NURTURING THE BUDDING IDEAS OF STEM ACADEMICS IN A UNIVERSITY-WIDE IMPLEMENTATION OF PEBBLEPAD

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Abstract

New technologies are often being implemented across universities from a top-down perspective, and often this prevents the nurturing of ideas and passions of academic staff. This paper explores a model to support STEM academics implement a new technology that could be used for any technology change. Data from the implementation is reported to confirm the success of this model with significant interest being shown across the STEM disciplines. Results show that employability, scaffolding laboratory skills, developing self-reflection, supporting weekly tasks and program wide initiatives were the major interests chosen by academics within Griffith Sciences.

Introduction

In 2015, Griffith University, in Queensland Australia, undertook significant strategic planning to implement a new *Griffith Model* of learning and teaching. One aspect of this model was to develop contemporary pedagogies to facilitate students' engagement with learning and to enhance employability skills, to prepare them to become "graduates of influence." The Griffith Model involved a planned and evolving shift of learning and teaching pedagogies, alongside course and program-wide redevelopment and renewal. A key aspect of this approach was to sustain program-wide development that was "intentionally designed" to support student development toward professional mastery. PebblePad personal learning software was purchased, and a university-wide implementation was undertaken to quickly embed employability and innovative learning and teaching goals into the curriculum.

In order to achieve these goals, Griffith Sciences devised a model to ensure that the fledgling innovations of our academics were not lost in the initial frenetic wider implementation. This paper showcases the Griffith Sciences Blended Learning Model and provides evidence of how this approach could support an implementation of learning technology whilst nurturing the ideas of its most important asset – academic and professional staff.

Background

In December 2015, a university-wide working party was formed to operationalise the learning and teaching approach provided by the Griffith Model. The remit of this group was to identify a desired future state, articulate a series of learning and teaching practices, analyse the current state, identify

technology gaps, and finally identify bridging solutions to close these gaps. The working party undertook a university-wide evaluation of learning and teaching practice with the end result being a list of seventy-three learning and teaching practices that were considered essential to our ecosystem and the technologies that could support these practices (https://teaching-resources.griffith.edu.au/technology-ecosystem/).

In April 2016, the Academic Provost was finalising the university-wide strategy to implement employability as a priority agenda for the university. One of the actions flowing from this was to scope and adopt an ePortfolio platform to serve this agenda. An extensive implementation plan was put in place to determine an appropriate technology, and PebblePad personal learning software was chosen. At the beginning of 2017, Griffith University began its university-wide implementation of PebblePad with the Deputy Vice Chancellor Academic (DVC Academic) being a major advocate for this new technology. It was important that the DVC Academic wanted to see a visible, whole of university approach to embed and engage with the technology. Griffith University undertook a number of key university-wide initiatives introduced in the first two years. All were major initiatives, with significant implications for students and staff, requiring significant investment of time and resources. Some initiatives included: The Remarkable Me Challenge (Blair, Campbell, & Duffy, 2017), the Academic Innovators program (Campbell, Bourke, Trahar, & Nisova, 2017), and The Griffith Graduates of Influence program (https://www.griffith.edu.au/the-griffith-graduate).

Due to the complexity and speed of the university-wide implementation, much of the training and support options were not centrally available in the initial trimester offering. Griffith Sciences decided to develop its own model to support a bottom-up approach to complement the university-wide top-down approaches. The Griffith Science Blended Learning Model, described in this paper, was identified as an appropriate vehicle to support these developments.

Literature Review

EPortfolio systems have been implemented in various universities over the past ten years (Hains-Wesson, Wakeling, & Aldred, 2014; Slade, Murfin, & Trahar, 2017) with this project building on the 2008 Griffith ePortfolio project and the subsequent 2011 review of ePortfolios (Coffee & Ashford-Rowe, 2014).

