THE UNIVERSITY OF QUEENSLAND
EARLY CAREER
SCHOLARSHIP OF TEACHING & LEARNING GRANT

APPLICATION FORM FOR FUNDING COMMENCING IN 2014

PART A: ADMINISTRATIVE SUMMARY

A1   ORGANISATIONAL UNIT TO ADMINISTER THE GRANT (i.e. UQ School/Centre/Institute/TEDI)

School of Biomedical Science	*Enter the name of the School of the first-named Chief Investigator. If successful, the grant will be assigned an account number within that School's Operational Unit.*

A2   PROJECT TITLE

Feedback Analytics – developing methodologies to understand the relationships between feedback provision, student feedback use and academic performance	*Insert a short descriptive title of no more than 20 words. The title should be precise but as informative as possible.*

A3   PARTICIPANT SUMMARY

Chief Investigator (CI), Participant details are provided in Part B. This section can be expanded to include additional team members as required.

Person number	Family name	Initials	School	Faculty or TEDI
1	Zimbardi	K	School of Biomedical Science	Medicine & Biomedical Science
2	Dekker	A	UQx	Innovation & Analytics
3	Bugarcic	A	Institute of Molecular Bioscience	Science

A4   REQUESTED SUPPORT

$15,000	*Total funds requested in this application* *EC-SoTL grants are funded for one year*

A5   PROJECT SUMMARY

Feedback is one of the most potent teaching strategies known to produce student learning gains (Hattie 2009), yet the provision of feedback has been identified as one of the weakest elements of university practices (Graduate Careers Australia 2012). We have developed an innovative online system to collect large-scale data on digital feedback provision, student accessing of feedback and changes in assessment performance. However, the extensive dataset that has been generated now requires several cycles of exploratory analysis to determine the direction of the future data collection and visualisation efforts, that will guide subsequent feedback interventions and innovations.	*A plain language summary of the issue(s) to be addressed, significance and expected outcomes (approx. 100 words).*

A6   KEYWORDS
A6.1 Discipline focus

Biomedical science, higher education	*- Enter between one and six keywords to describe the discipline focus of the project.* *- Keywords should be of the kind normally required for submitting an article to a major refereed journal.*

A6.2 Educational issues to be addressed

Feedback, learning analytics, big data mining, data visualisation, assessment for learning	*- Enter between one and six keywords to describe the educational issues to be addressed.* *- Keywords should be of the kind normally required for submitting an article to a major refereed journal*

A7   RESEARCH CLASSIFICATIONS

- List from highest % to lowest %, and in multiples of 10.
- SEO Codes are available from: http://www.uq.edu.au/research-management/era-seo-codes
- FOR (formerly RFCD) Codes are available from: http://www.uq.edu.au/research-management/era-for-codes
- Do not use codes ending in either '00' or '0000', as these are category headings.

Field of Research (FOR) – to total 100%	%
130103	60%
130212	40%

Socio-Economic Objective (SEO) – to total 100%	%
930101	80%
930103	20%

A8   ETHICAL/OTHER CLEARANCES

- If this application is successful, will you require ethical clearance?
- To mark your answer, please double-click on the relevant tick box and change it to 'checked'   ☒**Yes** ☐**No**

If yes, what category:

Human	☒	http://www.uq.edu.au/research/integrity-compliance/human-ethics
Animal	☐	http://www.uq.edu.au/research/rrtd/intergrity-compliance/animal-welfare
Biosafety	☐	http://www.uq.edu.au/ohs/index.html?page=29969
Other	☐	Please specify:

If UQ Ethical Clearance already exists, insert UQ Clearance No: | 2012001120 |

A9 ADDITIONAL DETAILS

- Have you submitted a similar application to any other scheme?   ☒**Yes** ☐**No**

