviour Wheel and I Framework.

9.10.1 Links to BCW and I Framework

The insights and reflections from this iteration of the trial affirm the inclusion of the four selected intervention functions of *Education, Training, Modelling and Enablement* from the Behaviour Change Wheel (BCW) in similar ways as identified in Chapter 8. Examples of the effectiveness of the specific Behaviour Change Techniques (BCTs) are included in Table 46 along with progress through the steps of the I Framework. Whilst most of the BCTs proved effective, lack of time proved to be a barrier for those involving outcomes of the behaviour. Increasing the length of the implementation plan will be one way of improving the effectiveness of those BCTs.

Table 15

Application and Effectiveness of Behaviour Change Techniques in this Study

Intervention function	Individual BCTs	Application in this study	Example of effectiveness of BCT
Education/ Training	Feedback on behaviour	Provide report of levels of engagements with LA reports and tools	Participants responded positively to reports of their interactions with their course sites.
			Discussions held on interaction with LA reports
	Feedback on outcomes of behaviour	Discuss changes in student interactions as a result of actions resulting from using LA data	Effectiveness of nudges was discussed by many participants otherwise
			minimal discussion at this level as participants generally did not have the time to engage at this level
Enablement	Social support (practical)	Focus group sessions and support website with opportunities for discussion	Participants appreciated the networking and social learning opportunities in the groups' discussions, but no collaborative discussions in the support site
	Goal setting (behaviour)	Agree on one question to be addressed and follow through I Framework to address this in an agreed timeframe	Each participant nominated a question to investigate and the I Framework was followed through implicitly. Most participants though only progressed as far as the interrogation stages. Lack of time to engage meant that neither the intervention nor impact stages were completed.
	Review behaviour goal(s)	Discuss progress through stages of I Framework in individual consultations	It was decided not to make explicit mention of the stages though this would be a recommendation for future implementation as it would provide further focus for participants. Progress in investigation of nominated questions was discussed in the individual consultations
Modelling/ Training	Demonstration of the behaviour	Work through LA reports available in LMS and	The range of LA reports were explained to participants along with

		how to use in individual consultations	examples of how they could use in their unique context. Guides were also included on the support site though participants suggested more effective ways of sharing that information
		Provide guides to reports and tools on support site	
Training	Instruction on how to perform the behaviour	Individual discussions on which reports and tools were most beneficial depending on question being investigated and how to interpret data	Participants were shown how to access and use different LA reports and tools in their individual consultations, and all reported increased competence and confidence in the final feedback survey

9.10.2 Changes to Draft Design Principles and Implementation Plan

The insights gained from the conversations with participants in the second iteration of the trial of the implementation plan affirm the changes to the draft design principles and implementation plan noted in Chapter 8. The main change was that the implementation plan be conducted over a 12-month period and be facilitated by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

The minor change to the individual consultations/interviews of making them more structured and scheduling for 30 minutes allowed the conversations to be focussed and directed and resulted in less cancellations or changes to sessions. The sessions often extended past the 30 minutes, indicating participants did value the support and discussions offered. Discussions also affirmed that the format for the resource site was not the most appropriate as there was little engagement with the site. Participants also noted they valued the information but not the engagement and collaboration opportunities on the site and would prefer that the resources be pushed to them over a period of time and include short videos. These suggestions will be incorporated into recommendations for the university.

9.11 Chapter Summary and Conclusion

This chapter has outlined the results from the second iteration of the trial of a LA implementation plan; this was the final component of Phase 3 of this

298

study. Seven academic staff from across the university participated in this iteration of the trial, and all participants reported benefits from engaging in the study. Those benefits included increased knowledge and usage of LA, as a result of the personalised and contextualised support provided in individual consultations and improved collegiality and social learning opportunities provided by the group discussions. Although the support site had been comprehensively considered and designed to model good practice in course site design and promote collaboration, participants did not engage deeply with the support site. This was despite reminders and discussion of expectations in the focus group sessions. Participants did provide feedback that the information was important and useful and several participants also suggested ways of disseminating this type of information including through regular newsletters, support guides and instructional videos and including the information on the TeachDesk site. These suggestions will be included in recommendations arising out of this study.

From the lens of the BCW, the insights from this iteration of the trial affirm the findings in Chapter 8 that the most effective intervention functions were *education*, *modelling*, and *training*, with elements of *enablement* also being effective, though less so than the other intervention functions. For this iteration, both individual consultations and group discussions proved to be effective modes of delivery, with the format of the support site being the least effective.

A comparison of the two iterations of the trial of the LA implementation plan revealed that there were many similarities in the barriers and enablers to implementation of LA. Lack of time to engage deeply, and lack of easy access to data in a usable format were reported by participants in both iterations as being the main barriers. The personalised and contextualised support provided by the researcher was reported as the main enabler across both iterations. Student experience and outcomes, teaching practice and course design all featured as the topics of questions raised and areas of focus for improvement across both iterations. Academic recognition through research and publications was a more dominant consideration for some participants in the second iteration, which was linked to two participants being

concurrently involved in a collaborative research project investigating course learning analytics and the effectiveness of nudges.

The results from this iteration of the trial implementation plan also informed each of the sub-questions of the research question for this study in the following ways.

What are the requirements and characteristics of an effective LA adoption strategy in a regional Australian university?

1. *What do academics identify as the enablers and barriers to the implementation of LA in their teaching practice?*

Consistent with results from the first iteration in Phase 3 of this study, lack of time to engage with LA and the processes of the intervention and lack of access to data in a format that was easy to download, analyse and interpret were reported as the main barriers to implementation of LA. Similarly, the main enabler to LA implementation was reported as the personalised and contextualised support provided by the researcher in the individual consultations. Institutions may need to consider a program of professional learning for educational designers, academic developers and /or IT staff to enable this level of support to be provided more broadly than was possible in this study and trial.

2. *Which aspects do academics engaging in a LA adoption strategy identify as enhancing their implementation of LA?*

Participants reported that the social learning and collegiality generated in the group discussions provided opportunities to network and share experiences and learn from each other in a nurturing environment.

3. *How is the LA adoption strategy effective in stimulating and supporting the usage of learning analytics by academics?*

The insights affirm that the combination of individual consultations, group discussions and provision of support resources is an effective strategy for LA implementation. Following the processes of the BCW enabled greater

understanding of the motivations and capabilities of participants and the opportunities they believed would empower them to engage deeply with LA, and consequently to employ appropriate intervention functions in the design of the implementation plan.

4. *What are the transferable design principles that underpin an effective LA adoption strategy?*

The findings from this trial affirmed the changes to the design principles for the implementation plan suggested in Chapter 8, including extending support for a full year and a different format to resources and guides, including pushing information to participants on a regular basis. The final Design Principles that were developed for the LA implementation plan are:

- provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities;
- provide support and resources for all aspects of LA, with resources being provided in different modalities, including regular newsletters, a central site and self-help videos;
- provide easy access to relevant and actionable LA data;
- promote clear and timely communication of available reports, support and any changes to systems;
- nurture a workplace culture that encourages and enables use of LA through structures and discourse; and
- facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

Chapter 10 concludes this thesis, providing an overview of the overall research findings, the limitations of the study and suggested areas for future research. Details of the final design principles for the LA implementation plan and the different components of the plan are included, along with implications of the study for a range of stakeholders.

Chapter 10: Discussion and Conclusions
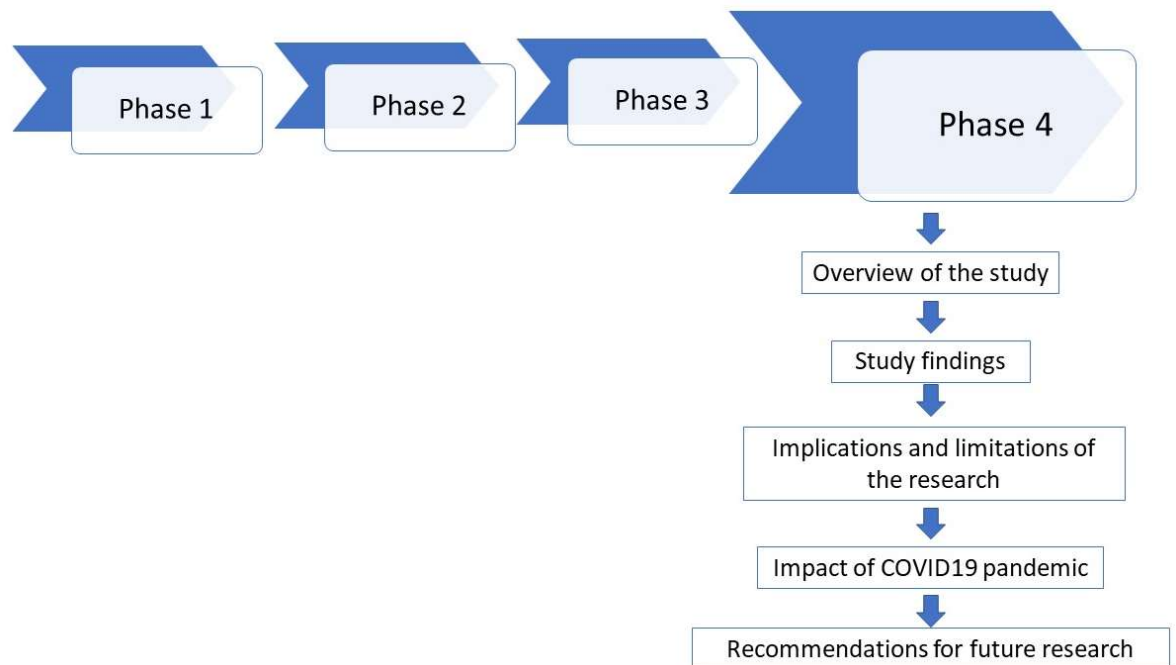
10.1 Introduction

Learning Analytics (LA) has developed as a discipline since its introduction at the first international conference on Learning Analytics and Knowledge in 2011. Initially the focus of research was on data science and how the learning from big data and educational data mining techniques could effectively be applied in educational settings, particularly higher education. Much of the research in the first five years was centred on technological components and development of data warehouses and tools that would enable data to be more easily extracted from Learning Management Systems (LMS) and other systems within universities with which students interact on a regular basis (Siemens, 2013; Sin, 2015). The human and sociological components of LA received some attention in this early stage, though mainly from the perspective of impacts on student experience and outcomes. There is an opportunity for more significant engagement in research that considers LA from the viewpoint of academics and investigates strategies to translate

research into changes of practice in order to promote widespread uptake of LA that informs and enhances teaching practice and course design (Baer & Norris, 2017; Rehrey et al., 2019; Wise & Vytasek, 2017).

This study has contributed to the LA and academic development disciplines through investigation of the academic voice and the role of academics in LA processes. The study began with identification of the barriers to implementation of LA as experienced by academic staff in the context of a single university, the University of Southern Queensland (USQ), the setting for this study. A behavioural change lens was adopted to consider how understanding of those barriers, as well as staff motivations for wanting to engage and the opportunities and support they felt they needed to engage, could inform the development of an effective implementation plan for LA. The implementation plan developed and trialled in this study was located at a regional university in Australia, and it is yet to be seen whether these results are generalisable. Yet many of the design principles developed in the study are likely to translate to other contexts because of their practical nature and theoretical underpinnings. Further, given its foundations in BCW research (Michie et al., 2014), it is likely that the described process of developing a LA implementation plan can be applied to universities worldwide.

This chapter begins with an overview of the study, including the research processes adopted in this design-based research (DBR) study to develop and refine the LA implementation plan and its underpinning design principles. This is followed by discussion of the theoretical and practical findings from the study and discussion of how the insights from these findings have addressed the overarching aim and research sub-questions for the study. The implications of the study for USQ and the wider higher education and LA communities are then discussed, followed by an overview of the limitations of the study and a brief discussion of the impact that the current COVID 19 may have on the importance of this study. The chapter concludes with recommendations for further research.

10.2 Overview of the Study

The aim of this DBR study was to determine the requirements and characteristics of an effective LA implementation strategy in a regional Australian university. To be successful, the plan needed to account for a range of academic competencies and motivations, and a behavioural change approach using the Behavioural Change Wheel (BCW) was adopted as the theoretical framework to inform the development of implementation plan. Chapter 2 drew on the literature to provide arguments for why academic behaviour change in the context of LA is a challenging but important problem. Chapter 7 provided a rationale for why the BCW was an appropriate tool to use for developing a behaviour change intervention.

A multi-phase study, using DBR as the methodology, was then carried out to investigate the outcomes of the BCW intervention and determine the barriers and enablers to LA implementation. The components of an implementation plan that staff perceived as important to their ongoing use of LA, were discussed in Chapters 4-6 for Phase 1 of the study and in Chapters 8 and 9 for Phase 3.

The DBR approach I adopted followed the work of Reeves (2006), with four distinct and sequential phases. The ways in which each phase of the study have been applied in this study and the chapters in which these were discussed are outlined in Table 47 and then discussed in more detail.

Table 47

Exploration of the Phases of the DBR Study in this Thesis

DBR Phase	Exploration in this Study
	Chapter 1: Introduction to the study Chapter 3: Methodology and methods
Phase 1: Analysis of problem through literature review, survey of academic staff, longitudinal interviews and analysis of usage data	Chapter 2: Literature review Chapter 4: Initial Data Gathering-Survey Chapter 5: Initial Data Gathering-Interviews Chapter 6: Initial Data Gathering -Log Data of Staff Interactions
Phase 2: Development of implementation plan	Chapter 7: Draft Design Principles and applying the Behaviour Change Wheel to develop a Learning Analytics implementation plan
Phase 3: Workshop with staff with relevant expertise followed by two iterative cycles of trialling and refinement of plan and development of draft design principles	Chapter 8: Trialling of Implementation Plan with Expert Group and Iteration 1 Chapter 9: Trialling of Implementation Plan Iteration 2
Phase 4: Reflection to produce final Design Principles and enhance the implementation plan	Chapter 10: Discussion and Conclusions

During Phase 1, I combined analysis of results from an extensive literature review with three data gathering exercises to gain insights into the issue of how staff had been engaging with LA in their teaching practice, and the barriers and enablers they experienced. The literature review clarified the key aspects of LA implementation frameworks that are likely to lead to successful uptake by individual academics. Key findings from LA implementation were that a combination of human and technical factors are considered, with data needing to be provided in an accessible format that is relevant to academics' specific teaching contexts (Bakharia et al., 2016; Jones et al., 2013). Support needs to be provided to academics in a range of aspects from what data is available to analysis and interpretation of that data and finally taking action as a result of that interpretation to ensure students' learning is optimised (Ferguson et al., 2014; Gasevic et al., 2015; Siemens, 2013).

The literature on strategies for successful implementation of educational technologies and LA was considered, along with lessons from professional learning, to inform the development of a conceptual framework for LA implementation: the I Framework, which, in turn informed the processes in this study. A survey of teaching staff across USQ and a subsequent series of interviews with four pairs of academics were conducted to extend this theoretical foundation with data from current academics within the specific context of USQ. Responses to the survey indicated that the main barriers to implementation were lack of time to engage and lack of knowledge about how to access, analyse, and interpret data available in the Learning Management System (LMS), which in the USQ context was Moodle. A comparison of results from this survey with corresponding questions in the Academic Level survey disseminated by West and colleagues showed similarities across most questions, suggesting that academics at USQ have similar perspectives to academics at other Australian universities. This indicates that the results of this study and the LA implementation plan developed may be transferable to other contexts. Insights from the survey results informed the questions discussed in the interviews. These were designed to inquire more deeply into the barriers identified in the survey, and to investigate the types of support and professional learning staff perceived as being relevant and effective in enabling them to engage with LA.

Additionally, analysis of log data of interview participants' interactions with their course sites in the LMS and institutional usage data for interactions with the LA reports and tools within the LMS complemented the survey and interview data to provide a holistic and in-depth picture of the level of LA usage at USQ. Although the insights showed low levels of knowledge and uptake, they also indicated a positive attitude towards LA use, with staff indicating that they could see benefits in using LA and a willingness and intent to adopt LA to inform and enhance their teaching within a twelve-month period. Whilst this was a more extensive process than typically followed in DBR studies - partly due to a change in approach from Critical Participatory Action Research early in the study - it did result in a rich study in terms of depth and breadth of data. This approach provided *a*

complementarity of data (Greene et al., 1989) from the different components of Phase 1 of the study.

The main purpose of Phase 2 of this study, as discussed in Chapter 7, was the development of an implementation plan to support academics at USQ to engage with LA on an ongoing basis to inform and enhance their teaching practice. The insights gained in Phase 1 informed the development of a set of draft design principles for the implementation plan which was developed through the theoretical framework of the BCW (Michie et al., 2014). Based on application of the results of Phase 1 to the COM-B model, which is the first stage of the BCW, the most relevant factors impacting the behaviour change of increasing engagement with LA were determined to be psychological capability, physical and social opportunity, and automatic motivation.