In a recent review of the literature, Brown (2016) found that there were six influences to faculty adoption of blended learning, including the faculty member's interactions with the technology, academic workload, institutional environment, interactions with students, the instructor's attitudes and beliefs about teaching, and opportunities for professional development and support. Other researchers investigated a number of considerations for adoption, such as the need for faculty buy-in, developing an institution wide strategy, providing adequate structure and support and having effective faculty support (Spring, Graham, & Hadlock, 2016). Garrison and Vaughan (2008) suggest that "the selection and integration of media must be shaped by educational goals and design considerations" and "although technologies may have

strengths and weaknesses that must be considered ultimately it is teaching and learning considerations that will have the most direct influence on learning" (p. 87).

The role of professional development in implementing new technology is an ongoing theme that has been reported in the literature over the years (Porter & Graham, 2016; Porter, Graham, Bodily, & Sandberg, 2016). Torrisi-Steele and Drew (2013) suggest that professional development is important "to facilitate integration of technology into the core of the teaching strategies so as to create innovative or improved student-centred, meaningful learning experiences" (p. 378). It is also important as it can provide clear, unambiguous expectations from faculty and help with faculty buy-in.

There are also different influencers depending on differing levels of adoption (Porter & Graham, 2016). It is suggested that innovators and early adopters would be more influenced by establishing adequate infrastructure, support and making sure that the institutional purpose is congruent with academic purpose. Porter and Graham (2016) go on to report that once innovators and early adopters are successfully implementing the technology then it may be time to consider changing approach to suit the needs of the early majority. These users are more interested in seeing compelling evidence of value. This is why it is extremely important to recruit innovators and early adopters to provide evaluation data to assist with advocacy and further professional learning opportunities. Finally, they suggest that the late majority and laggards are more influenced by solving issues of infrastructure, technical support and one-on-one training. Financial compensation, providing academics with additional time, reducing course load requirements or providing opportunities for promotion and/or tenure can all be options that speed up the transition into mainstream (Porter et al., 2016).

This investigation is part of a larger educational design-based research project, the purpose of which is to support Griffith Sciences academics in designing courses that utilise the principles of the Griffith Model whilst implementing ePortfolios/personal-learning environments. The project's aim is to develop blended learning principles that are appropriate in STEM higher education contexts, to develop a series of learning designs that can be shared, modified and utilised by other academics and to distribute these results internally and externally. The overarching research question framing the wider project is: "What are the guiding blended learning design principles for STEM higher education using a Personal Learning Environment / ePortfolio?" This specific study looks at a couple of preliminary sub-research questions:

- What implementation strategies/processes were used to support STEM academics to develop blended learning projects?
- What types of projects/issues were prevalent in the STEM disciplines?

Methodology

Design-based research has formed the methodological framework for the study. Design-based research was considered appropriate due to its iterative process that involves analysis, design, development, evaluation and

documentation of learning design principles and ideas (Phillips, McNaught, & Kennedy, 2012; Reeves, 2000). The project followed a four-step process similar to that defined by Reeves (2000, p. 25), as depicted in Figure 1.

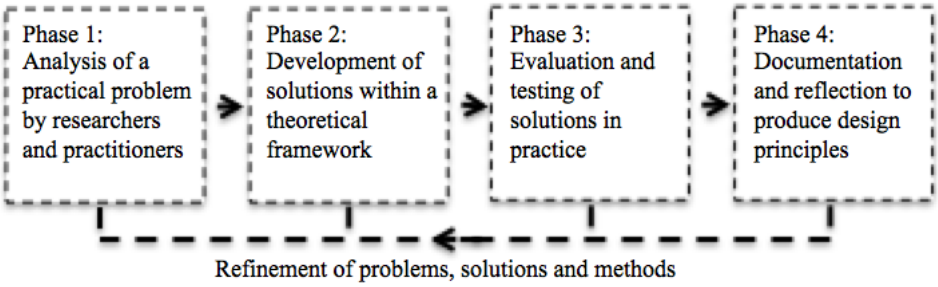

Figure 1. Design-Based Research Model (Reeves, 2000, p. 25).

