

THE UNIVERSITY OF QUEENSLAND Teaching Fellowship Scheme

APPLICATION FORM FOR FELLOWSHIP COMMENCING 2012

PART A: NOMINATION COVER PAGE

Contact details (for nominee)

Title (Mr, Ms, Dr, A/Prof, Prof)	Dr
First and last name	Kirsten Zimbardi
Position title	Associate Lecturer
School / department / faculty	School of Biomedical Science
Email address	k.zimbardi@uq.edu.au
Telephone	3346 9865

Fellowship focus

Fellowship title (20 words max)	Inquiring Minds – the impact of developing, implementing and evaluating inquiry-based curricula on coordinators, tutors and students in the sciences.
Discipline focus of Fellowship, if relevant (use key words)	Science (cross-disciplinary, including biomedical science and mathematics) <i>Technology in qualitative (narrative) research</i>
Educational issue(s) to be addressed in Fellowship (use keywords)	Curriculum renewal, inquiry-based curricula, active learning, research experiences

Nominee's Declaration

I agree to be nominated for a UQ Teaching Fellowship and agree to the conditions of the fellowship.

Signature		Date	30 September 2011
-----------	---	------	-------------------

Faculty Associate Dean (Academic) Certification (attached email certification also accepted)

I confirm that I have discussed the proposal with the nominee and I support this nomination on the basis of the attached documentation. I undertake to support this nominee in the activities associated with the UQ Teaching Fellowship in accordance with the attached statement of support. I confirm that the information above is true and correct and that the nominee named on this form is currently a staff member of this institution.

Associate Dean (Academic)		Faculty	
Signature		Date	

Head of School Certification (attached email certification also accepted)

I certify that:

- i) The program of activities, if funded under this application, can be accommodated within the general facilities in my organisational unit and that sufficient working and office space is available for any proposed additional staff.
- ii) I am prepared to have the program of activities, if funded under this application, carried out in my organisational unit under the circumstances set out by the Applicant.
- iii) I have noted the amount of time that the Applicant will be devoting to the project and agree that it is appropriate to existing workloads. I agree that teaching relief will be arranged if the funding application is successful

Head of School		School	
Signature		Date	

PART B: FACULTY/SCHOOL STATEMENT OF SUPPORT

(1 page maximum, 11 pt Times New Roman or Arial font)

The statement of support should endorse the nomination, with specific reference to the selection criteria, including Selection Criterion 4. In addition, the statement may detail the direct and indirect support that the faculty or school will provide during the fellowship. This statement should be provided by the faculty Associate Dean (Academic) or delegate.

PART C: WRITTEN STATEMENT FROM NOMINEE

Capacity for leadership in teaching & learning through positive influences on colleagues & students

I was purposefully recruited to the School of Biomedical Science (SBMS) during the implementation of the Bachelor of Science (BSc) Review as a teaching-focused, Associate Lecturer, to guide academic staff, tutors and students in transformation of key aspects of the science curriculum to inquiry-based learning approaches. In 2007, I began working with several curriculum design teams to incorporate recommendations from the BSc Review into curricula which could be easily sustained, and as Chair of a BSc Review Implementation subcommittee in 2008-2009, I led and advised several teams of coordinators across the Faculty to embed research-like experiences into courses and extra-curricular programs. From 2007 to 2010, I have strategically positioned myself, been invited by colleagues, and requested by the SBMS T&L Chair, to play a central role in the development of a series vertically-integrated, inquiry-based practical curricula across all three years of the biomedical science major. In 2009, I was selected from a Queensland-wide pool of teaching innovators to present this model at an ALTC Symposium (Farrand et al, 2009), and I have now been cited in an Australia-wide investigation for developing this "particularly innovative" case study of how the undergraduate curriculum can be "fundamentally redesigned" for a focus on inquiry-based learning (Elliott et al. 2010 pp 57-60).

One of the key requirements for successfully transforming curricula into inquiry-based approaches that develop scientific thinking skills for large cohorts of students, is to develop assessment guidelines, criteria rubrics, and processes for tutor training and marking moderation that ensure transparency and integrity in assessment standards. So, not only do I receive excellent teaching evaluation scores (4.07-4.76) for the 100-150 contact hours I contribute each semester, but as coordinator of 1st, 2nd and 3rd year courses with enrolments of 180-550 students, I also play a very active role in mentoring large teams of tutors. An extensive evaluation of the first iteration of my inquiry-based 2nd year course (completed by 392 students (93% of the cohort)) showed that students valued their interactions with, and feedback from, my tutors. For all seven questions asking students about their tutors (e.g. How much did working with tutors help your learning? My tutor gave clear feedback etc) 75-80% of the students indicated scores of 4/5 - 5/5 on the relevant Likert scale. I have also extended my mentoring of tutors as junior academics across my School and Faculty as Project Manager of the "Tutor Training for the new BSc" project (UQ Large Strategic Grant of \$100,000).

Detailed evaluations of each of the courses in the vertically-integrated, inquiry-based practical curricula in SBMS indicate that many students are seeing their development from novice student to scientist, for example: "*Kirsten was great in helping with the transition from student to scientist*" and "*The practicals... were vital in my growth as a scientist.*" Analysis of student assignments also indicates that students are learning to think like scientists (Farrand-Zimbardi et al 2010a). However, some students reject the self-directed nature of inquiry-based practicals as a substandard approach, the most common complaint being that they were faced with unexpected results, for example: "*it was very difficult to relate the experiment that we designed to the lecture material as the data [sic] that we obtained did not corroborate with previous research or what was expected to happen/what we had learnt in class.*" It is clear from literature in this area, and my experience, that students need to face unexpected results with guidance to come to a more mature understanding of the way scientific knowledge is developed. My ability to help students navigate this important, but often difficult, transition is demonstrated by the following exchange, with the positive outcome evidenced in the student's assessment item.