The second stage of the BCW involved determination of the intervention functions to be adopted, these being the broad strategies employed to implement the intervention. Through alignment of the available intervention functions to the COM-B factors identified as being relevant for this study, the chosen intervention functions were *Education, Enablement, Modelling,* and *Training*. The final stage of the BCW included choosing specific behaviour change techniques (BCTs) to use in the implementation and choice of the mode of delivery. For this study, the BCTs focused on providing training and support to participants in using LA and feedback on their progress towards engaging more effectively with LA. These BCTs were enacted through a multi-modal delivery including individual consultations and group discussions supported by an online resources and collaboration site.

The main purpose of Phase 3 of this study, as discussed in Chapters 8 and 9, was to trial the LA implementation and determine whether any changes would be needed to the draft design principles or implementation plan to allow for it to be used firstly, at scale at USQ and secondly, more broadly in other higher education institutions. Phase 3 began with a workshop with staff with expertise in educational design and academic development. The aim of the workshop was to gain their feedback on the relevance of the proposed implementation plan to the USQ context. There was general agreement from the group that the plan was suitable and no changes to the draft design

principles or implementation plan were made following their input, though some suggestions for further uptake are included in the recommendations section below. The implementation plan was then trialled over two iterations with six and seven participants, respectively. Overall, participants reported they had gained benefits from their involvement and would continue to use LA in their teaching practice, suggesting that the implementation plan had been effective. The resources site proved not to be an effective way of sharing resources and alternative ways of sharing these resources are recommended for future use of the implementation plan.

Phase 4, as discussed in the rest of this chapter, involved reflection on the previous phases, refining of the draft design principles into a final set of transferable design principles that can be adopted and adapted in a range of contexts, and amending the implementation plan into a more extended and targetted suite of professional learning opportunities and discussion, supported by online resources.

10.3 Research Questions and Findings

This study has investigated the overarching research question of:

> *What are the requirements and characteristics of an effective LA adoption strategy in a regional Australian university?*

The final design principles and LA implementation plan developed through this study provide the synthesis of responses to this question. An effective and scalable LA adoption strategy needs to include an extensive period of personalised and contextualised professional learning and support and ought to be provided by staff with experience and expertise in LA and educational design/academic development. The professional learning opportunities need to include a combination of individual consultations and group discussions. The purpose of the individual consultations is to build on individual academics' current competencies in, and motivations for, using LA all contextualised for the course(s) in which they are teaching. Group discussions provide opportunities for networking, collaborating and social learning to build a sense of community. A suite of self-help resources and

guides are recommended to support these opportunities and easy access to actionable data is a paramount component. Initial training may need to be provided for staff who will be charged with facilitating the implementation plan. Such training will vary depending on whether those staff are, as examples, academic developers who need upskilling in LA tools and usage, or ICT staff with big data experience who need pedagogical training.

The overarching research question had four sub-questions each of which have been addressed throughout the study and responses to each of these are now discussed.

10.3.1 What do Academics Identify as the Barriers and Enablers to the Implementation of LA in their Teaching Practice?

A small number of barriers were constantly noted by participants through Phases 1 & 3 of this study and discussed in Chapters 4 and 5 (Phase 1) and Chapters 8 and 9 (Phase 3). The barriers were generally connected and inter-related. For example, lack of easy access to data impacted on the time participants needed to engage with LA. Reducing as many barriers as possible has a positive impact on remaining barriers. Lack of time to engage was the main barrier identified through all components of both Phase 1 and Phase 3 and one that will not be easy to minimise. This barrier has also been noted in the literature on uptake of other educational technologies (Bates & Poole, 2003; Zhou & Xu, 2007) as well as LA implementation (Michos et al., 2020; Stelmaszak & Aaltonen, 2018). Learning and teaching activities are only one component of the complex academic workload and engaging with LA is only one aspect of teaching practice so solutions are needed that will raise the priority of LA and support academics to be efficient and effective in accessing and using data. The other main barriers that were regularly reported by participants were lack of knowledge and skills to engage with all aspects of LA, and lack of easy access to data. These are also barriers that have previously been identified in the LA literature (Gunn et al., 2017; Macfadyen et al., 2014; West, Heath, et al., 2016). Lack of knowledge and skills is addressed throughout the LA implementation plan developed in this study. A component of that capacity building is building staff knowledge of how to more easily access relevant data. The lack of easy access to data will

also need to be addressed by USQ and some strategies are included in the recommendations section below. Minimising these barriers becomes an enabler to implementation and some strategies that were discussed by participants in Phase 1 and Phase 3 of this study included:

- making data more accessible including push notifications at key touchpoints during each semester;
- reducing the administrative aspects of working with LA by sharing some of these tasks with professional support staff, for example identifying students deemed at risk and sending general nudges or follow up emails. This would allow academics to focus more on the content related concerns and pastoral care conversations; and
- building knowledge, competence and confidence through individual consultations, group discussions and support resources during the implementation plan.

Provision of professional learning combined with easy access to data will contribute to a reduction in the time academics have to spend on LA tasks which will minimise the main barrier to implementation and lead to an increase in efficiency and effectiveness, and consequently staff satisfaction.

10.3.2 Which Aspects do Academics Engaging in a LA Adoption Strategy Identify as Enhancing their Implementation of LA?

Participants noted that the personalised and contextualised support and advice provided by myself as researcher during the trials, was the most effective aspect of the implementation plan. They also valued the group discussions for the opportunities they provided for social learning, networking and building a sense of belonging and community. Participants also reported that building their knowledge of the range of LA reports and tools available in the LMS and the affordances of how LA can enhance teaching and student engagement were also effective components of the LA implementation plan.

10.3.3 How is the LA Adoption Strategy Effective in Stimulating and Supporting the Usage of LA by Academics?

The combination of intervention functions of *Education, Enablement, Modelling and Training* provided a nurturing environment and positive support for the participants and resulted in a LA implementation plan that was effective in increasing participants' level of awareness of the tools and reports available to them. This approach also built their knowledge of how they could use LA to inform their teaching practice and improve course design and student engagement. However, the barriers to use, particularly lack of time meant that participants felt frustrated that they had not been able to engage more deeply with LA. Their use of LA did not increase markedly over the period of the implementation plan and was generally reactive and explorative rather than proactive and strategic. The changes to the implementation plan, and specifically the proposed increased timeframe, will hopefully address these issues and lead to deeper and more meaningful engagement. These changes are further discussed below in Section 10.4.3.

10.3.4 What are the Transferable Design Principles that Underpin an Effective LA Adoption Strategy?

The analysis of results from the initial data gathering in Phase 1 (as discussed in Chapters 2, 4, 5 and 6) and trials of the intervention (as discussed in Chapters 8 and 9) have been synthesised into six design principles that inform future attempts at effective LA implementation. These principles have been arrived at inductively, from the data, and it seems likely that they are applicable in a range of contexts. It lies outside the scope of this thesis to test whether that holds true; yet these principles are a good fit with literature discussed in Chapter 2. These design principles are:

1. Provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities.
2. Provide support and resources for all aspects of LA, with resources being provided in different modalities, including regular newsletters, a central site and self-help videos.
3. Provide easy access to relevant and actionable LA data.

4. Nurture a workplace culture that encourages and enables use of LA through structures and discourse.

5. Provide clear and timely communication of available reports, support and any changes to systems.

6. Facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations.

Each of these principles has been elaborated upon, with exemplars on how they can be enacted and exemplars of literature to which they can be linked in Table 48. There are links to several different authors all of whom discuss only one or two of the principles. For example, Baer and Norris (2017, p.313) discuss a change management plan for enabling student success through use of LA, which includes five overarching strategies, two of which align with the design principles developed through this study:

- "Develop unified data, information and predictive learning analytics for student success" aligns with *Provide easy access to relevant and actionable LA data;* and

- "Integrate personalized learning and competence building into institutional practice" aligns with *Provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities.*

Other strategies in their plan focus on students.

In their study of academics' perceptions of LA, Howell et al. (2018) identified five themes of areas of concerns with student well-being linked to their theme of "facilitating learning" and concerns about workload issues to "what about us". These concerns are similar to those raised in this study of whose responsibility it is to provide pastoral care to students and of time to engage with LA, which are addressed through the design principles of *Nurture a workplace culture that encourages and enables use of LA through structures and discourse* and *Provide support and resources for all aspects of LA.* Their study concludes with a suggestion that academics be involved in the development of policy and procedures for LA which is a different approach to this study. However, this study has addressed their suggestion

that the perceptions of academics, as a key stakeholder group, be further investigated.

These examples and links to other research suggest that these transferable design principles do have a broad grounding in the literature and that the combination of these build on the existing body literature and is thus likely to be applicable in a range of contexts.

Table 16

Final Design Principles for Learning Analytics Implementation Plan

Design Principle	Elaborations and Examples	Links to Literature
1. Provide training and professional learning opportunities in all aspects of LA implementation in a range of modalities	Contextualise professional learning opportunities and support around the areas of importance to staff, for example student retention and success or use of nudges Take a holistic approach to capacity building by integrating training on LA into pedagogical discussions Provide training to build academics' knowledge of the full affordances of the LMS, including use of LA reports and tools appropriate to their context Build knowledge, skills and confidence all aspects of accessing and interpreting student data and implementing appropriate actions Provide a range of training opportunities including formal sessions, individual training, informal just-in -time learning, and social learning with and from peers/colleagues Focus contextual discussions on the benefits of LA for students rather than for academics	Baer and Norris (2017), West et al. (2018)
2. Provide support and resources for all aspects of LA	Provide support through actions/tasks which can be undertaken by other staff, including support for contacting students at risk to offer pastoral care where needed and support to access and analyse data Provide resources on how and why of using LA, including details of key personnel and roles; resources to build academics' knowledge and use of the full affordances of the LMS, including LA reports and tools; information on the benefits of engaging with LA reports, particularly those that currently have low levels of use; and resources to empower staff to access, analyse and interpret student data in the LMS.	Howell et al. (2018)
3. Provide easy access to relevant and actionable LA data	Provide timely and appropriate reports to help academics support students who may be at risk	Baer & Norris (2017)

	Include insights with reports that could enhance course design and student engagement and learning Provide access to data from other courses to enable comparisons Provide overview of staff usage of LMS and LA reports and tools and opportunities for discussion to consider actions that could be taken as a result. Provide information that links the names of reports in the Event name column of log reports to the way that data is provided in the course sites.	
4. Nurture a workplace culture that encourages and enables use of LA through structures and discourse	Provide opportunities for social learning, networking, collaboration and discussion with other staff Recognise the time needed to engage in these processes in staff workload models Include recognition and reward as a component of the implementation plan	Howell et al. (2018) Michos et al. (2020) Rehrey et al. (2019); Wise and Vytasek (2017)
5. Provide clear and timely communication of available reports, support, and any changes to systems	Include clear and timely dissemination of information about any new tools and reports. Include effective communication of supports available across the institution	Tsai et al. (2018)
6. Facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations	Ensure that those facilitating the implementation plan have the requisite knowledge and expertise to provide just in time learning on all aspects of working in LMS as well as LA Provide professional learning opportunities to build capabilities of staff in appropriate roles	Ferguson et al. (2016)

The aim of the principles is to provide insights and a guide that can be adopted and adapted in other contexts (McKenney et al., 2006), and these principles have been designed to be generic enough to be applicable in other higher education institutions as well as forming the basis for recommendations for USQ. Whilst each principle could be adopted in isolation, the most effective approach for any institution would be to consider these as a holistic approach, as was the case throughout this study.

10.4 Transferable Research Findings

As a result of the qualitative investigation of LA implementation using the BCW as the theoretical framework this study has contributed to the LA literature through several different lenses:

- considering how awareness of LA can be developed and how LA can be made accessible and usable by educators - moving it from institutional policy or individual "show and tell" to being generally understood and valued and part of "business as usual";
- having educational research as the focus, working with individual academics to identify their particular context and issues and then considering how LA can assist the development of solutions; and
- contributing to the discussion of how "small-scale projects and pilots might be successfully scaled to improve teaching and learning across an institution." (Ferguson et al., 2014, p. 122)

10.4.1 Qualitative Approach to LA Implementation and Inclusion of the Teacher Voice

This study has contributed to the LA discipline through the qualitative approach taken and by inclusion of the teacher voice, as there are few similar studies that have been undertaken (Howell et al., 2018). The main focus of LA literature to date has been on methods, models and tools to support use of LA and on student outcomes, with little focus on the professional learning and support needed to enable staff to use learning analytics in pedagogically-informed approaches. This study has responded to previous calls to include the academic perspective (Beer et al., 2014; Howell et al., 2018) through an in-depth investigation of these ideas from a behavioural change perspective, considering the motivations of staff to engage with LA as well as the barriers and enablers to use of LA.

As discussed in Chapter 5 for Phase 1 and Chapters 8 and 9 for Phase 3, four interconnected areas of motivation and impetus for engaging with LA emerged from the insights from deductive and inductive analysis of interview transcripts, as outlined below and illustrated in Figure 22:

1. Student engagement and experience: a desire to understand, measure and improve student experience and outcomes.
2. Teaching practice: a desire to be more effective and efficient teachers and know that what they are doing is of value.
3. Course design: a desire to improve course design to influence student experience.
4. Academic recognition: a desire to use the measures of improvement for promotion, awards and grants and to publish on findings of implementation.

Figure 22

Motivators for Uptake of Learning Analytics
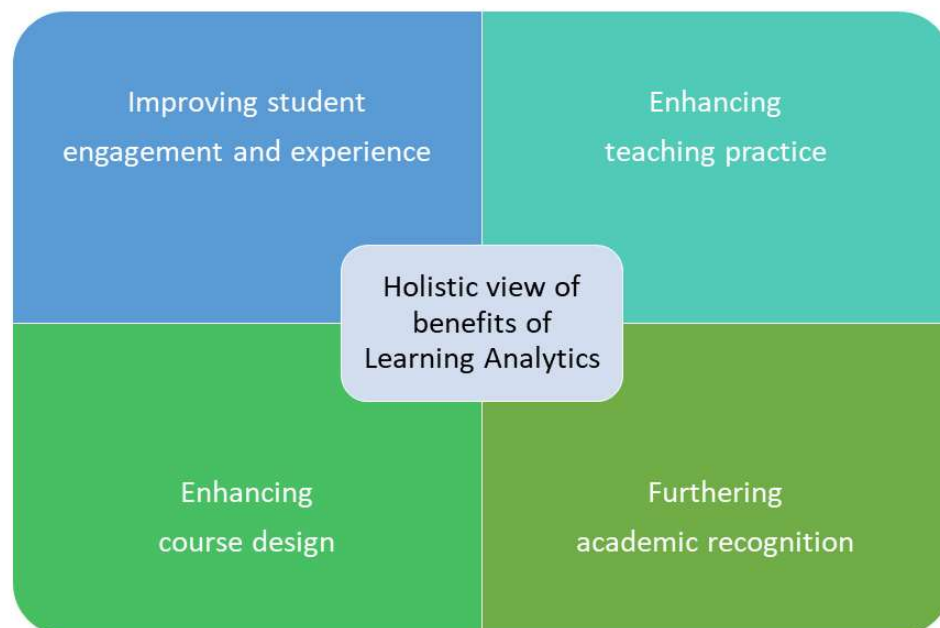
It is important for facilitators of the LA implementation plan to build an understanding of the combination of these motivators that apply for each academic they work with, as noted in discussions of the COM-B model in Chapters 1 and 7. This knowledge will help to ensure that appropriate starting points for conversations are chosen and that training and support are provided that target those initial motivators. Facilitators can then guide staff to a more holistic approach to using LA through gradually including

benefits from other motivators. As an example, if a staff member mentions that they want to use LA to improve student engagement, the conversation can start with questions about what student engagement means to them, why it is important for students to be engaged, and then move to discussion of how engagement is measured and what data they can use in their specific context. As conversation continues, the facilitator can suggest ways that teaching practice and/or course design could be enhanced to impact positively on student engagement and how the academic could trial an intervention and then measure success. The results for the intervention and discussion of the processes undertaken could be used in publications and as evidence for promotion or recognition of excellence in teaching.

10.4.2 Application of the BCW

The BCW was originally developed in the medical disciplines and has had little uptake in higher education or LA so its use in this study has been a novel approach that has proven to be relevant and effective. The few examples of use of the BCW in higher education cited in the literature have reported that this is an effective approach (Wilson et al., 2019; Wolski & Richardson, 2015) and this study has added to that positive appraisal.

As noted in Section 10.3.3 above, the intervention functions that were deemed to be relevant through the process of the BCW for this study were *Education, Enablement, Modelling* and *Training*. The combination of these interventions and their respective BCTs proved to be effective for this study as evidenced by the feedback from participants and their levels of engagement with the LA implementation plan. Designing an intervention following the BCW approach could also be an effective process for other institutions to follow. Whilst other institutions may find a different combination of intervention functions is more relevant to their context, it is likely that use of a combination of the positive focussed intervention functions from the BCW, such as those used in this study will enable strategic provision of professional learning opportunities. For facilitators of such interventions as well as academics, support and more ready access to actionable data will also be important to promote more widespread uptake of LA.

As noted in Chapters 1 and 7, influencing policy as discussed in Step 6 of the BCW was beyond the scope of this study. However, five of the seven policy categories could be considered by institutional management to enhance widespread use of LA. These categories are defined in Table 44 with examples of how institutions could adopt them. Some of the examples are aligned with the design principles as noted in the table. Having such institutional policy and guidelines in place will add direction for academics to embrace these processes.