This specific research involved data collection from staff involved with teaching PebblePad in their courses, interviews of two professional support staff within Griffith Sciences, usage data obtained from the PebblePad system and training data. Ethics approval was obtained in February 2017, prior to any data being collected throughout 2017. This study involved 19 course-based initiatives and five program-based initiatives throughout Griffith Sciences. Data used was from the initial program expressions of interest, including from the twenty four staff members participating in the model.

Results

The Griffith Sciences Blended Learning Model has been designed to support academics developing initiatives in blended learning (see Figure 2).

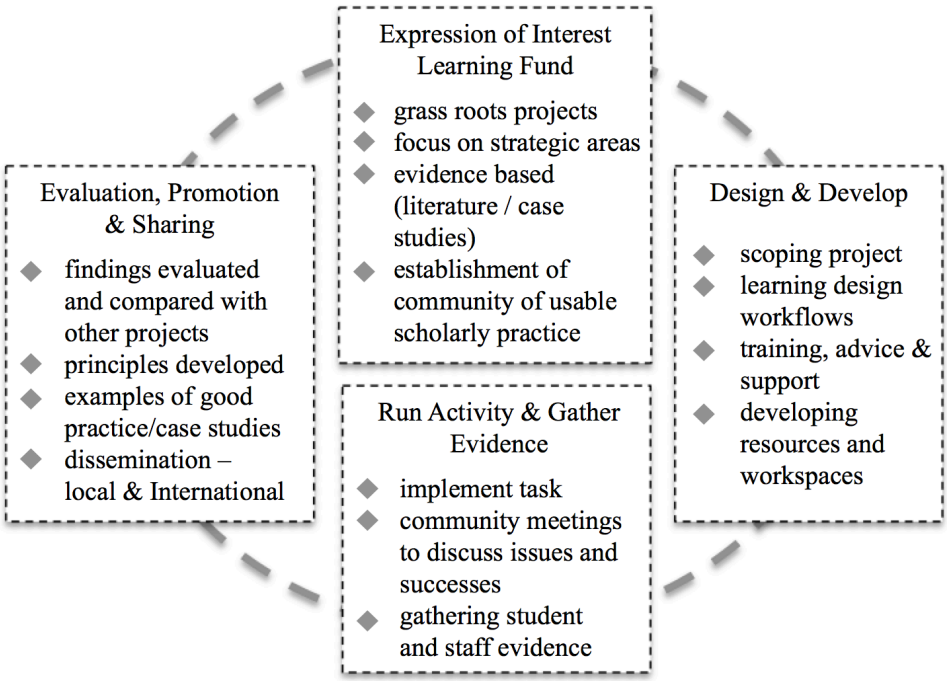

Figure 2. Griffith Sciences Blended Learning Model.

It is a four-step implementation process modified from the design based research process and includes: an initial call for interested parties, pre-trimester educational development, evidence gathering, and evaluation,

promotion and sharing. It is a series of interconnecting components that allow Griffith Sciences to quickly build expertise and knowledge in the use of ePortfolios, share this knowledge amongst a medium-sized group of people, in the first instance, and then expanding that group and our reach in future iterations of the project.

Phase 1: Expression of Interest - Blended Learning Fund
At the beginning of 2017, the Dean of Learning and Teaching Griffith Sciences called for interested parties to express an interest to undertake a project using PebblePad. All Griffith Sciences academic staff had the opportunity to generate/articulate an idea (in a paragraph or two). Funding was provided for program-based initiatives, course-based initiatives and initiatives to support staff using ePortfolios for their own professional development. Applicants could nominate for more than one area, and they could use the funding for any legitimate use that would benefit the academic, for example, teaching buy-out, conference attendance or equipment. An ethics application was also completed to allow all participants to undertake some form of evaluation or scholarly practice allowing surveys, focus groups, usage data and learning resources to be included in scholarly articles and evaluation.