An Expression of Interest submitted November 2013 has moved through to the full Proposal round due 16 June 2014: *Australian Office of Learning and Teaching (OLT)* *Harnessing feedback analytics to improve feedback provision, student engagement with feedback and academic performance* *~$400,000* This **OLT** proposal is focused on the **broad dissemination** of the Feedback Analytics System developed around the UQMarkUp iPad app. The work proposed in this **Early Career Researcher** grant is focussed on the **analysis of UQ feedback data** derived **from the 2012-2014 trials** conducted in several School of Biomedical Science courses. Therefore, success of the Early Career Researcher grant is likely to strengthen our track record, but will not be used to supplement an external grant. Indeed, at present, the research/scholarship of learning and teaching area described herein is unfunded.	*If 'Yes' to this question you must:* *- Name funding body* *- Provide title of the proposal(s)* *- Indicate the level of funding sought from the other agency(ies)*

A10 SUBMISSION

Applications for *Early Career Scholarship of Teaching and Learning Grants* must be submitted to the Teaching & Educational Development Institute by 3 March 2014.

Applications may be withdrawn but may not be changed after submission. Additions, deletions and modifications will not be accepted after submission.

- One electronic copy, in RTF, Word or PDF format must be forwarded to Michele Wirt, Teaching & Educational Development Institute (TEDI), Grants and Awards Officer m.wirt@uq.edu.au

PART B: PERSONNEL AND RELATED DETAILS

Please complete Section B for each named investigator on the ECR-SoTL application.

B1   Person number (refer to section A3)   **1**

B2   APPLICANT DETAILS

Employee No	**2062880**

Family name	Zimbardi			Role	CI
Given Name	Kirsten		Second name		
Title	Dr				
School		School of Biomedical Science			
Faculty or Org Unit		Medicine and Biomedical Science			
Current Appointment & Level (must hold a Teaching-Focused Position)		Teaching-focussed Lecturer B			
Year of Appointment	2007		Year of Expiry	Continuing (probation)	
Email:	k.zimbardi@ue.edu.au		Telephone:	x52931	

B3   ARE YOU CURRENTLY COMPLETING POSTGRADUATE RESEARCH TRAINING?   ☐Yes ☒No

> The UQ EC-SoTL scheme is not designed to provide funds for projects that constitute the topic for an applicant's research higher degree thesis.

	If yes, you must outline how the proposed UQ EC-SoTL project is clearly different from your research higher degree project and that the progress of your degree will not be affected by taking on the additional work outlined in this application.

B4   QUALIFICATIONS

B4.1   PhD qualification awarded

Discipline/Field	Physiology/Biomedical Science	
Organisation	University of Adelaide	
Country	Australia	
Month and Year awarded	August 2008	(or) Date Thesis Submitted/ Proposed Submission Date

B4.2   Other qualifications (including highest Qualification if not PhD)

Degree/Award	Year	Discipline/Field	Organisation and country
Grad Cert Ed (HE)	2006	Higher Education	University of Adelaide, Australia
BSc Hons	2000	Pharmacology/Biomedical Science	University of Adelaide, Australia
BSc	1999	Pharmacology & Genetics	University of Adelaide, Australia

B5   ACADEMIC, RESEARCH, PROFESSIONAL AND INDUSTRIAL EXPERIENCE

Current and previous appointment(s)/position(s) - covering a maximum of the past 10 years in descending date order, beginning with your current/most recent position. Describe the Status of your appointment by choosing from Continuing, Fixed-Term, or Past.

Position held	Organisation	School/Institute/Centre/ Department	Year appointed and status
Lecturer (full-time, teaching-focused)	University of Queensland	School of Biomedical Science	2012 (continuing – probation) Current
Associate Lecturer (full-time, teaching-focused)	University of Queensland	School of Biomedical Science	2007 (fixed term) Past
Associate Lecturer (full-time)	University of Adelaide	School of Biomedical Science	2006 (fixed term) Past
Associate Lecturer (casual)	Charles Sturt University	School of Biomedical Science	2004 (fixed term) Past

B6   PROJECT COMMITMENT

Average number of working days per month in 2014-2015 to be committed to:			
This project:	5	All other projects:	8

B7   All refereed publications in the past 5 years (2005 onwards)

- Use double-asterisks (*) to identify Scholarship or Teaching & Learning publications and a single asterisk to identify publications relevant to this application.
- List publications under the following headings: **Books, Book Chapters, Journal Articles, Conference Papers, Other Publications.**
- In-press publications are to include the acceptance date.
- Provide a list of all your publications if you have fewer than 5 years of publications.