Table 17

BCW Policy Categories Applicable to Learning Analytics Implementation,

adapted from Michie et al. (2014, p. 135)

Policy Category	Definition	Example	Design Principles
Communication/ marketing	Using print, electronic, telephonic or broadcast media	Monthly LA newsletter including good practice examples and links to relevant research	Provide clear and timely communication of available reports, support and any changes to systems
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision	Good practice guidelines	Provide support and resources for all aspects of LA
Regulation	Establishing rules or principles of behaviour or practice	Policy and procedural guidelines	
Environmental/ social planning	Designing and/or controlling the physical or social environment	Facilitation of LA Community of Practice or Research group	Nurture a workplace culture that encourages and enables use of LA through structures and discourse
Service provision	Delivering a service	Ensure all learning and teaching support staff have LA expertise	Facilitate professional learning by dedicated staff with expert knowledge and skills in LA and pedagogical considerations

Researchers or practitioners wanting to adopt a LA implementation plan, through a BCW approach in their institutions would ask the same questions as used in Phase 1 of this study, and would be likely to receive some difference in responses. Those responses would then lead to selection of different intervention functions and result in implementation plans specific to their context. It is this ability of the BCW to support development of

interventions for many contexts, by following the same processes that makes it a suitable choice for development of a LA implementation plan.

10.4.3 Final Implementation Plan

The final LA implementation plan has developed considerably from the trial implementation based on the insights and feedback from participants. A twelve-month implementation plan is recommended as a more effective solution that the 20-week version trialled in this study, as that would minimise the barriers to engagement, specifically lack of time and lack of knowledge. The extended timeframe would allow participants to engage with all aspects of LA, including evaluating the impact of changes to their practice and course design, and provide further social learning and networking opportunities for participants. The plan would commence at the start of the semester prior to their intervention to allow sufficient time for participants to determine a question to investigate, gather some baseline data and plan the intervention. They would then commence the intervention early in the semester and have sufficient time to gather data on the impact in the second half of semester. I believe that the support site used in this study could be improved upon through use of a simpler website which can be used as a resource repository and that fortnightly newsletters be distributed to participants, and the wider academic community, with links to specific articles and guides on the website. The revised implementation plan would also include more explicit links to the I Framework with group discussions and individual consultations to focus on each stage of the framework.

More emphasis on the individual consultations is also included with a session every four-five weeks to help participants keep on track, set and keep milestones, and allow time to consolidate the learnings between consultations. Group discussions would continue to be held every 6 weeks to encourage the development of networking and social learning opportunities. It is acknowledged that this would be a major commitment from academics. Such a plan would also require institutional support to build LA knowledge and capacities of academic developers and/or educational designers, so they can in turn support the academics who participate in the implementation. This level of support though could also be incorporated into usual learning

and teaching support processes. However, the benefits and value in engaging and completing a full cycle of LA implementations would be more attractive than was possible in the 20-week program, where many participants noted frustration at not being able to engage more fully. Institutions could also offer incentivisation and reward for engaging through recognition in workload model and or provision of support for researching/publication. The possibility of linking successful completion of the implementation to digital badges or micro-credentialing could also be considered as suggested in the workshop with experts in Phase 3 of this study. The Student Learning Analytics Fellows program (Rehrey et al., 2018) supports academics to research a learning and teaching topic of their choosing from a LA perspective over a 12-month period. This program is an example of a successful program that could be drawn on for further ideas. An outline of the revised implementation plan is included in Table 50. This approach also aligns with a five stage Teacher Professional Development program in Spain (Michos et al.,2020) which also starts with identification and analysis of a current learning and teaching problem, moves through training on data collection to enactment of a classroom solution and finishes with a reflection of the effectiveness of the enactment. Their program lasted two years suggesting that the extension of this plan to 12 months is likely to produce improved results including time for participants to evaluate the success of their intervention in terms of improved student outcomes and experiences.

Table 50

Proposed 12-month Learning Analytics Implementation Plan

Weeks	Professional Learning event	Focus	Stage of I Framework	BCW Intervention function
1	Introductory group workshop/	Overview of plan, Discussion of investigation questions	Institutional context Impetus	Education Enablement Modelling Training
3-4	Individual consultations	Goal setting, Discussion of course context	Impetus	Education Modelling Training
7	Group discussions	Overview of reports and tools in LMS	Input	Education Enablement Modelling
8-9	Individual consultations	Matching data with investigation question	Input	Education Modelling Training
12-13	Individual consultations	Accessing data	Interrogation	Education Modelling Training
14	Group discussions	Interpreting data	Interrogation	Education Enablement Modelling
16-17	Individual consultations	Interpreting data in course context	Interrogation	Education Modelling Training
20	Group discussions	Types of interventions, Use of nudges	Intervention (planning)	Education Enablement Modelling
21-22	Individual consultations	Plan intervention	Intervention (planning)	Education Modelling Training
24-25	Individual consultations	Finalise intervention	Intervention (planning)	Education Modelling Training
26	Group discussions	Sharing strategies and plans	Intervention	Education Enablement Modelling
28-29	Individual consultations	Initiate intervention	Intervention	Education, Modelling

				Training
32	Group discussions	Discuss progress of intervention	Intervention	Education Enablement Modelling
33-34	Individual consultations	Discuss progress of intervention	Intervention	Education Modelling Training
37-38	Individual consultations	Impact measures	Impact	Education Modelling Training
39	Group discussions	Measurement of success	Impact	Education Enablement Modelling
41-42	Individual consultations	Accessing and analysing appropriate data	Impact	Education Modelling Training
45	Group discussions	Sharing strategies and results	Impact	Enablement
46-47	Individual consultations	Final wrap up	Impact	Enablement
52	Group discussions	Wrap up and celebrations		Enablement

Whilst the support site was not valued highly by participants, they all noted that there was value in the resources shared on the site and ideas were provided for how to better share that information. In the USQ context, the information could be shared on the TeachDesk site and information included in regular newsletters. For the wider community, I plan to develop a resource website containing generic information, and LMS specific information in downloadable format, details of the implementation plan and suggested workshop plan, and guiding questions for facilitators, and a professional learning plan for facilitators as well as links to information on the BCW, recent LA research and relevant organisations. Institutions will be able to tap into the website and resources and adapt to their context, making it a valuable and on-going contribution to the LA and academic development fields.

10.5 Limitations of the Study

The main limitations of this study were that it was conducted at one institution, involving a small number of participants and using only data from the LMS (Moodle). The decision to use only LMS data was made as all students in the institution must access the LMS on a regular basis and all assignment submission is conducted through this system. As USQ is in the early stages of implementation of LA, there is no data warehouse aggregation of information from other sources of information and this study was also focussed on the staff interactions with the LMS and the LA reports and tools available within the system. To alert participants to the availability of further student information during the trial, I directed them to where they could source additional data that they could include in their investigations, as appropriate. I also acknowledged that accessing some of that data was difficult and I was conscious of not overloading participants with too many options as some of them had noted that they found the range of LA reports and tools within the LMS overwhelming and preferred to focus on just a few of the most useful and relevant reports.

The limitation of a small number of participants at one institution can also be viewed as a benefit as it meant the discussions could be focussed and personalised which led to a building of trust between myself and the participants, leading to rich and open conversations. In addition, most participants already had a positive perspective of the affordances of using LA, which could be due to already having engaged on at least a surface level and their self-selection into the study. Extending trials to include staff who have not previously engaged with LA and/or do not have a strong pedagogical background, both at USQ and other institutions, is an important next step in testing the effectiveness of the LA implementation plan in broader contexts.

These limitations were also offset by the depth and breadth of the study and the complementarity of the different data sources. The design principles developed as an output of this study have been written in a generalised manner that will enable then to be readily adaptable and adopted in other contexts. Sustainability and more large-scale adoption of the LA implementation plan will also be possible through training and involving

staff in educational design, academic development and ICT roles and adopting a distributed leadership approach, calling on early adopters to become champions.

The manual manipulation of data that was needed to create the reports of staff usage of the LMS, as discussed in Chapter 3 also proved to be a limitation in this study. The reports took many hours of manual cleaning and analysis which meant that the reports were not always prepared in a timely manner, lessening their impact. It will be incumbent on universities, LMS developers and professional learning facilitators to collaborate to develop more efficient and effective ways to work with the raw data to create meaningful and actionable insights, visualisations and reports for academics to encourage more widespread uptake of LA usage and support the LA implementation plans.

The relatively short timeframe for involvement in the implementation phase of the study meant that it was not possible to investigate any links between increased engagement with the LA reports or the involvement of the participants in this phase of the study and improved student grades, satisfaction or engagement. The scope of the ethics approval for this study also precluded access to student data by the researcher. As discussed in Chapters 8 and 9 some participants did provide anecdotal evidence that they had seen positive changes in student engagement. It is expected that extending the implementation plan to a full year program will allow for this type of investigation. This type of investigation could also be an avenue for further research, possibly involving the participants from this study.

10.6 Implications of the Research

The findings from this study have provided a range of theoretical and practical implications for individual academics, USQ, Moodle developers and data scientists, educational designers and academic developers, and the broader higher education and LA communities.

10.6.1 Implications for Individual Academics

For individual academics, the insights from this study provide strategies on how they might enhance their approach to interacting with their course sites

and students in the LMS, and specifically interacting with LA reports and tools to inform changes to their teaching practice. Academics could consider scheduling set times each week for course development and interaction with the LMS, including viewing the full range of LA reports available to them, to use their limited time more efficiently and effectively. Building their own capabilities for accessing and interpreting data and taking actions based on those interpretations will also be important steps in increasing uptake of LA. This could be achieved through attendance at any workshops and other professional learning opportunities provide by the institution and seeking advice and support from key personnel, including academic develops and educational designers.

10.6.2 Implications and Recommendations for USQ

This study has shown that academics at USQ generally have a positive perspective of the benefits of LA and a willingness to use reports and data to inform their teaching practice and enhance course design and student experience. Participants also noted frustrations at the lack of availability of actionable data, lack of recognition of the time and resources and lack of support and professional learning opportunities. The trials of the LA implementation plan have proved successful and continuation of this approach offers an effective solution to the current low levels of use of LA. The insights gained throughout this study also provide opportunities for the institution to consider, to empower staff to use the full affordances of LA and to promote widespread use across the institution. The following recommendations are offered as a way to improve access to actionable data and build staff capabilities:

- ensure there is widespread, timely and detailed dissemination of information about any changes to LMS, including LA reports and tools;
- recognise the time taken to engage with LA, including professional learning/capacity building, and the consequent actions in enhancing course design, through inclusion in academic workload allocations;

- embed LA resources, as developed in this study in TeachDesk and include discussion of the benefits of engaging with LA in learning and teaching induction and orientation sessions;

- provide and integrate data on views of recorded lectures;

- feature LA reports and uses in any regular L&T newsletters or communications;

- include explanatory videos in the suite of support resources; and

- clarify and communicate policy and guidelines around sending nudges to non-student emails and consider the option of disseminating via SMS

Whilst provision of visualisations was outside the scope of this study as none were available within the Moodle instance employed at USQ, participants did show interest in these when provided and this is an enhancement that could be made to the suite of tools and reports available to staff.

10.6.3 Implications for Moodle

In addition to the general recommendations above, there are also a series of recommendations to be considered by Moodle developers at USQ and at MoodleHQ that have grown from discussions with participants during this study, and noted by other authors as an area of concern for academics (Falcão, 2020). These recommendations are based on the frustrations with accessing data and reports that occurred during this study and are raised as suggestions for improving usability of these tools and reports. The recommendations will be shared with USQ staff who are responsible for Moodle development and with the Moodle company:

- organise ways that nudges can be sent by email rather than as Moodle message;

- develop the *Statistics* report so that report does not aggregate to a weekly overview when a period longer than four weeks is chosen;

- allow more choice in the report to choose time period and whether or not to aggregate, maybe through inclusion of a slider;

- where there is a choice of roles in drop-down menus for reports, have students as the top option;

- include views of discussion posts in log data and associated reports, rather than just the forum level, and similarly for resources in folders;
- investigate and communicate ways to make log data reports more accessible – accessing these reports often times out for large classes – one option could be a request form that staff can complete to run these at different key times in the semester, and overnight when load on the system is lower; and
- add filters to Log data to allow differentiation of cohorts by on campus or cohort or major or discipline in which they are enrolled

As noted above for USQ, consideration could also be given to options of visualisations and/or dashboards to further enhance the accessibility of information for staff, as well as students.

10.6.4 Implications for LMS and LA Tools Developers and ICT Staff

More generally, the lack of easy access to relevant and actionable LA is also a concern that the companies and software developers of LMS and LA tools will need to address. Engagement with academic communities to obtain their viewpoints will be one strategy that this group could employ to ensure their products meet the needs of this key stakeholder group. Ensuring consistency of terminology and format of information between different reports and the actions undertaken in the LMS will also assist staff uptake and confidence in the accuracy and completeness of data.

ICT staff, including staff responsible for maintenance and updating of the LMS, will also have key roles in building more effective and widespread uptake of LA in institutions. They may be involved in training and support for the technical aspects of interacting with LA reports and tools. More importantly though, they will need to engage with the academic community to determine how to present relevant data and visualisations in a manner that is clear and useful to staff. Careful consideration of terminology and building consistency across reports will also reduce staff frustration and improve access for academics.

10.6.5 Implications for Academic Developers/Educational Designers

The design principles developed in this study have implications for staff who will be responsible for facilitating this type of professional learning, in terms of how they conduct individual consultations and group discussions as well as the professional learning that they may need to undertake to feel competent and confident to facilitate the sessions. These staff are most likely to be academic developers or educational designers, although there is a possibility that some training could be facilitated by ICT or HR staff. In most institutions it would be rare to have a group of staff who have the requisite skills and knowledge in all areas of LA implementation that include knowledge of the reports and tools, technological knowledge of how to manipulate, analyse and interpret data and pedagogical knowledge to support staff in making appropriate choices about interventions. Staff chosen to facilitate the LA implementation plan would also need to become familiar with the elements of the plan and it will be the responsibility of institutions to determine the best way forward for their context. These groups of staff will also have important roles in the development and facilitation of resources and webinars on good practice use of LA and offering ideas and support to academics on how to build an effective teaching presence in the LMS. Understanding the specific context for each course and academic will be important strategies to enable support to be appropriately embedded into pedagogical discussions.

10.6.6 Implications for the Broader Higher Education Community

The importance of building staff capabilities in LA through provision of professional learning has been gaining recognition as an important component of widespread LA implementation. This study has provided insights and one approach to achieve this goal. Many of the implications and recommendations noted above for USQ can also be applied in other institutions to improve the accessibility of reports and data that will promote widespread implementation of LA. If the recommendations noted for Moodle are implemented, this will have implications for all institutions that use Moodle as their LMS and have a positive impact on staff experience.

As noted in the previous section, institutions will also need to determine who are the best group of staff to facilitate the implementation plan in their context and ensure that those staff receive adequate training and support. This may also have implications for staffing in learning and teaching centres. However, the benefits from having competent and confident facilitators will have flow-on positive effects for the staff who participate in the training and consequently the standards of course design and student experience.

Incentivisation to participate in, and complete, the LA implementation plan could be provided through awarding digital badges or micro-credentials. Providing credit towards a course in a Graduate Certificate of Higher Education programme for successful completion of all aspects of the intervention is a further reward that could be offered.

Institutions, through all levels of management will need to understand and promote the value that interacting with LA can provide to individual academics and the institution. Encouraging and supporting all the strategies listed in this section will be a key requirement for increasing uptake of LA in effective and efficient ways. Recognition of the time needed for course development and effective engagement with students in the online environment, and associated engagement with LA to enact and evaluate changes will also be needed. Incentivisation through recognition in the academic workload of time needed to engage with LA is a further way in which institutions can support their staff to increase the uptake of LA.

Promoting ethical use of data, as discussed in the analysis of results of the survey in Chapter 4, will be an ongoing concern for the sector. The importance of ethical use frameworks (Corrin et al., 2019; Drachsler & Greller, 2016; Pardo & Siemens, 2014; Tsai et al., 2018), which includes privacy concerns, has been widely discussed in the literature. However, as noted in a paper written out of this research (Jones, 2016), these issues have not as yet translated to significance in practice. Continuing some of the work in individual institutions in developing guidelines for academics (Welsh & McKinney, 2015), and implementing recommendations from a recent discussion paper on ethical considerations in the Australian higher education

sector (Corrin et al., 2019), are two ways these important considerations could be incorporated into future LA implementation plans.

Two recent systematic literature reviews of LA implementation have considered the perceptions of stakeholders, including academic staff, and concluded jointly that building a supportive culture, providing training in LA tools usage, pedagogical aspects of LA and linking LA to learning design, and provision of easily accessible data are key elements of successful LA adoption (Kaliisa et al., 2021; Mahmoud et al., 2021). This study built on these reviews through the development of a pragmatic implementation plan that will be able to be adopted in different contexts, thus contributing to the research in the LA field.