Phase 2: Design & Develop Within a Theoretical Framework
The second phase involved using a template designed in PebblePad to scope the idea and develop a learning design specific to a course. This template was used partially to normalise and showcase the technology. A learning design is developed for each project and included in a collection of learning designs that were later showcased and used in future iterations. The learning design became a starting point for early conversations to help the academic determine how to best support students completing their task. Afterwards, the academic, alongside the educational designer developed templates, resources and any necessary scaffolds and the educational designer creates bespoke instructional documents (pdf and/or video) for each task. Finally, a series of trainings sessions were run developing specific skills in PebblePad. A breakdown of attendance for Griffith Sciences Academics sessions is provided in Table 1.

Table 1

Session Attendance by Griffith Sciences Academics

PebblePad Training Sessions: University-wide and Tailored (*in italics*)			
An Introduction	39	Creating Activity Sheets	6
Supporting Reflection	4	Creating Interactive Resources	18
Creating Workbooks	2	Understanding the assessment lifecycle	10
Helping students reflect	*13*	*Creating an online study guide*	*26*
Total			118

Phase 3: Run the Activity and Gather Evidence
During the trimester, the focus moved towards ensuring that the project ran smoothly. A number of one-on-one support and training activities were provided. Instructions and resources were modified to suit changes to the learning task. A series of community lunch meetings were scheduled, to discuss issues, ideas and practice; and where educational designers were able to provide further one-on-one support wherever needed. (A community of scholarly practice is considered to be a significant aspect of the whole process.) Throughout the trimester, evaluation activities were conducted, with support from the learning and teaching team where needed.

Phase 4: Evaluation, Promotion and Sharing
At the end of trimester, the learning support team conducted a final community of practice meeting. This final community meeting was a debrief, considering the lessons learned and the opportunities and challenges that were faced within each project. As suggested by one of the professional staff:

> The meeting is also important as we discuss the evaluation data collected in various projects with the purpose of getting the academics to think about how they might showcase or present their findings so that other academics have an opportunity to learn from their experiences.

Many of the projects created a video case study and reflection of their activity to be housed on our university Learning Futures website (https://app.secure.griffith.edu.au/exlnt/entry/6405/view). Some of the projects were presented at an end-of-year ePortfolio Symposium. We also provided an opportunity for all of the projects to be included as a chapter in an edited book that is currently being developed.

Blended Learning Fund Projects 2017/2018
The Griffith Sciences Blended Learning Model was very successful. In 2017, there were 24 projects implemented and 23 "new" projects in 2018, with all of the 2017 projects being continued in 2018. In the Sciences, there were 3,683 unique users out of approximately 8,500 unique users across the university. Engineering had the largest number of projects (n=13), with examples from practical electronics, engineering science, international engineering practice, design practice, project management, and others. There was a large range of class sizes that implemented ePortfolios with the largest class size of 306. The main uses of the ePortfolios were to develop employability skills and practices, as a tool to support reflective thinking, for use within engineering laboratories, to support group projects, for field trip and industry field visits, and to document final projects and milestones.

There were nine projects in the Natural Sciences area. The Natural Sciences had the largest number of students (1,300+) and largest class size of 479. There were a variety of fields involved including biotechniques laboratory, biological systems, chemistry, physics, aviation, forensics and the professional practice in science (capstone) course. The main uses were to embed employability and professional skills, to develop laboratory skills and

laboratory thinking, to support reflective activities, to scaffold lab experiences and to connect lab activities throughout and across a program.

In Information Technology there were five courses ranging from human computer interaction, information management, IT foundations, routing and switching and network security. The largest course was Human Computer Interaction with 331 students enrolled. It was mainly used to develop week-to-week tutorial or computer lab activities, but it was also used for developing reflection and employability skills, for collaboration, feedback and peer assessment. There were also four courses in planning (approximately forty students) and one in aviation (one hundred and forty) that also participated. Planning used ePortfolios within studio work, as part of their geographic systems course and also as part of their practicum. It was mainly used for reflection, as part of week-to-week studio activities and to build a portfolio. Along with the course-based initiatives, there were also five program-based initiatives. An ePortfolio was used as part of the professional practice process in both forensic science degrees used for embedding employability activities across seven courses and to build a professional showcase ePortfolio. It is also being used in the Bachelor of Science (Advanced) to promote reflective practice associated with research skills development, in particular to scaffold development of reflective practice across the program and to support employability and assessment. The Graduate Diploma of Clinical Physiology used it to embed employability initiatives, to showcase achievements in clinical placements, to develop professional identity and to transition students into employment. They will also be developing a showcase portfolio as the culmination of their study. The Bachelor of Applied IT used it as part of their work integrated learning to reflect upon their experiences. The Bachelor of Aviation used it within their three-part Flight Training courses to record flight experience through simulation and to reflect on these flight experiences to demonstrate understanding of principles in practice and to reflect on their practical skill development.