Email from student: "*We tested ...[whether] stretching the heart increased [the] noradrenaline induced heart rate. But our results found no change. The heart rate didn't increase even when we added noradrenaline without stretch... running through the prac twice ... in case the first lot of was faulty but our observations didn't change. We did however observe a significant change in force although that wasn't what we testing... I'm just confused about how to write the discussion since there was no change... [since the]bulk of the discussion marks come from the interpretation of the results and physiologically explaining what has happened....Are we therefore supposed to write about what should have happened backed up by literature ?*"

This student is requesting permission to ignore the unexpected results and focus their writing on reproducing facts from the literature.

My email reply: "*... an interesting point I don't want you to miss ... you got differential effects of NA [noradrenaline] on HR [heart rate] and contraction force (very, very interesting!) this demonstrates that the NA was effective because it was able to change the force of contraction.... I would recommend ...using this differential responsiveness to talk about the different isoforms/receptor densities/responsiveness of the receptors*"

in the SA node and on the cardiomyocytes... your Discussion should be about interpreting the results and suggesting molecular mechanisms that might account for the results you saw, and backing these speculations up with evidence from the literature ... true discoveries of significance are made when the experimental results completely go against the accepted dogmas – this is your first taste of finding something a little different to what you expect, I would say – enjoy it!”

Student’s Report: *“Interestingly NA did not have a significant impact on heart rate at resting tension (figure 1). However, the differential response in force (figure 2) indicates that NA was effective in binding to receptors in the cardiomyocytes. Research indicates that the dominant sympathetic adrenoceptor in the sinus venosus of Bufo marinus is the β -2 isoform, not β -1 as seen in mammalian myocardium. β -2 adrenoceptors have a higher affinity for adrenaline than NA in amphibians which suggests that the main sympathetic neurotransmitter in active in Bufo marinus is adrenaline (Ju et al. 1999). The reduced affinity of NA to bind to β -2 adrenoceptors could impact on the cellular response and provide an explanation for the results evident in figure 1.”*

This student has incorporated my suggestions with increased depth in content, demonstrating an awareness of the novelty of their results and appropriately integrating their new findings with existing literature. This level of writing is what many of my colleagues hope for by the end of Honours, and the curriculum and guidance I provide has been able to elicit this in Semester 1 of 2nd year of the BSc.

Capacity to disseminate and embed outcomes

Over my past five years at UQ, I have been committed to designing, implementing and evaluating a range of inquiry-based approaches that help students develop the capability to demonstrate critical insights and make reasoned, evidence-based judgements - and I have loved watching this transformative learning take place. I regularly find myself excitedly sharing my experiences in facilitating student learning with my colleagues, who frequently report that I have inspired them to try similar initiatives in their curriculum, improving both their experience of teaching, and their students' experience of learning. My scientific background and commitment to transparent and consistently high standards in assessment, has also provided the concrete evidence of student learning outcomes needed to convince my colleagues in science of the effectiveness of my inquiry-based curricula (e.g. Farrand-Zimbardi et al 2010a). In addition, I have developed extensive networks with colleagues coordinating inquiry-based curricula through Faculty and UQ-wide projects (e.g. Farrand-Zimbardi et al. 2010b). More recently, I have been invited to participate in two ALTC funded projects which will both provide me with links to Australia-networks of colleagues interested in inquiry-based curricula, within my discipline and more broadly. I now look forward to using these established local and national collaborations to support the dissemination of the outcomes of this Fellowship project.

Alignment with teaching and learning priorities

This Fellowship proposal builds on my work in curriculum transformation, and the influences I have had on colleagues, tutors and students, and addresses several of the UQ Teaching Enhancement Plan for 2011-2015 and Faculty of Science priority areas. Briefly, during this Fellowship I will work with coordinators, tutors and students across the BSc to develop interactive, multimedia representations of the impact of inquiry curricula. With the help of CEIT and TEDI, I will develop a set of online, annotated videos of interviews, reflections and classes which evidence the achievements that I and my colleagues have made in inquiry-based curricula (UQ: Theme 2: Strategy 1: Actions 5 and 6, Strategy 2: Action 3, Strategy 3: Action 1, Theme 3: Strategy 4: Action 3; Faculty: Transition, retention and engagement, Learning outcomes, Professional development) and will produce critiqued videos for use in the professional development of new academic staff, sessional staff and tutors (UQ: Theme 2: Strategy 2, Theme 3: Strategy 4: Action 4; Faculty: Professional development). In addition, the videos and annotations from coordinators, tutors and students, as well as myself and colleagues who are experts in developing inquiry-based curricula, will provide a rich source of evidence and critical feedback to support future improvements to inquiry-based curricula that are targeted to the needs of the stakeholders (UQ: Theme 3: Strategy 1: Actions 3 and 5, Strategy 4: Action 3; Faculty: Transition, retention and engagement, Learning outcomes, Professional development). Lastly, engaging coordinators in the use of the tools involved in developing the online, annotated videos will provide these participants with new skills, ideas for embedding innovative technologies in their work, and facilitate new collaborations between staff of the Faculty of Science and CEIT (UQ: Theme 2: Strategy 3: Action 5, Theme 3: Strategy 1: Action 5, Strategy 3: Action 4; Faculty: Professional development).