10.7 The Impact of the COVID-19 Pandemic

Higher education in Australia has changed considerably since I commenced this study, particularly in light of the COVID-19 pandemic. Following the initial rush to move all students and courses online as the pandemic sent us all into lockdown, universities have been considering what are the benefits of online learning and how online learning can become more effective and efficient. Learning Analytics plays an important role in measuring the impacts of moving to the online environment, providing insights into what has and has not worked well, and how students and academics have reacted and adjusted. For institutions these insights can inform the "new normal". Academics have started taking more interest in what data is available to them as they adjust to the online environment, and how they can use this data to replace the insights previously garnered from face-to-face teaching. Providing professional learning for academics across all aspects of LA is gaining momentum and institutions will need to move to support academics in the more competitive environment we find ourselves in. These changes and momentum increase the contribution of this study which offers one solution to building staff capacity.

10.8 Recommendations for Future Research

There are many avenues for possible future research arising out of this study. Initially, further research that evaluates the effectiveness of the design

principles and the LA implementation over a longer period of time and in a range of contexts is recommended. One option is a comparative study across several institutions. Follow-up interviews with participants to gauge the long-term value of participation and any changes to their practice would also be worthwhile and several participants noted interest in conducting collaborative research in the future, which is further testament to the contribution of this study. As Learning Analytics is a relatively new and evolving field of study I will continue to engage with the increasing body of literature relevant to this study and ensure that all future research is grounded in the most current literature.

Development of an open access website (https://learninganalyticslady.wordpress.com) will be a more practical venture following the study. Research could then be conducted on the usage of the site, and the impact of the site and other promotion of this study and the plan on the uptake of the LA implementation plan by other institutions. Investigation of the interview transcripts from different lenses and perspectives, including the journey and progress of each of the participants, could also be undertaken as could more in-depth analysis of the institutional usage data and log data of participants' interactions with their course sites.

One specific area of further study, which is not directly related to LA but drew much interest from participants, is discussion of nudges. This research could be undertaken collaboratively with participants and consider several aspects of nudges, including identification of students, mechanisms of nudges, effectiveness, and using for positive reinforcement. There has been considerable research conducted around Australia and more broadly in this area, especially regarding the development and use of specific tools to support nudging, through the On-Task project (Pardo et al., 2018), and links could be developed to build on that body of research.

Further work on the comparison of results of this research with those of the LA for Retention Study (West, Heath, et al., 2016), will also be a beneficial area of further research and a possible avenue for collaboration with experienced LA researchers. This could include comparison of interview data.

10.9 Conclusion

This study adopted a DBR approach using the theoretical framework of the BCW to design and iteratively trial a LA implementation plan to enhance individual academics' knowledge of LA, and their competence and confidence in the use of these, thus enabling them to understand and enhance students' learning experiences. A set of transferable design principles were developed over the course of the study which will enable the implementation plan to be adapted and adopted more widely at USQ and in other higher education institutions. Professional learning and support for academics in the field of Learning Analytics is currently an under-researched area and this study contributes significant insights into how academic behaviour change in the use of Learning Analytics can be effectively supported through professional learning.

Four consecutive phases were included in the study: an analysis of a practical problem (low levels of use of learning analytics by academic staff), the development of a solution to the problem (an implementation plan for learning analytics adoption), the iterative trialling and evaluation of this design, and finally, reflection to produce transferable design principles for an implementation plan that could be more widely adapted and adopted. Data collection methods included surveys, interview data, and logs of staff usage of the learning management system and associated learning analytics tools and reports. Survey results were analysed using descriptive statistical techniques and usage data through simple counts and comparisons. Interview data were coded and analysed using deductive and inductive thematic analysis.

The study has resulted in transferable research outputs including the LA implementation, design principles and a conceptual framework for implementation of LA, the I Framework. Insights from the study have resulted in a deep understanding of the barriers to adoption of LA and the motivators that lead academics to adopt LA. Participants in this study believed that their involvement increased their awareness and use of LA and they commented that the benefits of involvement were the combination of individual support, opportunities to discuss with other staff interested in using LA, and the resources made available to them. Findings suggest that

incorporating these elements into a long-term implementation plan is likely to result in increased uptake and staff capabilities in the use of learning analytics.

The pragmatic approach adopted in this study has resulted in a LA implementation plan built on rigorous research that will be useful for practitioners, and informative for a range of stakeholders including academic developers, LMS developers and institutional management. It thus makes a significant contribution at the intersection of knowledge of LA implementation, professional learning and behavioural change processes.

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Appendices

Appendix A: Ethics documentation

Ethics Amendment Approval

Due to minor changes in this study including change of title and supervisory teams several amendments to my Human Research Ethics (HRE) application had to be submitted. The following is the text for the final amendment submission approval: Email received October 22, 2018

Dear Hazel

I am pleased to confirm your Human Research Ethics (HRE) application has now been reviewed by the University's Expedited Review process. As your research proposal has been deemed to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007), ethical approval is granted as follows.

Project Title: H15REA229 - Using the Behaviour Change Wheel to design and test a Learning Analytics adoption strategy at a regional Australian university

Approval date: 22/10/2018

Expiry date: 15/09/2020

USQ HREC status: Approved with conditions

(a)responsibly conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal;

(b) advise the University (email: ResearchIntegrity@usq.edu.au) immediately of any complaint pertaining to the conduct of the research or any other issues in relation to this project which may warrant review of the ethical approval of this project;

(c)promptly report any adverse events or unexpected outcomes to the University (email: ResearchIntegrity@usq.edu.au) and take prompt action to deal with any unexpected risks;

(d) make submission for any amendments to the project and obtain approval prior to implementing such changes;

(e) provide a progress 'milestone report' when requested and at least for every year of approval;

(f) provide a final 'milestone report' when the project is complete.

(g) promptly advise the University if the project has been discontinued, using a final 'milestone report'.

Additional conditionals of approval for this project are:

 (a) Nil.

Please note that failure to comply with the conditions of this approval or requirements of the Australian Code for the Responsible Conduct of Research, 2018, and the National Statement on Ethical Conduct in Human Research, 2007 may result in withdrawal of approval for the project.

If you have any questions or concerns, please don't hesitate to make contact with an Ethics Officer.

Congratulations on your ethical approval! Wishing you all the best for success!

Kind regards

Human Research Ethics
University of Southern Queensland
Toowoomba – Queensland – 4350 – Australia
Ph: 07 4687 5703 – Ph: 07 4631 2690 – Email: human.ethics@usq.edu.au

Sample of Participant Information Sheet

The following is the Participant Information Sheet for Phase 3 of this study.

Participant Information for USQ Research Project
Discussion Group

Title of Project:	Using the Behaviour Change Wheel to design and test a Learning Analytics adoption strategy at a regional Australian university
Human Research Ethics Approval Number:	H15REA229

Research Team Contact Details

Principal Investigator Details	Supervisor Details		
Mrs Hazel Jones	Dr Marcus Harmes	Dr Katie Burke	Dr Nick Kelly
Email:	Email:	Email:	Email
Hazel.Jones@usq.edu.au	Marcus.Harmes@usq.edu.au	Katie.Burke@usq.edu.au	Nick.Kelly@qut.edu.au
Mobile: 0408830183	Telephone: (07) 4361 2317	0403 525 791	0409652047

Description

This project is being undertaken as part of a PhD study.

The purposes of this project are to

- i. identify the enablers and barriers to adopting learning analytics to inform and enhance teaching practice for academics engaging in a Learning Analytics adoption strategy at USQ
- ii. identify the opportunities and supports needed to enable academics to engage in an adoption strategy to use Learning Analytics to inform and enhance teaching practices that promote student learning and engagement
- iii. explore what academics engaging in a Learning Analytics adoption strategy at USQ perceive are the benefits from adopting Learning Analytics and how they measure their own success

351

iv.   investigate which aspects academics engaging in a Learning Analytics adoption strategy at USQ identify as enhancing their adoption of Learning Analytics to inform and enhance their teaching practice

v.   uncover which design principles underpin a Learning Analytics adoption strategy in order to maximise the probability of effectiveness and wide scale implementation

The definition of Learning Analytics used throughout this study is "the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occur." (LAK11, 2011).

The research team requests your assistance because you have experience teaching within the Higher Education environment and using student data within a Learning Management System.

Participation

Your participation will involve active participation in a 6 month pilot implementation of Learning Analytics including:

- participating in a professional learning workshop facilitated by the researcher;
- contributing your thoughts and ideas in group discussions that will take approximately 1 hour of your time on 3-5 occasions during the pilot. The discussion group meetings will take place at times and places to be determined by the group;
- contributing your thoughts and ideas in individual discussions with the researcher that will take approximately 1 hour of your time on 3-5 occasions during the pilot. The discussion group meetings will take place at times and places to be determined by the group;
- implementing Learning Analytics into your course as part of your ongoing course development;
- providing feedback on the effectiveness of engaging in the study.

The focus of the meetings will be on how learning analytics can be used to inform your teaching practice to optimise your students' experience.

The role of the researcher will be to guide these discussions and support the processes that are followed by each participant.

The meetings will be audio or video recorded, depending on whether the meetings are conducted in person or via video link, and notes will be kept from each meeting.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You will be unable to withdraw data collected about yourself after you have participated in the discussion group. If you wish to withdraw from the project, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland

Expected Benefits

It is expected that this project will directly benefit you by delivering

- Increased knowledge of learning analytics and effective ways to use data from the LMS, leading to greater awareness of student learning and engagement
- Opportunities for networking and collaborating with other academic staff from across the university who have an interest in Learning Analytics
- Enhanced student learning and engagement, and teaching practice

Risks

There are minimal risks associated with your participation in this project which may include:

- concern that responses may adversely affect relationships with colleagues; and
- time imposition in attending the meetings.

At the first meeting Guidelines for discussion will be disseminated and agreed upon by all members and participants will have the option to not participate in any given conversation or meeting if they have concerns. All discussion will be facilitated in a constructive and professional manner.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law.

Please note the following in regards to audio recordings from the meetings:

- The recordings and meeting notes will be retained for a minimum of 5 years and stored on secure USQ servers.
- All data from the meetings will be de-identified before dissemination and publication of any results.
- Data will be aggregated and compared across participants and direct quotes may be used if appropriate.
- Data collected during the study may be used to inform future research. Information gained during the study may be published, however data will not be identified and personal information will remain confidential.
- It is not possible to participate in the project without being recorded as this would present an incomplete view of the discussion groups.

Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in the first session.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

Sample Consent Form

The following is the consent form for Phase 3 of this study.

Consent Form for USQ Research Project

Project Details

Title of Project:	Using the Behaviour Change Wheel to design and test a Learning Analytics adoption strategy at a regional Australian university
Human Research Ethics Approval Number:	H15REA229

Research Team Contact Details

Principal Investigator Details	Supervisor Details		
Mrs Hazel Jones Email: Hazel.Jones@usq.edu.au Mobile: 0408830183	Dr Marcus Harmes Email: Marcus.Harmes@usq.edu.au Telephone: (07) 4361 2317	Dr Katie Burke Email: Katie.Burke@usq.edu.au 0403 525 791	Dr Nick Kelly Email Nick.Kelly@qut.edu.au 0409 652 047

Statement of Consent

By signing below, you are indicating that you:
- Have read and understood the information document regarding this project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that the individual and group meetings will be audio recorded.
- Understand that you are free to withdraw at any time, without comment or penalty.
- Understand that you can contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au if you do have any concern or complaint about the ethical conduct of this project.
- Are over 18 years of age.
- Agree to participate in the project.

Participant Name	
Participant Signature	
Date	

Please return this sheet to a Research Team member during the first session of the discussion group.

Appendix B: Sample Interview Transcript

Cleaned transcript from final individual consultation with Jordan

Hazel: Basically, today is just a wrap-up. What, if anything, you've got out of this, what you've been able to do this semester and I do appreciate that it's been really difficult for you but obviously from what you've already said, you're happy that the nudges have worked.

Jordan: Yes, I think they seem to have.

Hazel: Yes, which is good because not everybody has said that.

Jordan: Well, when I've done it in the past I have had people saying, "Oh look sorry, I'm about to get into the course." and that, at this time, no one has responded specifically to the nudges but each time I sent something it did reduce the number of people that hadn't looked at the StudyDesk. It hasn't totally reduced it but then you've always got the, what I call, those angelic ones.

Hazel: Yes. Overall, have you used Learning Analytics more this semester?

Jordan: One of the things I did that you suggested was, because I've got on to StudyDesk is, wherever it is, Learning how Academics Work tutorial and quiz, that you said to, before the exam, I started getting queries about, "Oh where do I find my exam centre?" and all that thing and that is embedded in that tutorial and quiz. I sent out a messaging saying, "Remember, you did that. That includes information on applying for deferred exams." and then after that, I didn't get any more requests about, "How do I get deferred exams?" I thought that was really helpful.

Hazel: That reduced your workload-

Jordan: Yes, yes.

Hazel: -in that area? Yes. That's really good. I'm just trying to find the questions that I've asked everybody else in these meetings. That's right. I'll keep going. What are the particular analytics that you've used in your site?

Jordan: Just really viewing because I had that issue where I talked to ICT without getting any great resolution about the analytics for the quizzes but

that wasn't able to be resolved. They couldn't work out how you could get the analytics in past semesters, yes. That would've been helpful, although just because students found it difficult, doesn't mean it's bad but it would have been interesting to review the ones it triggered.

Hazel: Yes. Now, this is one of the problems, that there's not enough information yet about it. Who did you actually talk to? Can you remember?

Jordan: I talked to a few people. There's one guy, could've been Michael someone but it may not have been but he was most helpful but he got back to me to say, "We couldn't do it yet."

Hazel: When I was still on staff here, we were doing a project. We were looking at past analytics and we did it as a pilot and they came up with lots of visualisations and things looking back at past analytics from past semesters and the data's still there and he used to be BSMI, well BSMI but they've changed their name but if you look up xxx, you'll find him in there and he may be able to give you a bit more information about it.

Jordan: Because I do use the same database with a few different questions that- I think I've refined it fairly well in that I didn't get any queries this time saying that my answer was right and your answer was wrong.

Hazel: Yes [laughs].

Jordan: I did look at a few, that I could get analytics. I looked at a few that way but, yes. Yes, it'd be nice to have a sweep of the database. Do you want me to go-

Hazel: I was going to say, you should be able to go back to previous semesters.

Jordan: Well, this has got it in now because we've done the tests [crosstalk]. These analytics, will they actually--

Hazel: I think you've got to go-- to view the quizzes data you have to go into the quiz first.

Jordan: Okay.

Hazel: Which again is just another step and then, if you go to quiz administration and look at reports, or is it results. Go to responses and just click *Show Report* and you can download this. This shows you each student then what grade they got and then their responses for each question.

Jordan: Yes, but then they all got different--

Hazel: This is why you sometimes need to download it because they've done them in a different order.

Jordan: There's 80 questions from the database.

Hazel: Yes. What exactly was it you're trying to see again? Can you remind me?

Jordan: Which questions everyone got wrong or--

Hazel: Okay. I'll back up and go back into the *Quiz Administration* right at the top. You all right? Go to *Results* again and go to the one underneath it, *Statistics*. When it's ready to think about it and if you scroll down. This now does actually pick up each question but you'd have to click on it to see which question it is but these will tell you. This one was 67. About 67% of them got it right. A standard deviation--

Jordan: That only gives you 15 questions and not the 80.

Hazel: Okay. That is a waste of time, yes.

Hazel: One of the questions that I have about the study. I noticed that you didn't get a chance to go on to the support side.

Jordan: Yes, yes.

Hazel: Now, I'm going to ask you to do it at least once because this is our final questionnaire.

Jordan: Okay.

Hazel: Just for the final feedback. I don't want to repeat those questions now but I'll show you how to get into it before we disappear. The question is why-

Jordan: Why didn't I?

Hazel: -yes. [chuckles]

Jordan: Because I was teaching both courses and I just couldn't [crosstalk].

Hazel: That is fine. It's the same with everybody. Making the time and all the other priorities.

Jordan: It's the first six weeks of semester. I teach three days. One day in Toowoomba, one in Springfield and then Course yyy here and then after that six weeks then everything supposedly gets better but there's so much admin stuff. I don't know. And then the mum thing happened then my last two weeks this semester were just gone [crosstalk].

Hazel: Yes. All the way through this, there is no judgement. It's just how can someone in the type of role I used to have, better support people to bring it into and make it part of what you do on a regular basis. Thinking about that, what would still be the barriers for you for using Learning Analytics and has it changed from being part of this?

Jordan: I suppose the barriers are just in terms of understanding and if I'd actually got onto the site, it would have helped but I still don't think I have a basic understanding of it. I would really love when we eventually get data on who listens to what part of the lecture in the way that you can access all that information, that'd be really interesting particularly just for general things like even-- I know the feedback's anonymous but I always find it troublesome that people are evaluating you on your teaching when they haven't listened to a lecture. Not that that would tell you that but, I mean, it would be interesting to know whether people started it or-- particularly with first year, first semester. I mean, someone wrote to me earlier in the semester and said, "Are these available in MP3 format because I want to listen to the lectures when I'm walking the dog?" And I said, "Please do not listen to the lectures when you're walking the dog. Sit down at your desk, get a notebook, and write. Active listening, you're not going to learn whilst you are walking the dog. And she was like, "Oh, thank you for that. I didn't really understand how to study." It's got nothing to do with Learning Analytics, I'm sorry.