It is worth noting there were some challenges involved in the project. Specifically, time barriers for both the innovators and also for support staff were noted throughout. At the university, in the STEM area, spending time on learning and teaching can reduce research time, which is seen as an impediment to promotion opportunities.

Discussion

The Griffith Sciences Blended Learning Model proved to be very successful at generating this bottom-up interest throughout STEM disciplines at Griffith University. The combination of support, training, resources and conversation amongst different school groups has provided opportunities for cross-fertilization of ideas and practices. These strategies certainly have a place within a blended learning technology implementation such as PebblePad. The Griffith Sciences Blended Learning model provided academics an opportunity to develop their own ideas, with guidance, and allowed them ownership of the agenda, which supported better practice. An impressive aspect of the model was the spread of courses and Schools that took part. Twenty-four projects in the first year and a further twenty-three (based on ePortfolios and another

twenty plus initiatives involving active learning through the Echo360 active learning platform) in the second year were significant numbers of participants in the initiative.

The most prevalent use of ePortfolios in the Griffith Sciences Blended Learning Model was not surprisingly employability and reflection. The university had issued a number of statements about the need for improvements in this area, and with a number of key academic performance indicators linked to student employability, it would have been expected for many of the projects to be involved in this area. Examples came from first year to final year, with a long-term plan to embed employability initiatives throughout programs within various Schools. What was worth noting is that ePortfolios also had a number of other uses that were just as valuable for courses in the STEM disciplines. Laboratory templates that support students thinking like a scientist were significant in a number of courses. The idea of scaffolding support for students in early laboratory templates and then reducing or "fading" this support in future iterations was suggested by a number of projects. As suggested by one of the project course convenors:

> The course initiative will help to consolidate understanding in the laboratory and application to future laboratory experiences. It will also assist student development of reflective practices and provide opportunity to solidify nature and purpose of laboratory skills…

who went on further to say that it can be "used to provide scaffolded opportunities to consolidate experimental knowledge and linkage to broader context and potential career pathways."

An interesting aspect of the Griffith Sciences Blended Learning Model was the willingness by academics to experiment and innovate. There were a number of projects that saw the use of PebblePad as an opportunity to deliver learning in ways that they would not be able to achieve in the learning management system. The use of aviation simulators alongside reflective templates in the ePortfolio provided an opportunity for students to consider not only the practical aspects of flying but also the metacognitive thought that goes on in the head of a pilot. In a first year design based Engineering course, the use of a scaffolded workbook became a springboard for students to develop metacognitive skills involved in scoping a real world project and delivering solutions. In both instances, the ability to monitor progress throughout the course was considered essential as it highlighted the process and not just the final product. In Biology, students were able to use digital microscopes to record experiences into a laboratory workbook that developed practical laboratory experience with reflective thought. In each of these instances, the students were able to develop a sense of process and understand and articulate the types of thought needed to become an engineer, a scientist, or a pilot within the context of a real world product or a real world task.

Conclusion

The Blended Learning Model was designed to fund ground-up projects within the Sciences Academic Group, by giving incentive and time (via funding) to willing academics. These academics were then able to develop scholarly

practice within their courses, generating lessons learned, principles of good practice in STEM and research outputs whilst creating a community of newly experienced practitioners armed with a variety of strategies and resources that they can use to develop better practice and support the next generation of users. This study proved that the Griffith Sciences Blended Learning Model could provide a bottom-up framework used in conjunction with top-down approaches to implement any new technology.