PART D: DESCRIPTION OF PROPOSED FELLOWSHIP ACTIVITIES AND OUTCOMES

Issue

Within an international climate focusing higher education on the task of creating a 21st century workforce able to deal with novel, complex, unstructured problems, there is increasing emphasis on the specific pedagogies that will adequately prepare students to tackle such problems. Across a broad range of contexts, inquiry-based curricula have been proposed to help students develop advanced critical thinking skills, particularly in the evaluation of evidence in complex settings (Kuhn 2005). Thus, over the last 30 years, science education has moved toward models of inquiry curricula in an attempt to teach students these cognitive skills, and specifically, how to 'think like scientists' (Dunbar and Fugelsang 2005). However, the ways in which students experience inquiry-based curricula and work to achieve the learning goals have been found to vary distinctly across different science-based disciplines (Abrandt-Dahlgren and Dahlgren 2002). In addition, the degree of guidance and ownership provided to students during inquiry classes has been shown to have a significant impact on the learning outcomes that students achieve (Kirschner et al. 2006).

Inquiry-based curricula are characterised as engaging students in "...identifying questions, attending to evidence, identifying patterns, making controlled comparisons, interpreting increasingly complex data, supporting claims, and drawing justified conclusions" (Kuhn and Pease 2008 p512). The move to inquiry-based curricula has been a priority for Faculty of Science at UQ for several years, based on recommendations from the 2006 BSc program review such as "...students should have: (i) the opportunity to be critical thinkers who value the opportunity for open-ended inquiry and (ii) who have some insight into how scientific knowledge is generated." (The University of Queensland 2008 p283). As outlined in Section C, I have been extensively involved and provided leadership in designing, implementing, evaluating and improving inquiry-based curricula embedded within the new BSc. Through this Fellowship, I will engage my colleagues locally, nationally and internationally in using an innovative technology-enhanced approach to increase the visibility of the work that my colleagues and I have undertaken in this curriculum reform. In addition, we will develop the evidence base needed to guide future improvements in inquiry-based curricula in science at UQ, nationally and internationally.

Overarching research question: What are the impacts of transforming curricula to inquiry-based models?

Specific research questions:

- 1) What are the perspectives of the coordinators, tutors and students on the design, implementation, evaluation on ongoing improvement of inquiry-based curricula in science?
- 2) What are students doing in inquiry-based curricula (use of resources, activities in class, completion of assessment items), and how does this impact on their learning outcomes, and the experiences that students, tutors and coordinators have of inquiry-based curricula in science?

Plan

Through this UQ Teaching Fellowship, I will use an innovative, technology-enhanced approach to document, critique and disseminate evidence of the initiatives that I and my colleagues have embedded in science courses during our curriculum renewal process. Combining this technology-enhanced approach with my current national collaborations, I will be able to use our recent curriculum renewal efforts to increase the visibility of the quality of teaching and learning in the Faculty of Science at UQ, and not only document, but also improve the curriculum, student experience and learning outcomes, within our Faculty, across Australia and internationally.

Specifically, with guidance from CEIT, I will develop a set of annotated videos focussed on inquiry-based curricula from the perspectives of the coordinators, tutors and students. Specifically, videos of interviews with these participants, of these participants engaged in inquiry-based classes and assessment tasks, and of participants reflecting and making interim statements about what they are learning from their engagement in the project will be collected the beginning, end and at regular intervals throughout Semester 2, 2012. As they are collected, these videos will be placed online and annotated by the participants. Initially the participants will annotate the videos separately from each other, detailing what they each think are important features of inquiry-based curricula and what the impacts of the design, implementation and evolution of this curricular are on themselves and others. Then, key features of the videos and annotations will be made available across all three participant groups, and each participant again asked to reflect on the videos, and annotations, and to highlight

important aspects, impacts and changes in their thinking around inquiry-based curricula. In addition to the metacognitive perspective of these annotations, the choices participants make when selecting elements for the videos, will provide me with a documented timeline of the evolution of the participants' thinking about inquiry-based curricula, the project, and the tools for developing the online, annotated videos throughout the project.

Throughout the project, with guidance from TEDI, CEIT and disciplinary experts in inquiry-based curricula both within Australia and world-wide (in science: Assoc Prof Les Kirkup (University of Technology Sydney, NSW), in biomedical science: Dr Dee Silverthorn (University of Texas, Austin, USA), I will analyse the evolving database of videos and annotations using a narrative inquiry approach. From the participant stories, I plan to characterise the diversity of ways in which the participants experience inquiry-based curricula, and the impacts that transformation to this curricula are having on their lived experience of science in the higher education sector. My previous experience with inquiry in biomedical science, and literature from chemistry (e.g. Samarapungavan et al 2006) and earth sciences (Kuhn and Dean 2005), indicates that engaging students in the processes of experimental design and dealing with unexpected results prompt a transition from a black and white picture of science as a set of concrete facts, to a more mature epistemology in which students begin to understand the tentative nature of scientific knowledge as a set of models about how the natural world works, and the role of experimental evidence in testing and refining these models. In contrast, work with colleagues in mathematics indicates that the development of expert reasoning is quite different in that discipline, requiring features of inquiry-based curricula which help students to transition from uncertainty to certainty to achieve the discipline-appropriate learning outcomes. I will therefore focus the analysis of the videos and annotations on contributing to our understanding of the differences between generic, and discipline-specific, impacts that inquiry-based curricula have of the development of students from novices to expert thinkers. Alongside the novel insights this will provide on specific processes involved in the development of scientific reasoning in a range of disciplinary contexts, this work has important implications for the design of resources, classes and assessment strategies within inquiry-based curricula in different scientific disciplines.