Hazel: No, but it does because it's showing you-- I mean, and yes, it didn't necessarily come from the analytics but it's because you had the conversation with the student and it's the same thing with me having a conversation with you triggers something, and it's the same as you having that conversation with a student. It's all about helping them know how to learn and that really is what we're here for, we hope, is to help students learn. Yes, do you want to just for a minute go back up to the USQ Analytics , it's under course administration, in the reports and just tell me what that's telling you. Is it what you were expecting? Is it different to--? When it decides to think [crosstalk]. No, It's just thinking. Too many people putting grades in today.

Hazel: So would these things where there's nobody looked at them, I think that they'd be hidden.

Jordan: There are things that are hidden. For instance, this was something I added in this term about how to use a question and answer tutorial booklet, how to make use of that for the exam. I mean, I think it's really disappointing that everyone didn't open that. A past exam paper and examples of answers. This is just basic stuff.

Hazel: Yes, and it would be interesting if you can do it to have a look--

Jordan: At who didn't?

Hazel: If you tick both of those, you could see whether it's the same people who hadn't yet.

Jordan: Probably. It would be interesting to see what their result was, yes.

Hazel: Exactly, yes. And that's the sort of thing you can use that makes you say, "The people that didn't read this didn't do as well as the people who did," and so you're using it to-- it's not much use for the people this semester obviously but you can use it in-- I think you still have to do it here, don't you? What you've used from student feedback to [crosstalk]--

Jordan: Oh, they're bringing it in so everyone is sort of resisting as much as we can.

Hazel: Yes. Why do you think there's a resistance?

Jordan: I don't know. Is this what you're talking about. On the StudyDesk for the new semester, there's feedback about how they've improved it based on student feedback. Well I mean, how relevant is that for the current students? I have real problems with student feedback I must say and I'm going to write a paper for this likely in September on that because I just think the longer I'm here, the worse--

Hazel: Look, you're not going to get any argument from me but sometimes the written feedback, you can see whether it's just a grumpy student or if it's a consistent comment that's being made, then it may be something to look at. This is slightly different but it's doing the same sort of thing that we say, "Based on results from last year and student interaction with the site last year, I can tell you that those people that didn't look at this-- so I strongly recommend that you do use this. It's there for your benefit."

Jordan: You can say in the course leader's messages and you can stay on the lecture and then with the lectures, listening to the lectures, how can you pass a course?

Hazel: Do you have any on-campus at all for this one?

Jordan: Yes. That would reduce it of course and that's why you're never going to get 100% but I reckon there is going to be a drop-off over the semester. It always seems to be less people looking at it.

Hazel: Yes, and that's not a breadth that we've looked at with everybody. If you go up again to the top and under the reports if you chose *Statistics*. I will leave everybody with having access to the support side and details of all of those reports and how to use it are in there. For this one, if you choose here, change that to students and just for some reason-- that one, yes. For now, just go back four weeks because the problem with this report is that after four weeks, it aggregates it to a weekly thing. We'll look at two levels of it and then if you just click view here-- No, this is for grad side. Okay, because we're at the end of the semester-- When was the exam?

Jordan: On the 14th.

Hazel: Yes, that's the day before. It was when everybody-- and there was a bit of activity in the discussion forum and I'm assuming this is when the assignment was due?

Jordan: That's the online test, yes.

Hazel: Yes. You can see this is only over four weeks but it's a daily thing and you can see that apart from those peaks, yes, they started ramping up a bit again here ready for the exams and obviously it's dropped right off. Now, if you change that four weeks back to three months, which takes you almost all the way to-- it aggregates it, as I said, onto a weekly feed but you can see that that was first assessment.

Yes, it's dropped off, come back up before but overall-- there's a bit of a trend downwards but overall that trend downwards isn't too bad. Yes, it just gives you a little bit more of that picture of where they are and obviously here it's not quite as big as you say you've had some drop off even around the assessment time they haven't been quite as engaged. It just gives you a bit of an overall picture of what they've been doing and that's pretty typical of most courses, you've got that drop-off. Would that be what you were expecting to see?

Jordan: No. [laughs]

Hazel: You would have expected more or less?

Jordan: I would've thought more.

Hazel: So, how many students in the course?

Jordan: It's about two hundred and, well, technically 260.

Hazel: So, each week, going backwards, 260 on average, it's about 10 views, which is clicks basically, per student per week. And here where they're-- posts to the discussion forum, but also posts to the assignment or something like that, so that's recognizing every time they've answered a question on the quiz. So that's what that's picking up.

Jordan: Right.

Hazel: A lot of time, on the site there but overall it's not-- this gives you that extra level of detail from the USQ Analytics which just says, "Have they looked at it at some point in time, or not?" whereas this one is telling you when people- this one isn't attached to a single person, but if there was a particular student you wanted to look at-- No, I don't think you can from this page, can you? You've got to choose *All Students*, you can't choose a particular student, but if you wanted to go to, for example, if you go to *Participant List* and click on any of the students-

Jordan: So if I pick an external? This one, I know she's online.

Hazel: Okay, so now if you go to her *Statistics* and you click on that there--

Jordan: She's a really good student.

Hazel: You'll see, again, this is now aggregated at a monthly level. So, she's been fairly active and if you go back one level and look at *Complete Report*, this will tell you exactly what they've looked at and how many times they've looked at it.

Jordan: Okay.

Hazel: I think its-- or when they last looked at it - so there's still some things here, well if she's a good student you wouldn't be expecting her to look at assignment extensions.

Jordan: But she's not looked at the exam paper but she's looked at that-

Hazel: And looked at it three times.

Jordan: And she's looked at that.

Hazel: Wow, that was way back in February.

Jordan: Ah, straight away, I can get an idea of what she's been looking at for the semester. You could make all sorts of conclusions. The fact that is she's looked at the exam paper very early on-- she wants to know, so this can give you-- and a lot of people use this page, particularly if they're borderline students, or a student is complaining and things like that, you can get at that information for everybody.

Hazel: Again, there's multiple ways you can get at it, so anywhere you click on the student's name, you'll be able to get this straight to *Participant List* or if you're on one of the reports where their name comes up, you click on their name you can get to all of this. And that one's the *Complete Report*.

Jordan: So, she's looked at all the lectures as they've gone so to say.

Hazel: But she hasn't gone back to them for revision, so maybe she didn't need to, whereas other students may have gone.

Jordan: But she didn't look at the tutorial questions and answers which when I do that data last time, I found that less people looked at those than looked at the recorded lectures which doesn't make sense because it's just one PDF document and this time I said "This is so vital that you look at these and use these for revision.' and yet--

Hazel: But it's only that week probably because here she did.

Jordan: Right.

Hazel: It's up and down. Maybe they are the weeks that she came to the tutorial.

Jordan: No, she's in WA.

Hazel: Oh yes, of course, you said that. Are there any other students in WA?

Jordan: I'm not sure, I just know because she did the Zoom thing for course yyy

Hazel: I know from a past experience in another University, I'm looking at something like this, they're only looking at things every now and again, but what we found out it was a cohort at one of the remote campuses and week one, Jordan would go in and download everything and share it, week two it was Hazel's turn to go in and download and they actually built up a very strong learning community within the students but from looking at something like this,

Jordan: It would say are there any random

Hazel: Yes, there's always different stories that you could put on there, but at least it's a starting point to see what people are doing.

Jordan: Let's just bring in this part.

Hazel: So she's not someone who's gone back to things a lot, but it could well mean that she's downloaded them and is looking at them offline.

Jordan: Or just listens to them like an internal student and then has her own notes.

Hazel: I might even do that, as you said, there's a lot of the different barriers, still. Have you had any opportunities or occasions where you've talked to anybody else much about Learning Analytics?

Jordan: No, I showed earlier on when we were doing the pilot, I showed some of our zzz discipline people how to do it, and then when my colleague taught Course aaa, they checked who had not listened to the first lecture and sent notes to people like that and they had more responses than me. A lot of people sort of saying "Oh sorry and that and yea I'll get on to it".

Hazel: At the thing I was at on Wednesday a lot of it was around this sort of thing, and one of the comments was - there's good nudges and bad nudges, so it's a matter of how you word them and what you try to get out of it and everything and I think as a whole area of, the power of nudges negative or positive or everything that could come out of this, but that's a post Ph.D. thing.

Jordan: [laughs]

Hazel: [coughs]

Jordan: I just say, on the Learning Analytics available to me, it seems to indicate that--

Hazel: [coughs]

Jordan: If this is correct then you should consider-- we are now in week four so, drop the course if you're not going to do it--

[coughs]

Hazel: Basically, that's all I wanted to do today- to have a little look with you through a course, to get a bit of an aha moment. Or not an aha moment, is it more about aha moments or is it more about affirmation of what your gut was already telling you and I think often it is that.

But, occasionally people are picking up something different and it's the same what I'm looking at. What I'll do, I'll show you how to get into that StaffDesk, if you could just do that evaluation thing. If you go to *My StaffDesk* and if you just search Learning Analytics one should come up for you. Yes, that's this one. This is the survey that I want you to do at some point. In here, it's just a form and there's a bit of conversation about nudges happening there, and then later on glossaries, where I've been putting things up as I thought about them.

One of the things that we've talked about today is people to get to know, staff to get to know. I've put yyy's details in there,and all the educational designers who can help with any changes to course and things like that.

Jordan: Strategic, isn't it?

Hazel: Yes, vvv would say that's-- If you want to even say it came from me if not, that's fine. He knows who I am and what I'm doing. There's a couple of Moodle books, if you go back to course activity. I've set this up as much as I can with the same layout as a normal Moodle course would be. The Moodle analytics reports and tools, they're both books and tell you how to get into all of those reports and what they can tell you.

That was the workshop from the first one, Everybody I gave a private space, too, if they wanted to talk about anything. You can say that everybody's got one, but not what's going on in their area. That was basically-- You can see with yours, you can see more than you can see on the others.

Jordan: Yes.

Hazel: That's basically it, apart from me to say thank you so much particularly because you've been there for a long haul.

Jordan: [laughs] That's all right.

Hazel: I have but one more iteration to go over semester two and then it's just write, write, write. [laughs] I will let people--

Jordan: You've got so much stuff that you will get-- is there not too much to write up?

Hazel: Probably. Yes, and that's part of it at the moment, but also the survey and from the pilot, I'm writing a paper on that title at the moment. It doesn't really have much of the "So what?" at the end of it, which I'm trying to-- because it's the preliminary part of it, but there's enough for a whole paper there. Minus the so what, so on, still working on that piece. [chuckles]to try and put it all into one paper and, I mean yes, the thesis is going to be big. It's a matter of at what level of analysis do I do. Even from this phase, I think we've met three or four times, times six people plus the group discussions There's a lot of data for me to skim through and work out what it is.

There's some interesting stories coming out from it, and hopefully the idea of it at the end, or whether I can go back to USQ as a starting point and say, this is what the academics on the ground are saying about Learning Analytics. They want it pushed to them. They want to, they're interested in it, but you're just making it too hard for them. The data's not coming through in a usable format. Push it to us. They need support because they're so overloaded with everything else they don't have the time.

I mean, as I said, there's a whole heap of people in the university that have roles for the Learning Analytics, but it's not filtering down. That's one level of the thing and then the way that I've structured this semester's support and learning and I'll be adapting it slightly for next semester, and having it more like this, the one-on-ones will be more like this. The group ones, talking about their experiences and what they found useful and whatnot, and where there's similarities and synergies that people might be able to get together and talk more about and how that approach works much better than just having a workshop and then you're not using it for three months.

It's on how that can be adapted for, get the educational designers all being able to talk to you like this, and then having that approach of understanding what people's motivations are would be a wider thing. An even bigger wider

thing is looking at some of the things that people said, "It would be really good if this report, I could do this." Sending that to the USQ people but also sending it to the Moodle people and saying, "These are things that the people on the ground are saying they would like from your Moodle analytics, what are you going to do about it?"

If some of that changed, then there is a bit of impact. They'll say there's a lot of bits and pieces from it. I really, really appreciate all you've done. I'm going to press stop now.

Jordan: You could say that about the whole uni, there are all these people doing all these things, and none of them filters around?

Hazel: I'm not going to press stop for a minute. [laughs] Keep going.

Jordan: It's like we have the careers and employability section. Anyway, eventually they came to our school meeting and they've got all this stuff to provide to our students. Colleagues and I are meeting with them and now we're working with them, but there's this great resource that no one knew about. It's just that one person said, "Oh, we've got to go around the schools." They're right, but there must be thousands of people that are more professional staff than academic staff, doing all these wonderful things, but no one knows about it. [laughs] We should be the Vice Chancellor for a day.

Hazel: More importantly, the Vice Chancellor should do this job for a day so they can come and see and have the concepts. I'm sure they do sometimes.

Jordan: Oh, but only at such a high level that they get told what they-- I'm sure even the dean doesn't know this

[00:37:40] [END OF AUDIO]

Appendix C: Sample Report of Staff Interactions

This Appendix includes a sample report provided to participants in Phase 1 of this study. The reports included information on interactions with the course sites for other members of the teaching teams, however that detail is not discussed further in the body of the thesis as it does not add to the narrative of this study. The information was provided to participants for completeness of information.

Report of Staff Interactions with LMS for Coursexxx S1, 2016

Prepared for Course Examiner

By Hazel Jones

May 2017

Overview

This report provides details of the interactions of yourself, as Course Examiner, and other teaching staff with the Moodle StudyDesk for Semester 1 2016.

The intent is to provide you with information and data that you can use to inform and enhance your teaching practice and course design for future iterations of this, and other courses.

It is acknowledged that every course and Course examiner have their own unique context that influence the way in which you interact with StudyDesk and your students. This report is presented as one component of my PhD research and is intended to be read in conjunction with a conversation with myself in regards to interpretation of the results and possible actions that you may choose to take as a result of that conversation.

Course Examiner Time on Site

Total time on site for Course examiner was 74 hr and 24 min, with 87% being conducted in normal working hours. The most time spent online on a single day was 4 hours and 5 min (13th June). There were a total of 80 days when the Course Examiner logged on to the StudyDesk and for over half of these the number of daily sessions was less than 4, although the maximum number of sessions was 13. This data suggests a deliberate approach to engagement with the StudyDesk.
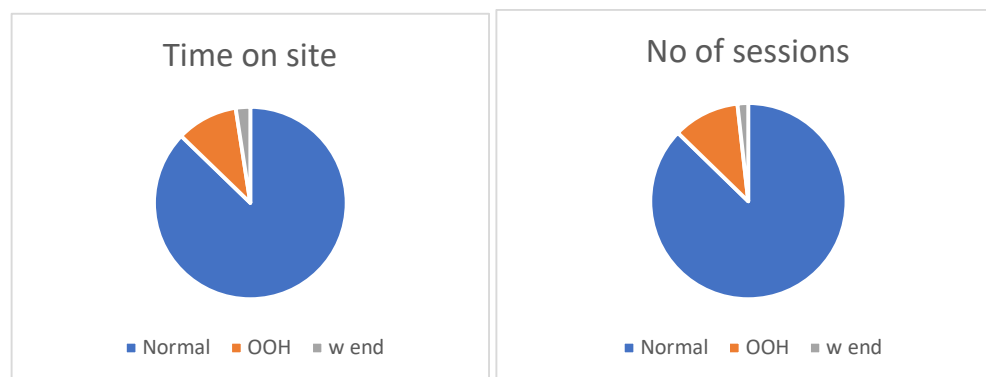
Normal – normal working hours, OOH – out of normal hours on week days, w end - weekend

Course Examiner Time on site
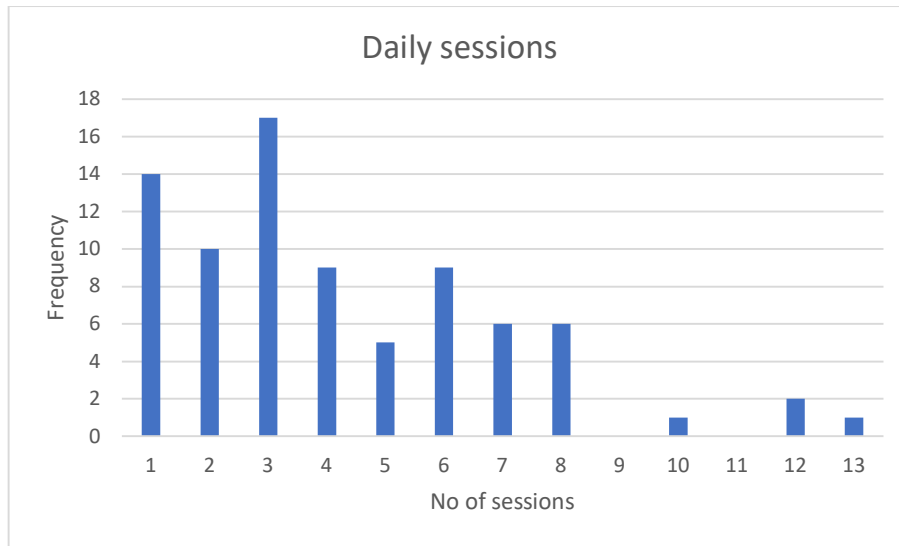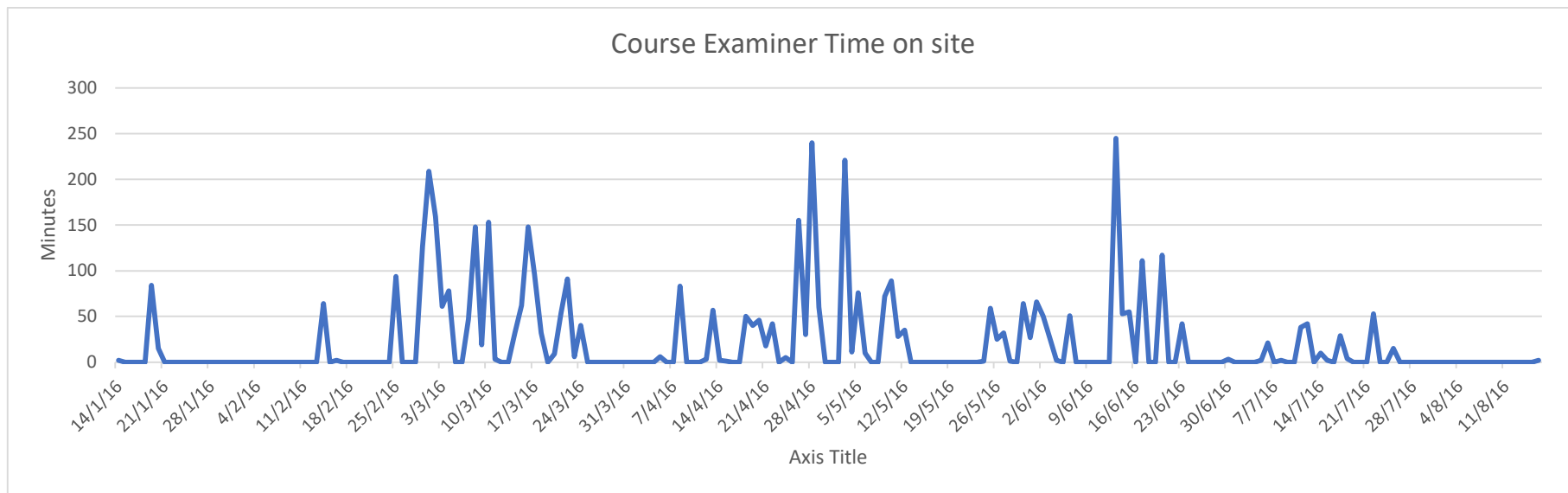
Types of Interactions

Which of these visualisations makes more sense to you?