Books

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, and Wood D (2010) Improving first-year laboratory classes in bioscience – students' views. 1st Ed. Leeds, UK: UK Centre for Bioscience Higher Education Academy. 37 p. ISBN: 0-9548751-8-4

Journal Articles

Chunduri, P., Lluka, L., Kinna, G., Good, J.P., **Zimbardi, K. and Colthorpe, K. (2014) A simple way to cultivate referencing habits in first year biology students. *International Journal of Innovation in Science and Mathematics Education*, 22 (in press; accepted 12/2013)

****Zimbardi, K**., Bugarcic, A., Colthorpe, K., Good, J.P. and Lluka, L. (2013) A set of vertically integrated inquiry-based practical curricula that develop scientific thinking skills for large cohorts of undergraduate students. *Advances in Physiology Education*, 37(4): 303-315.

Colthorpe, K., Liang, S. and **Zimbardi, K. (2013) Facilitating timely feedback in the biomedical

sciences. *International Journal of Innovation in Science and Mathematics Education*, 21(3): 60-74.

Zimbardi, K., and Myatt, P (2012). Embedding undergraduate research experiences within the curriculum: a cross-disciplinary study of the key characteristics guiding implementation. Studies in Higher Education, doi:10.1080/03075079.2011.651448

Bugarcic A., **Zimbardi K., Macaranas J., and Thorn P. (2012). An inquiry-based practical in an undergraduate laboratory that illustrates a basic ceullar uptake mechanisms and develops scientific reasoning skills. Biochemistry and Molecular Biology Education (BAMBED) DOI: 10.1002/bmb.20587

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

Szarek E, **Farrand K**, McMillen IC, Young IR, Houghton D, Schwartz J. (2008) Hypothalamic input is required for development of normal numbers of thyrotrophs and gonadotrophs, but not other anterior pituitary cells in late gestation sheep. Journal of Physiology 586 (4): 1185-1194.

Farrand K, McMillen IC, Tanaka S, Schwartz J. (2006) Subpopulations of corticotrophs in the sheep pituitary during late gestation: effects of development and placental restriction. Endocrinology. 147(10): 4762-71.

Schwartz, J., **Farrand, K.**, McMillen, I. C., Young, I. R., Houghton, D. and Szarek, E. (2006) Effect of hypothalamo-pituitary disconnection on the development of anterior pituitary cells in late gestation ovine fetuses. Faseb Journal, 20 5: A1283-A1284. 0892-6638 2006

Callaghan PD, **Farrand K**, Salem A, Hughes P, Daws LC, Irvine RJ. (2006) Repeated administration of the substituted amphetamine p-methoxyamphetamine produces reductions in cortical 5-HT transporter binding but not 5-HT content, unlike 3,4-methylenedioxyamethamphetamine. European Journal of Pharmacology 546(1-3): 74-81.

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

Conference Papers (peer-reviewed)

Zimbardi, K., Meyer, J. H. F., Chunduri, P., Taylor, C. E., Ross, P. M., Tzioumis, V. and Lluka, L. J. (2014). Student understanding of the critical features of an hypothesis: variation across epistemic and heuristic dimensions. In: Catherine O'Mahony, Avril Buchanan, Mary O'Rourke and Bettie Higgs, Threshold Concepts: from personal practice to communities of practice. Proceedings of the National Academy's Sixth Annual Conference and the Fourth Biennial Threshold Concepts Conference. Dublin, Ireland, 27-29 June 2012. (123-127) ISBN: 978-1-906642-58-7.