Outcomes and strategy for profile building

The outcomes of this project will be three fold. Firstly, the process of engaging in this project, creating and annotating the videos, and of discussing this process with me in interviews and through the reflective videos, are expected to impact on how participants view the inquiry-based curricula in which they are involved. At the very least, this is expected to make previously tacit understandings more explicit, which will facilitate their documentation and analysis. For the coordinators in particular, it is anticipated that participation will help them to evidence and analyse their curriculum renewal efforts, benefiting them in terms of their professional development and future curriculum initiatives. Secondly, the skills each of the coordinators will gain in working with the technology for developing the annotated videos may provide them with ways to use similar technologies to enhance their work – in research, teaching and service. Thirdly, the annotated videos that will be produced during this project will provide a rich source of visually-engaging resources and data, which can be used to promote best practices, and to provide guidance and training in improving weaker practices.

As one of the coordinators of inquiry-based curricula, I will also gain all of these benefits from project. Furthermore, developing a repository of rich, interactive, multimedia evidence of 'inquiry-based curricula in action' using a system that can be accessed online very easily and made public through 'featured' videos, coupled with my extensive networks, will enable me to showcase and disseminate this work across UQ, nationally and internationally. This will raise my profile, both as a leader in innovative curricula, and as a SoTL researcher.

Strategy for dissemination and embedding outcomes within UQ and nationally

My strategies for disseminating and embedding these outcomes are guided by the evidence-based D-cubed framework for effective dissemination (Hinton et al. 2011), which focuses on: 1) determining the readiness of the climate for change, 2) engaging change agents throughout the life of the project, and 3) transferring the outcomes to the change agents. As indicate above, the outcomes from this proposal that require dissemination and embedding are both: the inquiry-based curricula itself, and the annotated videos depicting the experiences of coordinators, tutors and students engaged in the inquiry-based curricula. Therefore, key change agents who are willing to embed, document and improve inquiry-based curricula, as well as use and disseminate the annotated videos, will be involved throughout the life of the project.

Overall, there is a clear climate of readiness for embedding and improving the use of inquiry-based curricula in the science higher education, and for evidencing the impact of these curricula in easily accessible ways, both at

UQ and nationally. Following the exceptional investment of academic time and effort in the BSc review, and implementation of its recommendations, over the period 2006-2010, it is now of utmost importance that we capture evidence of the outcomes of this curriculum transformation. This project will capitalise on these efforts to prepare the participating academic staff for the next program review in ~2013-2014. In addition, the project outcomes may provide guidance for the upcoming review of another major UQ program, the Bachelor of Engineering. Thus, this project has been designed and timed to contribute substantially to STEM education across two major UQ Faculties. Specifically, key change agents involved in each of these program reviews will be identified, provided access to the online resources and invited to the 2012 UQ T&L Week Showcase. Furthermore, by involving coordinators of BSc courses with inquiry-based approaches as participants, and engaging them in reflective and metacognitive practices throughout the life of the project, I will be able to ensure that the project is tailored to address their specific questions about the impact of the use of inquiry-based curricula in their contexts. Not only will this assist my colleagues across the Faculty of Science in evidencing and improving the effectiveness and sustainability of the inquiry-based approaches in their curricula, but as I will also be a participating coordinator in this project, I will be able to ensure the same outcomes for the vertically-integrated inquiry-based practical curricular threaded through 5 courses in SBMS that are requirements for the biomedical science major.

Nationally, the current ALTC Fellowship awarded to Les Kirkup focused on supporting the transformation of science curricula in universities across Australia toward inquiry-based designs, both demonstrates the climate of readiness for this curriculum reform, and provides gateways for dissemination of my Fellowship findings to academic staff who are willing to use the project findings and resources in transforming their curriculum. My Fellowship is timed to build on the collegial networks I will develop during my involvement in the Assoc Prof Kirkup's project, throughout life of my Fellowship project.

Ultimately this Fellowship will allow me to build an online resource that will serve as a platform for extending the work of my colleagues and I in designing, implementing, evaluating and improving inquiry-based curricula in the sciences to a larger community of practice across Australia and internationally. Once uploaded and annotated, the videos can be made into 'featured videos' that are available publically and will not require additional support to be sustained. The very nature of this technology-enhanced approach ensures that the annotated videos are easy to disseminate and sustain, as well as providing a mechanism to disseminate and sustain the curriculum reform that incorporated inquiry-based approaches into the BSc at UQ.

Evaluation

The perspectives of key stakeholders are incorporated into the project through the participation of coordinators, tutors and students. Throughout project (preparation, duration and final evaluation), I will ask participants during interviews, and determine from their annotated videos, how: 1) the process of engaging in project as participant, 2) working with the online system, and 3) developing the annotated videos as products, can help them in the 1) current curriculum, 2) future development of the curriculum, and 3) their own scholarly development. For formative evaluations conducted at the beginning and throughout the project, I will also ask how the project could be adapted to facilitate these outcomes to a greater extent. For the summative evaluation at the end, I will ask how the project can be built upon in the future to improve the science curriculum, and use of technologies in, and for, the curriculum. I will summarise the key outcomes of this back to participants, as well as UQ administrators and policy makers, and the national change agents detailed above in a Final Report.

Timeline

Now – end Semester 1 2012 (preparatory work):

During this period I will be working on projects which have gained support from two ALTC funded researchers. Within Assoc Prof Les Kirkup's ALTC Fellowship on inquiry-oriented practicals in science, I have been funded to develop narrative vignettes of the experiences of coordinators, tutors and students involved in the reform to inquiry-based curricula in SBMS for national dissemination to scientists who will be leading their own curricular transformations. Within Dr Mia O'Brien's ALTC project on the development of disciplinary expertise, I have been funded to lead an inter-institutional cluster of physiologists to characterise what it means to think like an expert in our discipline, and how inquiry-based curricula are used to help students develop these habits of mind. During this time I will be developing the national and international networks to disseminate my Fellowship findings and resources. For example, I will be developing a proposal for a Satellite Symposium on the use of inquiry-based learning in physiology education for the 2013 International Union of Physiological Societies conference (opens November 2011, closes February 2012) in collaboration with internationally

renowned leaders in physiology education Dr Dee Silverthorn and Prof Barb Goodman, with whom I have worked on educational symposia previously (see attached cv).