Task type

■ edited	■ Reset	■ Removed	■ Added
■ Downloaded	■ Searched	■ Started	■ Granted
■ Reviewed	■ Deleted	■ Unlocked	■ Uploaded
■ Created	■ Updated	■ Graded	■ Viewed

No of clicks

Examiner Interactions
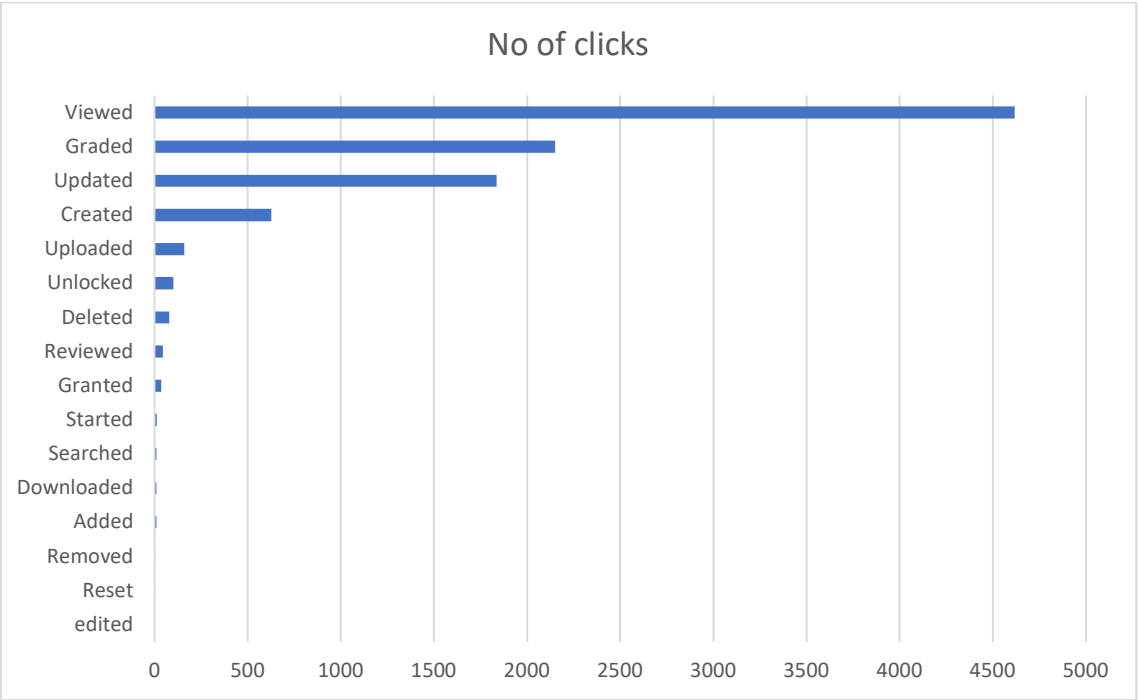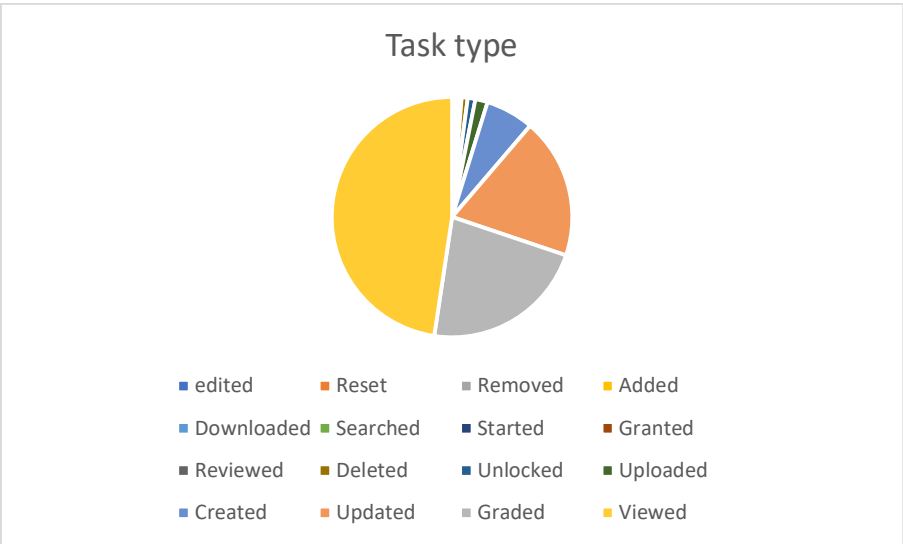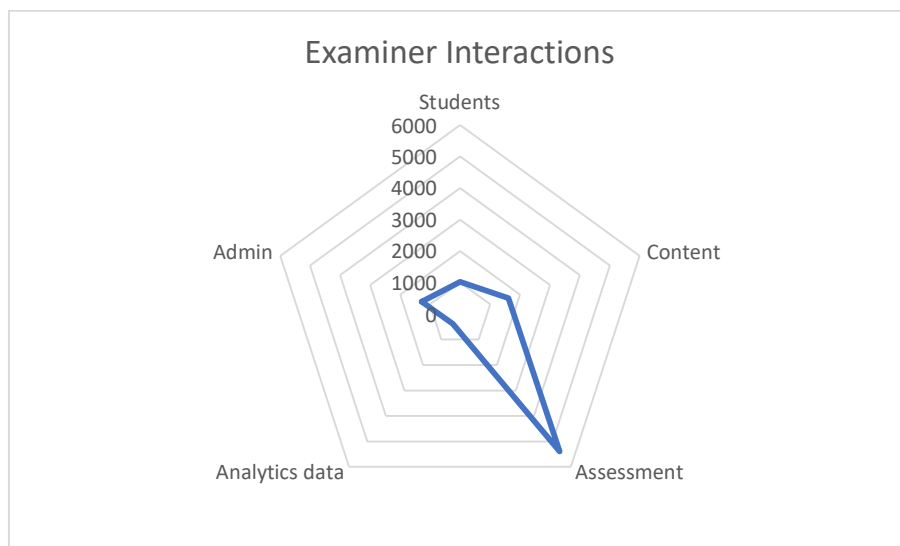
Together this data suggests that there was a strong focus on assessment and content with little interaction with students.

Other Staff Time on Site

In addition to the Examiner, the Course Moderator was the most active person on the StudyDesk with the majority of their interactions concentrated around the months of May and June

There were four active markers with Marker 2 being much more active, and they seem to have a much larger workload of assignments to assess.

There were also three members of the teaching team who were largely inactive on the site – Course leader and two team members having a maximum of 3 days on the site each.

Moderator time on StudyDesk

Marker tasks

Types of Interactions

Overall interactions - all staff
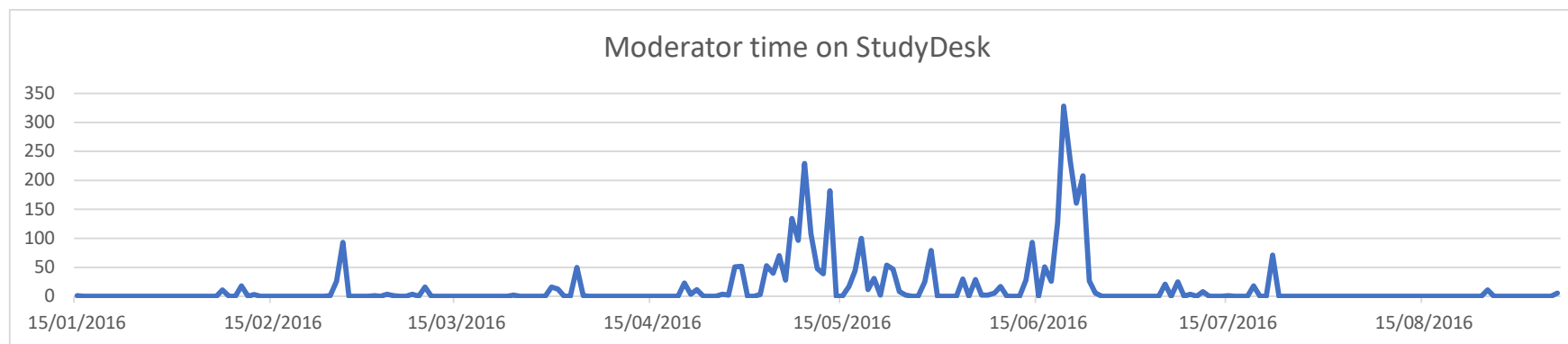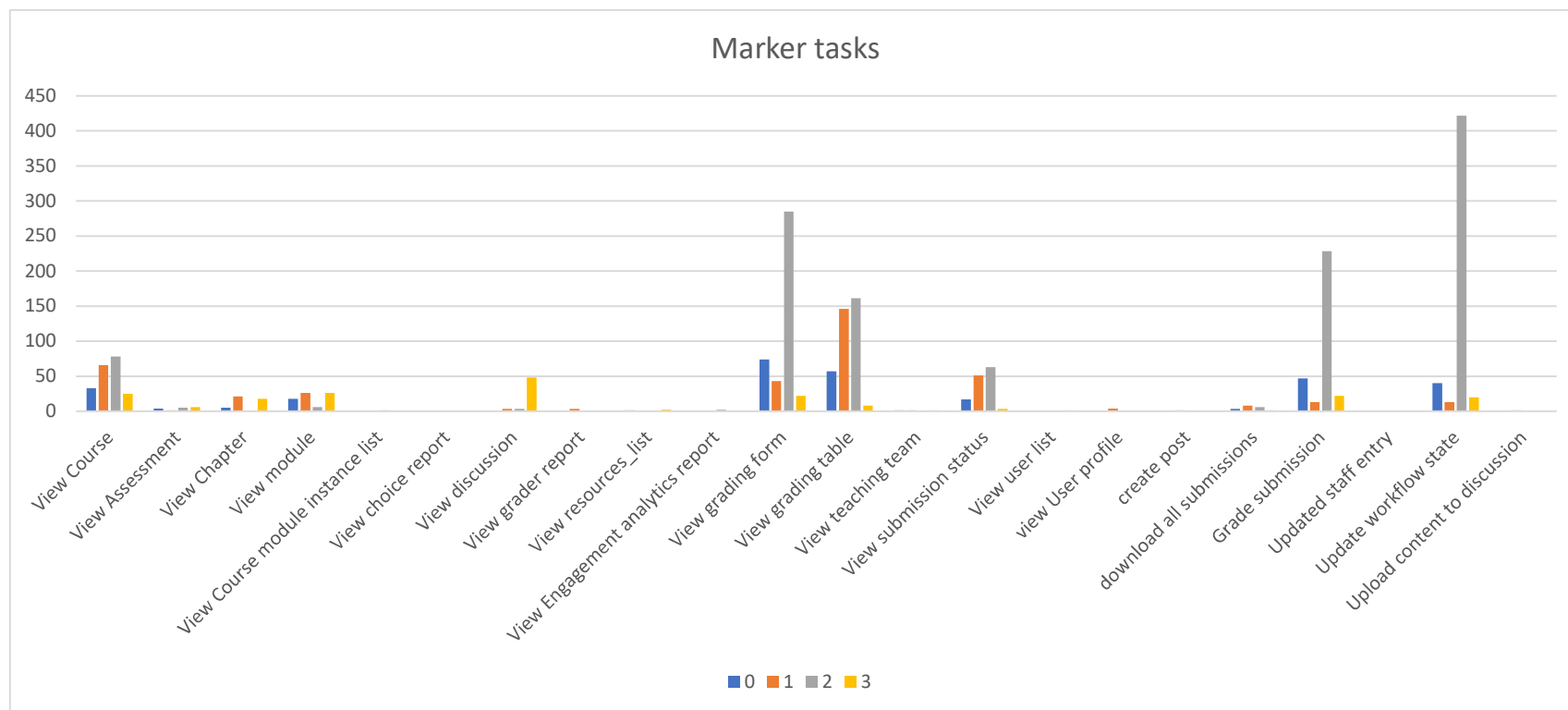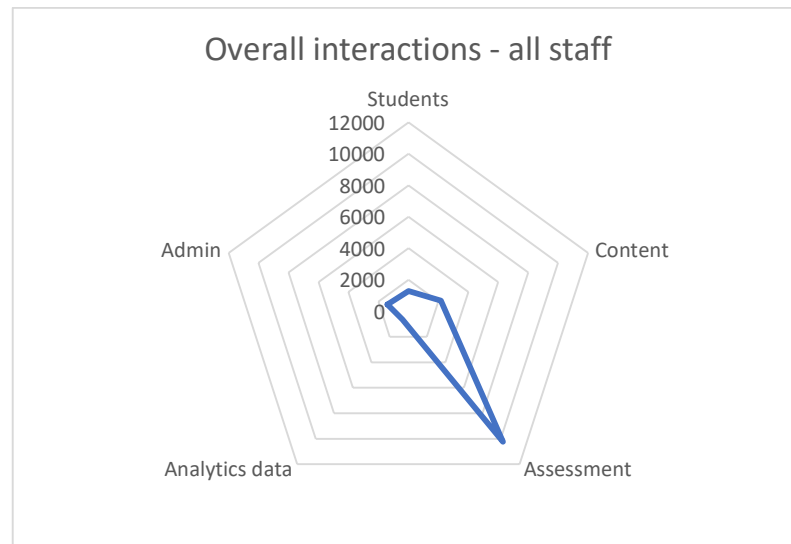
Possible actions

Consider ways to increase visible teacher presence, possibly through specific use of discussion forums to promote collaborative learning

Questions

Comparative roles of examiner/moderator

Would weekly breakdown of tasks be useful

Role of discussion forums ?? any weekly announcements

Appendix D: Survey Instrument

The following is the survey instrument developed in Qualtrics and disseminated to target staff by email. Please note that as the survey has been developed in Qualtrics and some formatting has not transferred to this word version. Please also note that the second survey referred to in Q 16 on page 411 was not conducted due to changes to the approach in this study.

The Impacts of Implementing Learning Analytics in Different Higher Education Discipline Groups

Principal Investigator: Mrs Hazel Jones

Thank you for participating in this online survey that aims to better understand how Learning Analytics implementation impacts upon staff beliefs, attitudes and intentions towards Learning Analytics and considers the links between these characteristics, group culture and teaching practice.

The online survey comprises 19 questions and will take approximately 30 minutes to complete. Clicking on the 'submit' button at the completion of the survey is accepted as an indication of your consent to participate. If you decide to take part in the survey and change your mind prior to clicking 'submit' you are able to withdraw from the survey at any stage by closing your browser window. Due to the anonymous nature of the survey, any information obtained in the survey cannot be removed or destroyed from the data analysis process after you have clicked the 'submit' button.