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.

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.

Other – Reports

Farrand-Zimbardi, K., van der Burg, N., and 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. 118 pages

Please complete Section B for each named investigator on the ECR-SoTL application.

B1   Person number (refer to section A3)   **2**

B2   APPLICANT DETAILS

Employee No	

Family name	Dekker			Role	AI
Given Name	Andrew	Second name	James		
Title	Mr				
School					
Faculty or Org Unit	UQx / CEIT				
Current Appointment & Level (must hold a Teaching-Focused Position)	Senior Developer				
Year of Appointment	2014	Year of Expiry	2017		
Email:	uqadekke@uq.edu.au	Telephone:	0402095786		

B3   ARE YOU CURRENTLY COMPLETING POSTGRADUATE RESEARCH TRAINING? ☒Yes ☐No

> The UQ EC-SoTL scheme is not designed to provide funds for projects that constitute the topic for an applicant's research higher degree thesis.

My postgraduate study is investigating business processes within web design firms, and not related to teaching practice. I am currently writing up my PhD which is part time.	*If yes*, you must outline how the proposed UQ EC-SoTL project is clearly different from your research higher degree project and that the progress of your degree will not be affected by taking on the additional work outlined in this application.

B4   QUALIFICATIONS

B4.1   PhD qualification awarded

Discipline/Field	Interaction Design	
Organisation	Information Technology and Electrical Engineering	
Country	Australia	
Month and Year awarded		(or) Date Thesis Submitted/ Proposed Submission Date	2014

B4.2   Other qualifications (including highest Qualification if not PhD)

Degree/Award	Year	Discipline/Field	Organisation and country
Bach Information Technology (Hons 1)	2007	Information Technology and Engineering	University of Queensland, Australia
Bach Multimedia Design	2005	Information Technology and Engineering	University of Queensland, Australia
Bach Information Environments	2005	Information Technology and Engineering	University of Queensland, Australia

B5   ACADEMIC, RESEARCH, PROFESSIONAL AND INDUSTRIAL EXPERIENCE

Current and previous appointment(s)/position(s) - covering a maximum of the past 10 years in descending date order, beginning with your current/most recent position. Describe the Status of your appointment by choosing from Continuing, Fixed-Term, or Past.

Position held	Organisation	School/Institute/Centre/ Department	Year appointed and status
Senior Developer	University of Queensland	UQx/CEIt	2014
Director	Ably Digital Design	Industry	2007
Associate Lecturer	University of Queensland	Information Technology and Electrical Engineering	2008

B6   PROJECT COMMITMENT

Average number of working days per month in 2012-2013 to be committed to:			
This project:	3	All other projects:	27

B7   All refereed publications in the past 5 years (2005 onwards)

- Use double-asterisks (*) to identify Scholarship or Teaching & Learning publications and a single asterisk to identify publications relevant to this application.
- List publications under the following headings: **Books, Book Chapters, Journal Articles, Conference Papers, Other Publications.**
- In-press publications are to include the acceptance date.
- Provide a list of all your publications if you have fewer than 5 years of publications.

Book Chapters
Dekker A, Marrington J and Viller, S., 2013. Going DEEP: Public, Iterative Release as a Mobile Research Strategy In Tools for Mobile Multimedia Programming and Development. Book Chapter IGI Global, QUT 1-17. DOI=10.4018/978-1-4666-4054-2.ch001

Conference Papers
Marie Bodén, **Andrew Dekker, Stephen Viller, and Ben Matthews. 2013. Augmenting play and learning in the primary classroom. In Proceedings of the 12th International Conference on Interaction Design and Children (IDC '13). ACM, New York, NY, USA, 228-236. DOI=10.1145/2485760.2485767 http://doi.acm.org/10.1145/2485760.2485767