I will recruit coordinators who have been incorporating inquiry-based learning into courses for BSc students for participation in my Fellowship project, through a project investigating the degree of inquiry-based curriculum in each of the BSc majors (under consideration for funding Faculty of Science T&L grant scheme).

Gain ethics approval, with details from the standard UQ Video Release and Waiver form included in the Participant Informed Consent forms (process already confirmed with UQ Ethics Officer Michael Tse).

Begin working with tools for the annotated videos to trial and learn system, using a large database of video and audio files collected in previous projects from the vertically-integrated, inquiry-based practical curricula model in SBMS, as well as collecting new recordings as coordinator the 2nd year course within this curricula model.

June-July 2012:

Develop project approaches (and any curricula interventions) with participating coordinators (including my own course BIOM3015 which is the final semester of the vertically-integrated, inquiry-based practical curricula model in SBMS) to ensure that engagement with the project maximises outcomes for professional development, showcasing innovations, evaluating and reporting on curricula. This final part of the planning phase will focus on determining which aspects of student learning outcomes are of key importance to each discipline/teaching context, and central to the design of key resources, classes and assessment in each curriculum. At least 1 week (9-13 July) will be spent as an intensive residency in CEIT to ensure planning is finalised before Semester 2.

Semester 2 (August – October) 2012:

As the BIOM3015 coordinator, I will undertake the following as both a participant and the researcher.

1 day/week x 13 weeks residency in CEIT working with John Zornig and Phil Long, and coordinators, tutors and students involved in inquiry-based curricula to collect, upload and annotate the online videos from project participants. This residency will also include formative evaluation of the participants' engagement with the online tools (acceptance, regularity and types of uses), allowing adjustments to the project as necessary.

1 day/week x 13 weeks residency in TEDI working with Merrilyn Goos and Wendy Green on the narrative analysis and reporting (presentation and writing) of the metacognitive and social processes in play, both within the curriculum, and in working with the annotated videos. This residency will also include working with Deanne Gannaway on the formative evaluation of the impact of participants' engagement in this project on their experience in relation to the inquiry-based curricula and the project, adjusting the project as necessary

(When this Fellowship commences, TEDI and CEIT will be colocated in LIB. Thus the "residencies" dissected above will not refer to two offices, but have been detailed in this way to make it clear that for alternating days each week I will be collecting and analysing the videos and annotations from these different perspectives. This structure of reiterative cycles of data collection and analysis is important in maximising trustworthiness and usefulness of findings in qualitative research generally, but particularly when using a narrative lens which is focused on understanding the meaning within participants' stories (Clandine and Connelly 2000). Further, this particular structure and timing for the residency has been designed to allow me to provide mechanisms for demonstrating and cementing cohesive collaborations between TEDI and CEIT.)

November 2012 - February 2013:

Lead a 2012 UQ T&L Week Showcase on the project outcomes, focussing on the annotated videos as narrative evidence of participant experiences in designing, implementing, evaluating and improving inquiry-based curricula in the BSc. This Showcase will include a keynote seminar from Les Kirkup linking my Fellowship with the outcomes of and collegial networks from his ALTC Fellowship (to be completed in August 2012).

1 day/week residency in LIB to work with the participating coordinators to use the annotated videos, experiences with the online tools and their reflections and insights about inquiry-based curricula during participation in the project to plan revisions to their curricula for 2013 and beyond. Select and release 'featured' annotated videos for national dissemination through the collegial networks developed during my involvement in the ALTC projects of Les Kirkup and Mia O'Brien.

1.5 weeks intensive residency in early December to work with the Evaluations unit on summarising the formative and summative evaluations into a Final Report for all stakeholder groups.

References:

- Abrandt-Dahlgren, M., & Dahlgren, L.O. (2002). Portraits of PBL: Students' experiences of the characteristics of problem-based learning in physiotherapy, computer engineering and psychology. *Instructional Science*, 30(2), 111–127.
- Clandinin, D. J. and Connelly, F. M. (2000) *Narrative Inquiry: Experience and Story in Qualitative Research* (San Francisco, CA: Jossey-Bass).
- Dunbar, K. and Fugelsang, J. (2005). Scientific Thinking and Reasoning. In: Holyoak and Morrison (Ed.), *The Cambridge handbook of thinking and reasoning*. (pp 705-725) Cambridge University Press: New York, NY.
- Elliott, K., Boin, A., Irving, H., Johnson, E., & Galea, V. (2010). Teaching scientific inquiry skills: A handbook for bioscience educators in Australian universities. Sydney, Australia: Australian Learning and Teaching Council. Available from: <http://www.scientificinquiry.meu.unimelb.edu.au/outcomes/docs/handbook.pdf>
- Farrand, K., Kibedi, J., Colthorpe, K., Good, J., and Lluka, L. (2009) Creating physiology graduates who “think and sound like scientists.” Third National Attributes Graduate Project Symposia, 2 July 2009 Griffith University QLD. Available from: <http://www.itl.usyd.edu.au/projects/nationalgap/resources/gap posters/Creating%20physiology%20graduates%20who%20think%20and%20sound%20like%20scientists.%20UQ%20-%20K.%20Farrand.pdf>
- Farrand-Zimbardi K, Colthorpe K, Good J, Lluka L (2010a) Becoming a scientist: the development of students' skills in scientific investigation and communication through a vertically integrated model of inquiry-based practical curricula. International Society for the Scholarship of Teaching and Learning (ISSOTL) conference. Liverpool, UK.
- Farrand-Zimbardi, K., van der Burg, N., & Myatt, P. (2010b). Undergraduate Students' Research Experiences: Bridging the Gap Between Teaching and Research in a Research-Intensive University, Report for the University of Queensland Strategic Teaching and Learning Grants Scheme Available from www.uq.edu.au/sbms/staff/docs/Zimbardi_Report.pdf
- Hinton, T., Gannaway, D., Berry, B., & Moore, K. (2011). *The D-Cubed Guide: Planning for Effective Dissemination*. Sydney: Australian Teaching and Learning Council. Available at: <http://www.altc.edu.au/system/files/The%20D-Cubed%20guide%20-%20web%20and%20email%20version.pdf>
- Kirschner, P.A., Sweller, J. & Clark, R.E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist* 41(2): 75-86.
- Kuhn, D. (2005). *Education for Thinking*. Harvard University Press.
- Kuhn, D. and Dean (2005) Is Developing Scientific Thinking All About Learning to Control Variables? *Psychological Science* 16 (11): 886-870.
- Kuhn, D. and Pease, M. (2008) What Needs to Develop in the Development of Inquiry Skills? *Cognition and Instruction*, 26: 512-559.
- Samarapungavan, A., Westby, E. L. & Bodner, G. M. (2006) Contextual Epistemic Development in Science: A Comparison of Chemistry Students and Research Chemists. *Science Education* 90: 468 – 495.
- The University of Queensland (2008) Bachelor of Science Review. 339 pages. Available at: espace.library.uq.edu.au/eserv/UQ:152848/Final_Submission_web.pdf