If you would like any further information about this research project, please contact the Principal Investigator:

Mrs Hazel Jones

Australian Digital Futures Institute - Level 3, Y Block, University of Southern Queensland, Toowoomba 4350

Email: hazel.jones@usq.edu.au

Telephone: (07) 4631 2325 Mobile: 0408830183

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au.

Throughout this survey the following terms and meanings are used:

Learning Analytics: the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs (LAK11, 2011).

Learning Management System: Moodle component of USQ StudyDesk

LMS and other educational technologies

These questions are designed to investigate your current use of the LMS and other educational technologies in your learning and teaching role at USQ

1. Do you have a teaching role at University of Southern Queensland?
2. What broad teaching activities do you conduct within the Learning Management System? Please select all responses that apply.
❑ I don't use the Learning Management System for my teaching
❑ Provision of learning materials and resources
❑ Assessment submission
❑ Assessment feedback
❑ Learning focused interactions between myself (or other lecturers/tutors) and students
❑ Learning focused interactions between students
❑ Other - please list _____

Knowledge and usage of Learning Analytics

These questions are designed to investigate your current knowledge and use of the learning analytics within the LMS in your learning and teaching role at USQ.

3. Within the LMS there are a number of tools and reports that provide information about students' progress and usage. The following list

includes common tools which are available at USQ. For each of the tools and reports listed below please indicate your level of knowledge of the tool or report by choosing one option for each of the tools in response to the statement "I am aware of how this tool can be used to give me information about how students use the LMS"

	I don't know anything about this	I have seen this but know nothing about it	I have seen this and have a vague understanding of this	I have a general understanding of this	I have a good understanding of this
Participant list	○	○	○	○	○
Log data	○	○	○	○	○
Gradebook	○	○	○	○	○
Activity report	○	○	○	○	○
Course participation	○	○	○	○	○
Statistics	○	○	○	○	○
Engagement analytics	○	○	○	○	○
Progress bar	○	○	○	○	○
Quiz results	○	○	○	○	○
Quiz responses	○	○	○	○	○
Quiz statistics	○	○	○	○	○

4. For each of the tools and reports listed below please indicate your level of usage of the tool by choosing one option for each of the tools.

	I have never used this	I rarely use this	I occasionally use this	I use this most times that I access the LMS	I use this every time I access the LMS
Participant list	❍	❍	❍	❍	❍
Log data	❍	❍	❍	❍	❍
Gradebook	❍	❍	❍	❍	❍
Activity report	❍	❍	❍	❍	❍
Course participation	❍	❍	❍	❍	❍
Statistics	❍	❍	❍	❍	❍
Engagement analytics	❍	❍	❍	❍	❍
Progress bar	❍	❍	❍	❍	❍
Quiz results	❍	❍	❍	❍	❍
Quiz responses	❍	❍	❍	❍	❍
Quiz statistics	❍	❍	❍	❍	❍

5. Please indicate your level of confidence in your ability for each of the following tasks, by choosing the appropriate scale for each of the statements

	Strongly Disagree	Disagree	Neither Agree nor disagree	Agree	Strongly Agree
I am confident in my ability to access appropriate student data from the LMS					
I am confident in my ability to interpret student data extracted from the LMS					
I am confident in my ability to implement appropriate actions based on interpretation of student data					

6. Please indicate your level of interest in each of the following reasons for using student data within the LMS

	I am not interested in this	I am interested in trying this	I already do this
Checking student results in gradebook	○	○	○
Analysing individual student results in quizzes	○	○	○
Analysing cohort results for individual questions in quizzes	○	○	○
Identifying students who have not accessed Study desk	○	○	○
Identifying students who have not accessed particular resources or activities	○	○	○
Analysing number of discussion forum posts	○	○	○
Analysing content of discussion forum posts	○	○	○

Analysing amount of time students spend in the LMS	○	○	○
Analysing number of times each week students use the LMS	○	○	○
Identifying resources and activities that students do not engage with	○	○	○
Using student data to predict student success	○	○	○

7. Please indicate the extent to which you disagree or agree that the following factors impact your current knowledge of learning analytics.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Lack of training	○	○	○	○	○
Lack of institutional guidelines	○	○	○	○	○
Lack of support	○	○	○	○	○
Lack of interest	○	○	○	○	○
Time constraints	○	○	○	○	○
Competing priorities (include details)	○	○	○	○	○
Other (include details and rate)	○	○	○	○	○

8. Please indicate the extent to which you disagree or agree that the following factors impact your current use of learning analytics

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Lack of knowledge	○	○	○	○	○
Lack of appropriate skills	○	○	○	○	○
Lack of institutional guidelines	○	○	○	○	○
Lack of support	○	○	○	○	○
Lack of interest	○	○	○	○	○
Time constraints	○	○	○	○	○
Competing priorities (include details)	○	○	○	○	○
Other (include details and rate)	○	○	○	○	○

Beliefs, attitudes and intentions

These questions are designed to investigate your current beliefs and attitudes about, and intentions towards, the use of learning analytics within the LMS in your learning and teaching role at USQ.

9. Please summarise your opinion on using learning analytics.to inform your teaching practice.

    _____

_____

_____

10. Please indicate the importance, to you, of each of the following aspects of accessing student data.

	Not at all Important	Slightly important	Moderately Important	Extremely Important
Knowing what student data is available	○	○	○	○
Being able to easily access the data in a format I can use	○	○	○	○
Having access to a consolidated information from a number of sources and systems about my students	○	○	○	○
Having easy access to graphical representations of data	○	○	○	○
Having access to professional development in regards to accessing learning analytics	○	○	○	○
Having support for accessing data	○	○	○	○

Support for analysing and interpreting data	○	○	○	○

11. Please indicate the importance, to you, of each of the following aspects of support for using student data.

	Not at all Important	Slightly important	Moderately Important	Extremely Important
Professional development in regards to understanding learning analytics	○	○	○	○
Support for accessing data	○	○	○	○
Support for analysing and interpreting data	○	○	○	○
Support for contacting students identified as at risk of not satisfactorily completing course	○	○	○	○
Policy on ethical use of student data	○	○	○	○
Guidelines for ethical use of student data	○	○	○	○

12. I intend to use learning analytics within the next twelve months
- ⭕ Strongly disagree
- ⭕ Disagree
- ⭕ Neither disagree nor agree
- ⭕ Agree
- ⭕ Strongly agree

13. Please indicate your level of disagreement or agreement with each of the following statements in regards to using learning analytics for informing your teaching practice.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
My use of learning analytics will be a rewarding experience for me	○	○	○	○	○
My use of learning analytics will be beneficial for me	○	○	○	○	○
My use of learning analytics will be beneficial for my students	○	○	○	○	○
My use of learning analytics will be beneficial for the university	○	○	○	○	○

14. Please indicate how influential each of the following factors would be in determining your future use of learning analytics.

	Not at all influential	Slightly influential	Moderately influential	Very influential
Directive from management	○	○	○	○
Workload allocation for engagement with learning analytics	○	○	○	○
Training in developing skills for effectively using learning analytics	○	○	○	○
Policy and guidelines on use of learning analytics	○	○	○	○
Availability of support staff to help me use learning analytics	○	○	○	○
Other - please list	○	○	○	○

15. This survey will be followed up with a second survey in 18 months and the following question is used to provide a unique identifier which will allow comparison of an individual's responses whilst maintaining anonymity.

Please provide your mother's birthday plus first three letters of your street address (eg Mothers birthday 9th July, I live on Mary St – 09MAR)

_____

Demographics

The following questions are designed to gather some basic information about you and your role at USQ.

16. At what academic level are you primarily employed? (If you have multiple jobs with different levels, please select the level for the job in which you spend the greatest proportion of your time.)
   ○ Tutor
   ○ Associate Lecturer
   ○ Lecturer
   ○ Senior Lecturer
   ○ Associate Professor
   ○ Professor
   ○ Other - please provide details _____

17. On what basis are you primarily employed? If you have multiple jobs with different levels, please select the one for the job in which you spend the greatest proportion of your time.
   ○ Casual
   ○ Part-time
   ○ Full-time
   ○ Consultant
   ○ Other - please provide details _____

18. For how many years have you worked in the higher education sector and for how many years have you worked for USQ?

	Less than 18 months	18 months - 5 years	6-10 years	11-20 years	More than 20 years
Working in the Higher Education Sector	○	○	○	○	○
Working at USQ	○	○	○	○	○

19. In what modes do you teach? Please select one response that best describes you.
○ I teach only on-campus students
○ I teach only online students
○ I teach a mix of online and on-campus students

Thank you for completing this survey, I remind you that clicking on the submit button below is an indication of your consent to participate in the study.

Appendix E: Demographic Details of Schools in which Survey Participants Taught

A further question asked staff to nominate in which academic school, or unit they worked. At the time of the survey USQ had two faculties – Faculty of Business, Education Law and Arts (BELA) and Faculty of Health, Engineering and Sciences (HES), each with six schools. There was wide distribution of respondents across the schools, as shown in Table A1. In addition, this question was a free text response which meant that respondents were not always specific with three respondents only noting their faculty (*one Business, Education, Law and Arts, and two Health, Engineering and Sciences*) and there were three responses noting *Curriculum and Pedagogy, Teaching & Learning and Higher Education* respectively and it was not clear if these respondents were from the relevant School or the central learning and teaching group. One respondent noted that they would not answer this question, possibly due to concerns this would identify them, and one person responded *na..* It can thus be seen that there were respondents from across all areas of the university. Due to the small numbers for each grouping it was resolved to only conduct analysis at the whole of university level.

Table A1

Discipline/School Groupings

Discipline Grouping	Schools	Number of respondents
	School of Arts & Communication	9
Creative Arts, Society and Culture	College for Indigenous Studies, Education and Research, Digital Learning Lab, Open Access College English Language and Pathways Programs	0
	School of Commerce,	9
Management, Commerce and Law	School of Management & Enterprise	2
	School of Law & Justice	2
	Business	1
Education	School of Teacher Education and Early Childhood, School of Linguistic, Adult and Specialist Education	14
Engineering Built Environment and IT	School of Civil Engineering & Surveying, School of Mechanical & Electrical Engineering,	2
	School of Agricultural, Computational and Environmental Sciences	13
	School of Nursing & Midwifery	3
Sciences and Health	School of Health & Wellbeing	1
	School of Psychology & Counselling	4

Appendix F: Accessing Learning Analytics Reports in LMS

Examples of the navigation paths academics need to follow to access different LA reports in the LMS. This shows that accessing the *Particpants* report is quicker and easier than some other reports. *Participants* report is visible on, and accessed directly from, the standard left hand navigation bar, located on each page of the LMS.
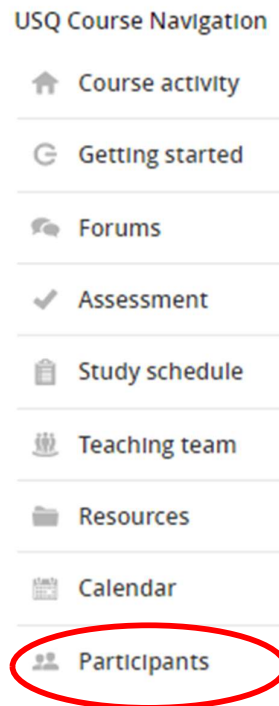
Conversely several other reports are not visible and require several clicks to access as per the steps below.

Step 1: Click on Course Administration link in top tool
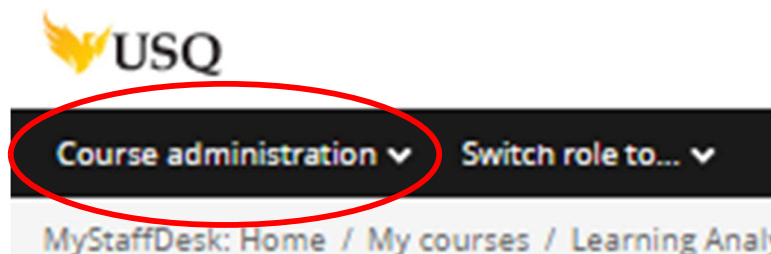
Step 2: Choose Reports option from drop down menu
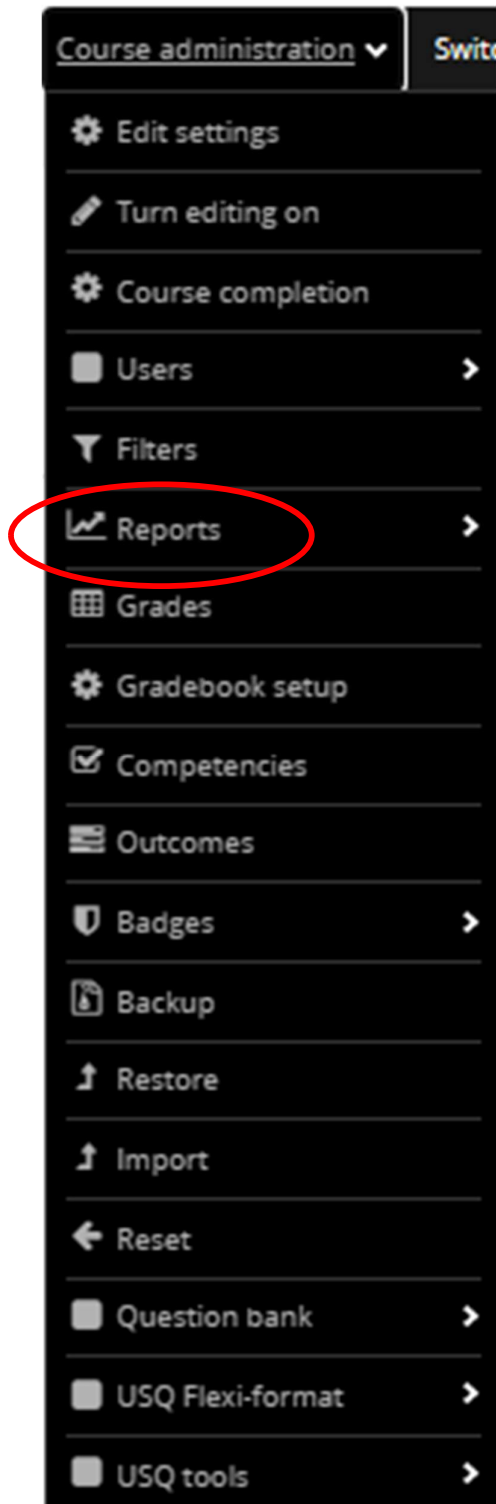
Step 3 Choose relevant report from the drop down menu
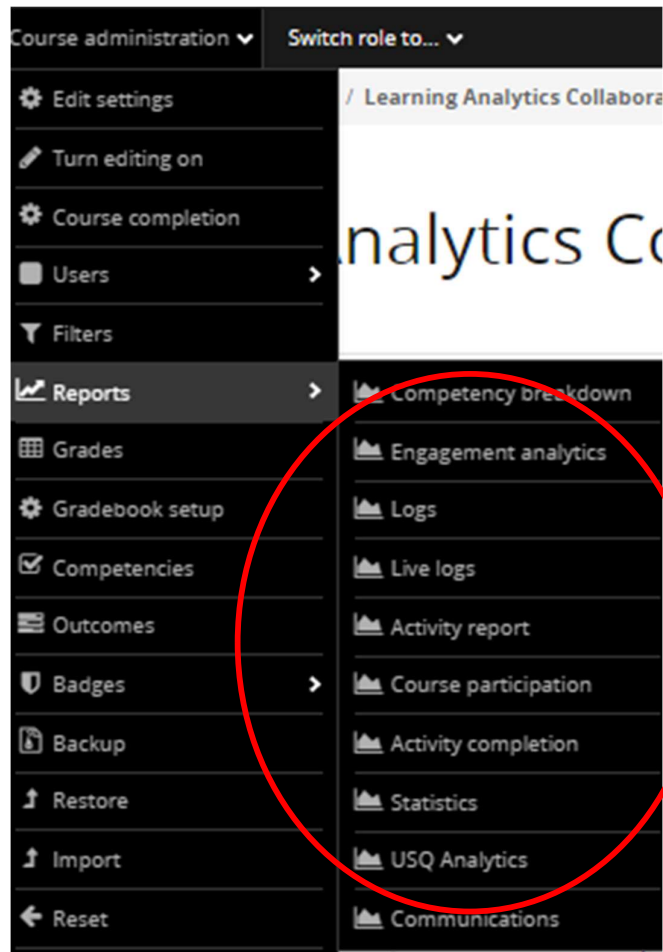
Appendix G: Participant Recruitment for Phase 1

The journey to inviting discipline groups to participate in the initial data gathering stage of my study began with email invitations to the Executive Deans of the two faculties at USQ, and from there took quite divergent paths. Both paths had their advantages and disadvantages in terms of ease of contact and reach of invitation and each resulted in two small groups joining the study.

The Executive Dean of Faculty A responded with a request for a personal meeting to discuss the study and the best way to engage staff from their faculty. At that meeting two discipline groups were nominated as possible participants with the Dean providing contact details of suggested "champions" for each of those groups and an undertaking to contact both of those staff members to introduce my study and requesting them to make contact with me.

The contact from Discipline A1 (who also holds a senior position in the faculty) contacted me by phone and we had a follow-up meeting with suggestions of staff who might be interested. Subsequent emails unfortunately did not result in any immediate participants for Semester 1 2016, however follow-up emails and a face to face meeting with 4 staff resulted in 2 staff joining the study from Semester 2, 2016.