Erik Champion, **Andrew Dekker**, Indirect Biofed Architecture: Strategies To Best Utilise Biofeedback Tools And Interaction Metaphors Within Digital Architectural Environments, CAADRIA 2011, Newcastle, Australia

Marie Boden, **Andrew Dekker, and Stephen Viller. 2011. Discovery table exploring the design of tangible and ubiquitous technology for learning in preparatory classrooms. In Proceedings of the 23rd Australian Computer-Human Interaction Conference (OzCHI '11). ACM, New York, NY, USA, 54-57. DOI=10.1145/2071536.2071543 http://doi.acm.org/10.1145/2071536.2071543

Champion, E., & **Dekker, A**. 2011 Biofeedback And Virtual Environments. International Journal of Architectural Computing, 9(4), 377Ð396. doi:10.1260/1478-0771.9.4.377

Jason Yang, **Andrew Dekker**, Ralf Muhlberger, and Stephen Viller. 2009. Exploring virtual representations of physical artefacts in a multi-touch clothing design collaboration system. In Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7 (OZCHI '09). ACM, New York, NY, USA, 353-356. DOI=10.1145/1738826.1738895 http://doi.acm.org/10.1145/1738826.1738895

Andrew Dekker. 2010. Social software and interactions in web design: an in situ exploration of tools & methods to support designer-client communication. In Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction (OZCHI '10). ACM, New York, NY, USA, 428-431. DOI=10.1145/1952222.1952328 http://doi.acm.org/10.1145/1952222.1952328

Fiona Redhead, **Andrew Dekker**, and Margot Brereton. 2010. NNUB: the neighbourhood nub digital noticeboard system. In Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction (OZCHI '10). ACM, New York, NY, USA, 418-419. DOI=10.1145/1952222.1952324 http://doi.acm.org/10.1145/1952222.1952324

Redhead, F., Brereton, M., **Dekker, A**. & MacColl, I., 2008 "Nnub: Getting to the Nub of Neighbourhood Interaction", paper presented to CHI '08 workshop: HCI for Community and International Development, Florence, Italy

MacColl, I., Billinghurst, M., Brereton, M., DoSouza, M., **Dekker, A**., Postula, A., Redhead, F., Richardson, I. & Ros, M., 2008 "Urban Interfaces", paper presented to CHI '08 workshop: Designing and Evaluating Mobile Phone Based Interactions with Public Displays, Florence, Italy

Champion, E., **Dekker, A**., Thomas, P., 2008 "A lazy panorama table for urban visualisation and orientation", CAADRIA 2008, Chaiang Mai, Thailand

Dekker, A., Champion, E., 2007 "Please Biofeed the Zombies: Enhancing the Gameplay and Display of a Horror Game Using Biofeedback", Proceedings of Situated Play, DiGRA 2007, Tokyo, Japan

Other Publications
Dekker, A., Marrington J., 2011. Extending Existing Applications - Good Practices for Writing APIs to Interact With New iOS Applications, /dev/world/2011, Rydges Bell City, Melbourne

Dekker, A., Champion, E., 2010. "Designing for biofeedback: Blood sweat and fears" UX Australia

Dekker, A., Viller, S., Tan, A., 2009. "Waving creatively: An examination of Google Wave to facilitate collaboration in creative processes", Createworld 2009, Brisbane, Australia

Redhead F., **Dekker A**., Brereton, M., Maccoll, I., 2007 "Digital documents of life, photo sharing and management technologies in everyday life", Simtech Mundane Technologies, Melbourne, Australia

Please complete Section B for each named investigator on the ECR-SoTL application.

B1   Person number (refer to section A3)

> **3**

B2   APPLICANT DETAILS

Employee No	**20775595**

Family name	Bugarcic			Role	AI
Given Name	Andrea		Second name		
Title	PhD				
School		Institute for Molecular Biosciences			
Faculty or Org Unit		Faculty of Science			
Current Appointment & Level (must hold a Teaching-Focused Position)		RO Level B1			
Year of Appointment	2008		Year of Expiry	2014	
Email:	a.bugarcic@uq.edu.au		Telephone:	+61 7 334 62031	

B3   ARE YOU CURRENTLY COMPLETING POSTGRADUATE RESEARCH TRAINING?   ☐Yes ☒No

The UQ EC-SoTL scheme is not designed to provide funds for projects that constitute the topic for an applicant's research higher degree thesis.