PART E: BUDGET AND JUSTIFICATION

The budget must be itemised, detailing and justifying costing for all components of the fellowship expenditure. Amounts should be exclusive of GST. The total budget, exclusive of GST, should not exceed \$15,000

[illegible]

Budget Information
Salaries: <http://www.uq.edu.au/current-staff/index.html?page=11206>
On-costs: <http://www.uq.edu.au/research/rrtd/grants-salary-on-costs>
Qualifications/experience required for various levels of support staff:
<http://www.uq.edu.au/hupp/attachments/personnel/5.40.3App2EvaluationClassificationPosition.pdf>
Subsistence/per diem rates <http://www.fbs.uq.edu.au/?page=87273>

Salaries: <http://www.uq.edu.au/current-staff/index.html?page=11206>
On-costs: <http://www.uq.edu.au/research/rrtd/grants-salary-on-costs>
Qualifications/experience required for various levels of support staff:
<http://www.uq.edu.au/hupp/attachments/personnel/5.40.3App2EvaluationClassificationPosition.pdf>
Subsistence/per diem rates <http://www.fbs.uq.edu.au/?page=87273>

On-costs: <http://www.uq.edu.au/research/rrtd/grants-salary-on-costs>
Qualifications/experience required for various levels of support staff:
<http://www.uq.edu.au/hupp/attachments/personnel/5.40.3App2EvaluationClassificationPosition.pdf>
Subsistence/per diem rates <http://www.fbs.uq.edu.au/?page=87273>

Qualifications/experience required for various levels of support staff:
<http://www.uq.edu.au/hupp/attachments/personnel/5.40.3App2EvaluationClassificationPosition.pdf>
 Subsistence/per diem rates <http://www.fbs.uq.edu.au/?page=87273>

Subsistence/per diem rates <http://www.fbs.uq.edu.au/?page=87273>

Subsistence/per diem rates <http://www.fbs.uq.edu.au/?page=87273>

Budget justification (1 page maximum)

As required, the bulk of the Fellowship (~\$9,930) will be provided to the School of Biomedical Sciences to reduce my teaching load sufficiently to undertake the residencies in LIB. Importantly, I will retain my coordination roles for the BSc courses in which I have embedded the vertically-integrated inquiry-based curricula to allow me to effectively integrate my Fellowship activities with my teaching roles, and provide the evidence to raise my profile as both an innovator in teaching and in SoTL.

“Flip-cams” will be used for the video recordings because these devices are simple to use, can be unobtrusively held in the hand and have been used in CEIT to provide the level of visual and audio quality required for the online video annotation system. To allow the collection of a substantial range of perspectives from coordinators, tutors and students from at least two courses simultaneously throughout the semester, 18 devices will be required (9 per course allows for 1 coordinator, 2 academic staff, 3 tutors and 3 students per course). Note that additional video and audio recording equipment required for the interviews has already been purchased and used successfully by my research team on previous projects.

Showcase at 2012 UQ T&L Week will be held in the James Birrell Room at UQ Staff Club with catering for 50 attendees to disseminate the resources (annotated videos) and key project findings to academics involved in the BSc curriculum reform and the review of the BEng, to reach key change agents across STEM disciplines. Inviting Les Kirkup as the keynote speaker will both increase the profile of the showcase at UQ, and support my strategies to disseminate the findings of my Fellowship to the national network of science coordinators that Assoc Prof Kirkup has drawn together during his ALTC Fellowship project in August 2011- August 2012.

Transcription of interviews: although the interviews will be video recorded and key parts will be snipped out and uploaded into the online tool for annotation along with the videos from the classes, transcription of the interviews provides a more complete set of data that can be de-identified, thematically analysed and re-grouped to be presented at conferences and written into papers for publication in peer-reviewed journals. This data will also be crucial for the formative evaluations (which will guide the refinement of the project for its duration) as well as the summative evaluation, when compiling the Final Report.