Recruitment of the second group from Faculty A began with a telephone conversation with the key contact nominated by the Executive Dean and a subsequent presentation at a School Learning and Teaching forum. 3 staff members initially joined the study from this meeting, although one withdrew after 4 months, due to lack of time. Although other staff were invited to join via email, no further participants joined the study.

The Executive Dean from Faculty B forwarded the invitation to participate to all Heads of Schools and I was then able to follow–up with each of the schools. This invitation met with mixed reactions and I was able to speak at a Learning and Teaching forum for one school and a full school meeting at another school. The presentation at the Learning and Teaching forum resulted in two staff agreeing to participate, whilst the full school forum did

not attract any participants. The Learning and Teaching Coordinator for School B2 included the invitation to participate in their school learning and teaching newsletter and whilst initially this drew no response, I was approached after a few months by the leader of a subgroup of this school with an expression of interest. They discussed this with members of their sub-group and I followed up with an explanatory email and this resulted in three staff members joining the study. One of these members withdrew after four months as they changed roles within the university.

A summary of the recruitment process is provided in the following Figure.

Email invitation to Executive Deans

Faculty A
Personal Meeting

Discipline A1
Personal meeting

Emails to 6 nominated staff

2 positive responses, 1 response not teaching but will share email; 3 no response

Further follow-up resulted in 2 staff joining study as team A1

Discipline A2 contact
phone conversation

Meeting with Learning and Teaching committee and follow up email

3 staff accpeted invitation and became Team A2 (one member withdrew)

Faculty B
Email invitation to all staff & follow-up email to Heads of Schools

Responses from 5/6 HoS and several individual staff members

School B1
Meeting with Lerning and Teaching Committee

2 possible projects

2 staff accepted invitation and becamePt team B1

School B2 present at School forum - Feb meeting cancelled, presented at Mar meeting

School B3 - L&T Co-ordinator to inlcude in newsletter end of Feb

After some time approach made to me by leader of a subgroup in this school

Following invitations to subgroup 3 staff joined study as team B2

(One member later withdrew)

School B4 forwarded to Heads of Disciplines - no responses

School B5 general enquiry from HoS only

School B6 - interest from one individual staff member only

Appendix H: Calculation of Time on Site

This Appendix provides detailed information on the log data reports extracted and analysed during this study, and the methods followed for cleaning, organisation and categorisation of the data

Log data from Moodle is presented as a CSV file showing clicks with a time stamp and the action that was taken as per the extracted example below. For ease of analysis and comparison the csv files were all converted to Excel spreadsheets.

Event time	User index	User role	Event component	Event action	Event target	Event name	Context ID	Context name
20/07/2016 14:47	1	Examiner	core	created	course_module	Course module created	1040713	File: Powerpoint for Lecture 2
20/07/2016 14:47	1	Examiner	core	viewed	course	Course viewed	890675	Course: *xxx*
20/07/2016 14:47	1	Examiner	core	updated	course_module	Course module updated	1040669	URL: Article
20/07/2016 14:48	1	Examiner	core	deleted	course_module	Course module deleted	964385	
20/07/2016 14:48	1	Examiner	core	deleted	course_module	Course module deleted	964386	
20/07/2016 14:48	1	Examiner	mod_equella	viewed	course_module	Course module viewed	964378	eLOR Resource (EQUELLA): *xxx* Exam 2013
20/07/2016 14:48	1	Examiner	core	updated	course_module completion	Course module completion updated	964378	eLOR Resource (EQUELLA): *xxx* Exam 2013
20/07/2016 14:48	1	Examiner	core	updated	course_module completion	Course module completion updated	964378	eLOR Resource (EQUELLA): *xxx* Exam 2013

The description of each column was provided by ICT staff in an email (9/3/2017)

Each file contains these columns:

- Event time — the time the event was logged (timezone UTC+10).
- User index — an anonymous identifier of the user within the course. An identical user index in another file does not represent the same user.
- User role — the Moodle role(s) the user bears.
- Event component — the Moodle internal name of the plugin that generated the event.
- Event action — the event 'verb'.

- Event target — a thing the event occurred against.
- Event name — the descriptive name for the event.
- Context ID — the specific identifier of the thing the event occurred against.
- Context name — the descriptive name for the specific thing the event occurred against. If empty, then the thing no longer exists in Moodle.

For analysis, these fields are your ideal keys: User index, . vent component, Event action, Event target, Context ID."

Time on Site

The time on site was used as the basis for amount of interaction rather than the number of clicks as some automated actions, such as setting workflow for assignments display up to 20 clicks in the same minute. Additionally, Moodle only records the start time of a slick or session and not when a session is ended so time on site was calculated using the following criteria:

1. If there was one click only in a one-minute session this was recorded as 1 minute and one session
2. For multiple clicks in two consecutive minutes only this was recorded as 2 minutes
3. For multiple clicks over more than 2 minutes the time was calculated by subtracting the start time from the finish time of that session
4. If there was a break of 15 minutes or more a new session was recorded

Each of these criteria are shown in the following example

20/06/2016 15:46	1. One session of one minute recorded
3/07/2016 11:29	2. One session of two minutes recorded
3/7/2016 11:29	
3/7/2016 11:30	
7/07/2016 7:56	3. One session of 6 minutes recorded
7/07/2016 7:57	
7/07/2016 8:01	
7/07/2016 8:01	
7/07/2016 8:02	
7/07/2016 8:02	
7/07/2016 8:02	
7/07/2016 8:02	
	4. Break of 15 min so new session of 22 min
7/07/2016 8:17	recorded

```
7/07/2016 8:17
7/07/2016 8:18
7/07/2016 8:19
7/07/2016 8:19
7/07/2016 8:19
7/07/2016 8:19
7/07/2016 8:19
7/07/2016 8:20
7/07/2016 8:21
7/07/2016 8:21
7/07/2016 8:33
7/07/2016 8:34
7/07/2016 8:34
7/07/2016 8:39
7/07/2016 8:39
```

Additionally, if a session spanned both normal hours and out of hours work this was split into two sessions.

Number of sessions

Following the calculation method noted above the number of sessions for each day was also noted.

Days/time

A normal working week, defined by the Enterprise Agreement for academic staff is 8:00am-6:00pm Monday to Friday. Time on site and number of sessions were subdivided into three categories:

- Normal working hours: 8:00-6:00pm Monday-Friday
- Out of hours: before 8:00 and after 6:00pm Monday-Friday
- Weekends: Any time Saturday and Sunday

Appendix I: Activity Types

Activity types were extracted from the Event name column of the log reports and sorted into five categorised as discussed in Chapter 6. Over the duration of this Study the Moodle version evolved with some additional reports and activities being added and others removed. All activities are included in this Table with the additional Activity Types noted in Phase 3 indicated in italics. Only those activities that were recorded for one or more participants are recorded here.

Engagement with Students	Content generation	Creation and Marking of Assessment	Viewed Analytics report	Administration tasks
Badge awarded	A file has been uploaded	A submission has been submitted.	Activity report viewed	Book printed
Badge created	Calendar event created	*All Responses saved as text*	*All Responses report viewed*	Checked for problems
Badge criteria created	Calendar event deleted	All the submissions are being downloaded	Choice report viewed	Course module instance list viewed
Badge duplicated	Calendar event updated	An extension has been granted	*Communications report viewed*	*Course backup created*
Badge enabled	Chapter created	An online text has been uploaded.	*Completion report viewed*	Course restored
Badge updated	Chapter deleted	*Assignment override created*	Course activity completion updated	Course searched
Clicked join meeting button	Chapter updated	*Assignment override updated*	Course user report viewed	Discussion moved
Discussion created	Chapter viewed	*Attempt resumed*	Engagement analytics report edited	Mapping created
Discussion deleted	Content page viewed	*Auto-initialised assessment*	Engagement analytics report viewed	Mapping deleted
Discussion subscription created	Course module completion updated	Batch set marker allocation viewed	*Grade outcomes report viewed*	Print preview page viewed
Discussion subscription deleted	Course module created	Batch set workflow state viewed	*Grade overview report viewed*	Read tracking disabled
Discussion unpinned	Course module deleted	Comment created	Grade single view report viewed.	Read tracking enabled
Discussion updated	Course module updated	Created assessment entry	*Grade user report viewed*	*Repaired problem*
Discussion viewed	Course module viewed	Deleted assessment entry	Grader report viewed	Role assigned
Group assigned to grouping	Course section created	Feedback viewed	*Individual Responses report viewed*	Role capabilities updated
Group created	Course Section deleted	Grade deleted	Live log report viewed	Role unassigned
Group deleted	Course section updated	Grading form viewed	Log report viewed	Staff entry updated

Group member added	Course updated	Grading table viewed	*Non-respondents viewed*	*Step shown*
Group updated	*Entry has been created*	Phase switched	Outline report viewed	*Tour ended*
Grouping created	*Entry has been deleted*	Question category created	Participation report viewed	*Tour started*
Post created	*Entry has been updated*	Question created	Quiz report viewed	User enrolled in course
Post deleted	*Entry has been viewed*	Question manually graded	Recent activity viewed	User unenrolled from course
Post updated	Field created	Question viewed	Statistics report viewed	Viewed teaching team
Questionnaire previewed	Field deleted	Quiz attempt abandoned	User list viewed	
Response deleted	Field updated	Quiz attempt deleted	User log report viewed	
Response submitted	Folder Updated	Quiz attempt preview started	User profile viewed	
Some content has been posted	Introduction updated	Quiz attempt reviewed	User report viewed	
Subscription created	Item created	Quiz attempt submitted	User statistics report viewed	
Subscription deleted	*Lesson restarted*	Quiz attempt summary viewed	*USQ analytics aggregated course modules detail viewed*	
Wiki page created	*Lesson resumed*	Quiz attempt viewed	*USQ analytics course module detail viewed*	
Wiki page locks deleted	*Lesson started*	Quiz edit page viewed	*USQ analytics report viewed*	
Wiki page updated	*Notes viewed*	Quiz override created		
Wiki page viewed	Page created	Quiz override deleted		
	page deleted	Submission created.		
	page moved	Submission form viewed.		
	Page updated	Submission updated.		
	Record created	Submission viewed.		
	Record deleted	The allocated marker has been updated.		
	Record updated	The state of the workflow has been updated.		
	Study schedule updated	The status of the submission has been updated.		
	Study schedule viewed	The status of the submission has been viewed.		
	Tag added to an item	The submission has been graded		

	Tag removed from an item	The submissions have been locked for a user.		
	Template updated	The submissions have been unlocked for a user.		
	Templates viewed	Updated assessment entry		
	Week updated	User graded		
		Viewed assessment		
		XLS grade exported		

The following is the information shared with participants in the Expert Workshop as background information prior to their attendance at the workshop.

Expert Consultant Workshop Background Information

My Study

Title: Using the Behaviour Change Wheel to design and test a Learning Analytics adoption strategy at a regional Australian university

Research Aims:

i. Identify the enablers and barriers to adopting learning analytics to inform and enhance teaching practice for academics engaging in a Learning Analytics adoption strategy at USQ
ii. identify the opportunities and supports needed to enable academics to engage in an adoption strategy to use Learning Analytics to inform and enhance teaching practices that promote student learning and engagement
iii. explore what academics engaging in a Learning Analytics adoption strategy at USQ perceive are the benefits from adopting Learning Analytics and how they measure their own success
iv. investigate which aspects academics engaging in a Learning Analytics adoption strategy at USQ identify as enhancing their adoption of Learning Analytics to inform and enhance their teaching practice
v. uncover which design principles underpin a Learning Analytics adoption strategy in order to maximise the probability of effectiveness and wide scale implementation

Behaviour Change Wheel

The theoretical framework on which my study is based. Developed originally in the health and medical fields this provides a practical approach to designing interventions to change behaviours and is based on the premise that behaviour is determined by a combination of a person's capabilities and motivations and the opportunities afforded to them to change. In my study the behaviour that is being investigated is use of Learning Analytics by academics to inform and enhance their teaching practice.

More details can be found at http://www.behaviourchangewheel.com/

Results from Phase 1

This Phase included:

- Survey distributed to all teaching staff (Mar-May 2016)
- Longitudinal meetings/interviews with 4 x pairs of academics from across uni over 18 mth period (Jun16 – Nov17)
- Investigation of Moodle log data for staff usage in their courses for participants in longitudinal study

See the attached paper which was submitted to LAK19 conference but unfortunately rejected (so please do not share further) for full details if interested, but in summary there were general positive beliefs about the benefits of Learning Analytics but with many caveats. Findings from this first phase are

- main barriers for LA adoption are lack of knowledge of many of the tools and reports available in the LMS and in interpreting data and implementing appropriate actions as well as lack of time to effectively engage with LA;
- The opportunities and supports that need to be provided to academics include provision of time to engage, provision of support to access and interpret data and design appropriate interventions;
- Academics perceive successful adoption of LA in a number of different ways, including improved student experience, more effective course design and efficient teaching practice, and evidence to enable career progression.

Design Principles

The following Design Principles were developed based on the results from Phase 1

1. Build on researched motivations and capabilities of staff
2. Ensure relevant and accessible support available
3. Academic staff are core participants and stakeholders
4. Plan needs to be flexible and adaptable
5. Mutimodal – 1-1, small group and discussion forums
6. Academics need to start with a specific question
7. Academics need to commit to a 20 week programme
8. Schedule all meetings at beginning of programme

I Framework

I also developed a conceptual framework with a focus on the processes of LA adoption by individuals within the specific institutional context, which will inform the intervention plans. Focusing on questions that can be discussed to encourage constructive conversations and help staff to focus on working together to ensure efficient and effective implementation.

Institutional context: the policies and strategic directions that have been set for implementation of LA. This context also incorporates the support structures, including technologies and /or data warehouses. Although individual staff and project teams will rarely have the opportunity to have any input into this, they do though need to be aware of these and situate their implementation within these contexts. **Impetus**: who will be driving the implementation and what are the specific questions to be addressed, for example is this related to student retention, student engagement with learning content or how are students performing on a particular quiz? From this an implementation plan can be developed that will address specific actions, timeframes and responsibilities. The implementation plan would also consider who and /or what will be influenced by this – will it be students (to become more responsible for their own learning) and or staff – to encourage interest in data and use of the data for positive change

Input: what data is available to address the question, who has access to this information and how do staff access this in a format that is easily analysed?

Interrogation: how is the data going to be analysed and interpreted and who will be responsible for this. Who will be provided with the results of the interrogation?

Intervention: What actions are planned as a result of the interrogation and who will be responsible for taking those actions?

Impact: How successful was the process of implementation and what was the impact of interventions? Depending on the results of this the process could be repeated, using similar impetus or a deeper level of investigation. Whilst the framework is generally unidirectional it can be an iterative process returning to any of the early phase as reflection occurs within the impact phase.

Jones, H. (2015). The "I"s have it: Development of a framework for implementing Learning Analytics. In T. Reiners, B.R. von Konsky, D. Gibson, V. Chang, L. Irving, & K. Clarke (Eds.), Globally connected, digitally enabled. Proceedings ascilite 2015 in Perth (pp. DP:29-DP:32). http://www.2015conference.ascilite.org/wp-content/uploads/2015/11/ascilite-2015-proceedings.pdf

Draft Adoption Plan

All of this research has led to the development of 20 week plan which I intend to adopt with two small groups (6-8) of staff from across the uni in each of Semester 1 & 2 next year.

All meeting dates to be tentatively set at 1st meeting

Prior to initial meeting, participants will provide details of the course they want to investigate and I will create overview reports of staff engagement in the course. Participants will be encouraged to apply for Ethics clearance.

Week	Meeting	Individual Actions - participants	Researcher Actions
1	Group	Attend workshop, Determine question to be investigated	Provide overview, discuss possible questions
2-3	Individual	Discuss overview report and data to be interrogated	
4-5		Initial analysis of data	Provide support in gathering and analysing data
6	Group	Discuss initial analyses and progress as well as next steps	
7-9		Design and develop action/intervention and plan implementation	Provide support in developing intervention
10	Individual with teaching team	Discuss project and each member's role in intervention	

11-12		Implement intervention	
13	Group	Discuss intervention	
14-15		Continue intervention	Support each participant as needed
16	Individual	Discuss evaluation of intervention	
17-18		Evaluation of intervention	Support each participant as needed
19		Complete feedback survey	Distribute feedback survey
20	Group	Wrap-up and celebration	

Purpose of this workshop

As per the Participant Information Sheet sent earlier, the purpose of this workshop is to gain your input and feedback on the plan and in particular:

- contribute your thoughts and ideas in group discussions on the design of the intervention plan and its suitability for USQ.
- whether the intervention plan will be effective in supporting participants to engage with learning analytics to inform and enhance their teaching practice to optimise their students' experience.
- Are there any changes you would suggest to improve the plan
- Is this approach something you believe would be useful for the EDD team/OALT to adopt for more widescale adoption of Learning Analytics across the university
    - o If yes, what, if any support/training would you need
    - o If not, what are the limitations
- Is this approach something you believe would be useful for the EDD team/OALT to adopt for widescale adoption of other educational innovations across the university