Results from the implementation confirm the success of this initiative, with significant interest being shown across the STEM disciplines, particularly within Engineering and Natural Sciences. Results also confirm that employability was not surprisingly the major reason for using PebblePad whilst other reasons included: scaffolding laboratory skills, developing reflection, for supporting week-to-week scaffolded lab activities and documenting field experiences. Integrating employability experiences was the major focus of program-based initiatives although aviation used the opportunity and funding to transform its flight training major by using PebblePad to support a flight simulation lab experience.

References

Blair, H. C., Campbell, C., & Duffy, M. (2017). A multi-pronged approach to the enterprise-wide implementation of a personal learning environment. In *2017 ePortfolio Forum: Owning, supporting and sharing the journey. Brisbane: eLearning Services* (pp. 9-17). Retrieved from https://eportfoliosaustralia.files.wordpress.com/2017/09/ebook_eportfolioforum_2017_papers_v1_20170907.pdf

Brown, M. G. (2016). Blended instructional practice: A review of the empirical literature on instructors' adoption and use of online tools in face-to-face teaching. *The Internet and Higher Education, 31*, 1-10. doi: http://dx.doi.org/10.1016/j.iheduc.2016.05.001

Campbell, C., Bourke, J., Trahar, P., & Nisova, K. (2017). University-wide implementation: Supporting the innovators program and working collaboratively with faculties. In *2017 ePortfolio Forum: Owning, supporting and sharing the journey. Brisbane: eLearning Services* (pp. 18-26). Retrieved from: https://eportfoliosaustralia.files.wordpress.com/2017/09/ebook_eportfolioforum_2017_papers_v1_20170907.pdf

Coffey, U., & Ashford-Rowe, K. (2014). The changing landscape of ePortfolios: A case study in one Australian university. *Australasian Journal of Educational Technology, 30*(3), 284-294.

Garrison, D. R., & Vaughan, N. D. (2008). Blended learning in higher education: Framework, principles, and guidelines. San Francisco, CA: Jossey Bass.

Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The Internet and Higher Education, 18*, 4-14.

Hains-Wesson, R., Wakeling, L., & Aldred, P. (2014). A university-wide ePortfolio initiative at Federation University Australia: Software analysis, test-to-production, and evaluation phases. *IJeP: International Journal of ePortfolio, 4*(2), 143-156.

Phillips, R., McNaught, C., & Kennedy, G. (2012). *Evaluating e-learning: Guiding research and practice.* New York, NY: Routledge.

Porter, W. W., & Graham, C. R. (2016). Institutional drivers and barriers to faculty adoption of blended learning in higher education. *British Journal of Educational Technology. 47*(4), 748-762. doi:10.1111/bjet.12269

Porter, W. W., Graham, C. R., Bodily, R. G., & Sandberg, D. S. (2016). A qualitative analysis of institutional drivers and barriers to blended learning adoption in higher education. *The Internet and Higher Education, 28*(2016)*,* 17-27. doi: http://dx.doi.org/10.1016/j.iheduc.2015.08.003

Reeves, T. (2000). *Enhancing the worth of instructional technology research through "design experiments" and other development research strategies.* Paper presented at the Annual AERA Meeting, April 24-28, New Orleans. Retrieved from http://treeves.coe.uga.edu/AERA2000Reeves.pdf

Slade, C., Murfin, K., & Trahar, P. (2017). A strategic approach to institution-wide implementation of ePortfolios. In J. Rowley (Ed.), *ePortfolios in Australian Universities* (pp. 173-189). Singapore: Springer Singapore.

Spring, K. J., Graham, C. R., & Hadlock, C. A. (2016). The current landscape of international blended learning. *International Journal of Technology Enhanced Learning, 8*(1), 84-102. doi:10.1504/IJTEL.2016.075961

Torrisi-Steele, G., & Drew, S. (2013). The literature landscape of blended learning in higher education: The need for better understanding of academic blended practice. *International Journal for Academic Development, 18*(4), 371-383. doi: 10.1080/1360144X.2013.786720

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