PART F: CURRICULUM VITAE

Curriculum Vitae

Kirsten Zimbardi, BSc (Hons), PhD, GCed (HEd)

Current Appointment

Associate Lecturer (Teaching Focused); application for promotion to Lecturer in 2012 currently in review.
School of Biomedical Sciences, University of Queensland

Education

- 2008 PhD, University of Adelaide
- 2006 Graduate Certificate in Education (Higher Education), University of Adelaide
- 2000 BSc Hons, University of Adelaide
- 1999 BSc, University of Adelaide

Awards

- 2011 Inquiry-oriented learning in science: Transforming practice through forging new partnerships and perspectives Honorarium from ALTC Fellow Les Kirkup
- 2011 Making Disciplinary Thinking Visible in University Classrooms Honorarium from ALTC Project Leader Mia O'Brien
- 2010 UQ DVCA Support for Visiting T&L Guest Presenters Award: Guest presenter: Professor Angela Brew Keynote: 'UQ Teaching and Learning Symposium on Undergraduate Research Experiences'
- 2007 Australian Physiological Society Award for T&L Symposium Guest Presenters Travel Support Presenter: Dr Barb Goodman (University of South Dakota, USA) and Dr Simon Barrie (USydney)
- 2007 Faculty of Biological and Chemical Sciences Award for T&L Guest Presenters Travel Support Presenter: Dr Barb Goodman (University of South Dakota, USA)
- 2006 School of Molecular and Biomedical Science Publication Award, University of Adelaide
- 2005 Faculty of Sciences Postgraduate Coursework Scholarship to undertake a Graduate Certificate in Education (Higher Education), University of Adelaide
- 2005 Physiology Travel Support Award to attend International Union of Physiological Sciences (IUPS) Teaching Satellite, University of Adelaide (*provided in recognition of an outstanding contribution to teaching in the Discipline of Physiology*)

Grants

- 2009 UQ Teaching Focussed New Staff Grant: The impact of collaborative scientific reasoning amongst students during inquiry-based practicals on student learning gains. Sole Investigator
- 2009 Advanced Concepts Teaching Space Grant: Use of the Advanced Concepts Teaching Space for embedding peer-review into tutor training Project Leader
- 2008 UQ Strategic Learning and Teaching Grant: Undergraduate Research Experiences: bridging the gap between teaching and research in a research intensive university. Project Leader
- 2008 DVCA BSc Review Implementation Strategic Funds: Undergraduate Science Students' Experience in Research (USSER) Network: bridging the gap between teaching and research at a research-intensive university. Project Leader
- 2008 DVCA BSc Review Implementation Strategic Funds and BACS ESC Funds: Measuring up to university learning: using online and collaborative preparatory resources to facilitate the transition from high school to university. Co-investigator
- 2007 UQ Large Strategic Learning and Teaching Grant: Developing a program for the professional development of tutors within the research-focussed Bachelor of Science Degree Program. Project Manager.

Publications (peer-reviewed)

Myatt, P., & Zimbardi, K. (2011). Opportunity, Diversity, and Integration in Undergraduate Research at the University of Queensland. Council for Undergraduate Research Quarterly, 31(3), 42-47.

Hughes I, Anderson-Beck R, Atkinson J, Awabdy D, Bowmer C, Colson N, Cousins X, Farrand-Zimbardi K, Good J, Goodhead L, Kahler C, Lluka L, Moni R, Nagley P, Naug H, Overfield J, Pountney D, Sheehan J, Wood

- D (2010) Improving first-year laboratory classes in bioscience – students’ views. Report for the UK Higher Education Academy. Available from: www.bioscience.heacademy.ac.uk/ftp/reports/studentviews.pdf
- Myatt P and **Farrand K** (2010) The impact of the undergraduate research experience: a pilot study investigating student’s perceptions and listening to their stories. C. Rust, Improving Student Learning for the 21st Century Learner. 17th Improving Student Learning Symposium, Imperial College, London, UK. September 7-9, 2009. - 2010
- Farrand K** and Myatt P (2009) Creation of a collegial network between researchers and undergraduate students at The University of Queensland. UniServe Science Conference, Sydney, Australia, (44-50). 30 September - 2 October, 2009. - 2009
- Jensen M, **Farrand K**, Redman L, Varcoe T, Coleman L (2005) A Few Simple Teaching Strategies to Help Graduate Teaching Assistants Lead Discussions with Undergraduate Students Journal for College Science Teaching, 34(7): 20-24

Submitted for Publication

Zimbardi, K. & Myatt, P., Embedding undergraduate research experiences within the curriculum: A cross-disciplinary study of the key characteristics guiding implementation. Studies in Higher Education (in review)

Publications (non-refereed)

- Zimbardi**, K. (2010) Report on Round-Table Discussions at the ISSOTL 2010 pre-conference workshop “International perspectives on Undergraduate Research and Inquiry.” Available from: www.cur.org/ISSOTL/2010/Table4.pdf
- Farrand-Zimbardi**, K., van der Burg, N., & Myatt, P. (2010). Undergraduate Students’ Research Experiences: Bridging the Gap Between Teaching and Research in a Research-Intensive University, Report for the University of Queensland Strategic Teaching and Learning Grants Scheme Available from [www.uq.edu.au/sbms/staff/docs/Zimbardi Report.pdf](http://www.uq.edu.au/sbms/staff/docs/Zimbardi%20Report.pdf)
- Farrand** (2007) The Next Generation. Australian Physiological Society News.

Conference Presentations and Invited Presentations

- Zimbardi**, K & Myatt, P (2011) A multi-disciplinary study of the benefits students gain from engaging in research experiences. HERDSA 2011, Gold Coast. *Showcase*
- Farrand-Zimbardi K**, Colthorpe K, Good J, Lluca L (2010) Becoming a scientist: the development of students’ skills in scientific investigation and communication through a vertically integrated model of inquiry-based practical curricula. International Society for the Scholarship of Teaching and Learning (ISSOTL) conference. Liverpool, UK. *Long Paper*
- Lluca L, Colthorpe K, Good J, Chunduri P, **Farrand-Zimbardi K** (2010) The development of a vertically integrated model of inquiry-based practical curricula to help students to learn to ‘think like a scientist.’ ISSOTL Conference. Liverpool, UK. *Short Paper*
- Colthorpe K, **Farrand-Zimbardi K**, Kibedi J (2010) Using oral assessment tasks to guide the development of scientific reasoning skills in undergraduate science students. ISSOTL Conference. Liverpool, UK. *Short Paper*
- Myatt P, van der Burg N, **Farrand-Zimbardi K** (2010) Undergraduate research experiences: are there discipline-driven differences in pedagogies and student outcomes? ISSOTL Conference. Liverpool, UK. *Short Paper*
- Myatt P, **Zimbardi K** (2010) Undergraduate research experiences within an Australian research-intensive university. ISSOTL pre-conference workshop “International perspectives on Undergraduate Research and Inquiry.” Liverpool, UK. *Poster*
- Myatt P, van der Burg N, **Farrand-Zimbardi K** (2010) Student outcomes from diverse undergraduate research experiences: findings from a multi-disciplinary study. HERDSA 2010, Melbourne. *Showcase*
- Bevan B, **Farrand-Zimbardi K**, Colthorpe K, Weir K, Good J, Roy Manchadi M-L, Lluca L. (2009) Handing over the reins: Preparing tutors for inquiry based laboratory practicals. HERDSA 2009, Darwin.
- Weir K, Bevan B, Byrne M, **Farrand-Zimbardi K**. (2009) An Evaluation of training procedures for casual demonstrators in anatomy laboratory classes. ANZACA 2009, Melbourne. *Poster*

Bevan B, D'Arcy B, **Farrand-Zimbardi K.** (2009) A 360o view of the role of the casual academic in laboratory based practical classes: A case study from Chemistry Sessional Staff Colloquium 2009, Melbourne. *Poster*

Farrand, K., Kibedi, J., Colthorpe, K., Good, J., and Lluka, L. (2009) Creating physiology graduates who "think and sound like scientists." Third National Attributes Graduate Project Symposia, 2 July 2009 Griffith University QLD. *Selected seminar*

Myatt, P, **Farrand, K**, Wegener, M and Blanchfield, J (2008). Undergraduate research experiences: Bridging the gap between teaching and research in a research intensive university. In: Enhancing Higher Education Theory and Scholarship. HERDSA Conference 2008, Rotorua, New Zealand. *Seminar*

Good, J. P., Ernst, H., **Farrand, K.** and Colthorpe, K. (2008). Do students with a strong preference toward the reading/writing learning style underperform in student-centred, inquiry-based laboratory classes? HERDSA Conference 2008, Rotorua, New Zealand. *Seminar*

Farrand K., Kuchel L, Lawrie G. (2008) An emerging model for professional development of large teams of Teaching Assistants at an Australian research-intensive university. CIRT Forum 2008, Madison, Wisconsin USA. *Poster*

Ernst H, Good J, **Farrand K**, Colthorpe K. (2007) Do individual or group-based formative assessment styles enhance student-centred, inquiry-based laboratory classes? Proceedings of HERDSA 2007, Adelaide. *Seminar*

Farrand K. (2006) Electronic voting system improves student experience in lectures. Proceedings of COMBIO 2006, Brisbane. *Seminar*

Farrand K. (2006) Using an electronic voting system in large class lectures enhances the learning experience for undergraduate students. School of Medicine, The University of South Dakota. *Invited Seminar*

External Service to Teaching in Discipline

- 2009 Reviewer for UniServe conference papers
- 2007 Education Symposium for Australian Physiological Society Conference: Organiser and Chair
- 2006 Reviewer for Advances in Physiology Education
- 2005 Teaching Satellite for International Union of Physiological Societies Conference: Session Facilitator

Memberships

- 2011- Transcription Analysis Group (UQ + QUT + Griffith)
- 2010- International Society for the Scholarship of Teaching and Learning (ISSOTL)
- 2008- Council on Undergraduate Research (USA)
- 2008- UQ Higher Education Research Group
- 2007- SBMS Education Research Unit
- 2006- Higher Education Research and Development Society of Australasia (HERDSA)
- 2006- Australian Physiological Society
- 2006- American Physiological Society

PhD Students in the Scholarship of Teaching and Learning

- 2009- Bronwyn Bevan-Smith
The role of casual academic tutors in science practicals in the development of critical thinking skills

Undergraduate Research Students in the Scholarship of Teaching and Learning

- 2011 Tharshikha Thavapalan
Diversity of assessment in the longitudinal development of student learning in the biomedical sciences

PART G: REFERENCES

Nominees are required to attach written references from two scholars recognised for their contribution to learning and teaching in a relevant field or discipline. The references should support the proposed fellowship activities and the capacity of the nominee to conduct these successfully within the specified timeframe.

Names and contact details of two referees:

Referee #1:

Dr Mia O'Brien
ALTC Project Leader
Lecturer - Pedagogy (Education, Arts Education, Higher Education)
School of Education, University of Queensland
Phone: 3365 6648
Email: mia.obrien@uq.edu.au

Referee #2:

Kay Colthorpe
2010 UQ Teaching Fellow
Lecturer
School of Biomedical Sciences
University of Queensland
Phone: 33469701
Email: k.colthorpe@uq.edu.au

Applications for *UQ Teaching Fellowship Grants* must be submitted to the Office of the Deputy Vice-Chancellor (Academic) by **Friday 30 September 2011**

- One electronic copy, in RTF, Word or PDF format must also be forwarded to the to Office of the DVC (Academic) m.card@uq.edu.au