	If yes, you must outline how the proposed UQ EC-SoTL project is clearly different from your research higher degree project and that the progress of your degree will not be affected by taking on the additional work outlined in this application.

B4   QUALIFICATIONS

B4.1   PhD qualification awarded

Discipline/Field	Biological Sciences	
Organisation	University of Auckland	
Country	New Zealand	
Month and Year awarded	August 2007	**(or) Date Thesis Submitted/ Proposed Submission Date**

B4.2   Other qualifications (including highest Qualification if not PhD)

Degree/Award	**Year**	**Discipline/Field**	**Organisation and country**
MSc	2001	Biological Sciences	University of Auckland, NZ
BSc	1998	Biological Sciences	University of Auckland, NZ

B5 ACADEMIC, RESEARCH, PROFESSIONAL AND INDUSTRIAL EXPERIENCE

Current and previous appointment(s)/position(s) - covering a maximum of the past 10 years in descending date order, beginning with your current/most recent position. Describe the Status of your appointment by choosing from Continuing, Fixed-Term, or Past.

Position held	Organisation	School/Institute/Centre/Department	Year appointed and status
Postdoctoral Research Officer	University of Queensland	Institute for Molecular Biosciences	2008/Current
Associate Lecturer	University of Queensland	School of Biomedical Sciences	2010/Current
Postdoctoral Research Associate	Griffith University	Institute for Glycomics	2007/Previous

B6 PROJECT COMMITMENT

Average number of working days per month in 2012-2013 to be committed to:			
This project:	2	All other projects:	22

B7 All refereed publications in the past 5 years (2005 onwards)

- Use double-asterisks (*) to identify Scholarship or Teaching & Learning publications and a single asterisk to identify publications relevant to this application.
- List publications under the following headings: ***Books, Book Chapters, Journal Articles, Conference Papers, Other Publications.***
- In-press publications are to include the acceptance date.
- Provide a list of all your publications if you have fewer than 5 years of publications.

Journal articles:

Follett J, Norwood SJ, Hamilton NA, Mohan M, Kovtun O, Tay S, Yang Z, Wood SA, Mellick GD, Silburn PA, Collins BM, **Bugarcic A**, and Teasdale RD (2014). Vps35 D620N mutation linked to Parkinson's disease causes endosomal dysfunction and improper sorting of cathepsin D. Accepted to Traffic (date of acceptance: 26/09/2013)

Zimbardi K, **Bugarcic A, Colthorpe K, Good JP, Lluka LJ (2013). A set of vertically-integrated inquiry-based practical curricula that develop scientific thinking skills for large cohorts of undergraduate students. *Advances in Physiology Education*, 37(4): 303-315.

Ghai R, **Bugarcic A**, Liu H, Norwood SJ, Skeldal S, Coulson EJ, Li SS, Teasdale RD, Collins BM. Structural basis for endosomal trafficking of diverse transmembrane cargos by PX-FERM proteins. (2013) PNAS USA. 110 (8) E643–E652. (IF 9.681)

**Bugarcic A, Zimbardi K, Macaranas J, Thorn P (2012). An inquiry-based practical for a large, foundation-level undergraduate laboratory that enhances student understanding of basic cellular concepts and scientific experimental design. Biochemistry and Molecular Biology Education 40(3): 174-180 (IF 0.29)

Bugarcic A, Zhe Y, Kerr MC, Griffin J, Collins BM, Teasdale RD (2011). VPS26A and VPS26B subunits define distinct Retromer complexes. Traffic Dec;12(12):1759-73. (IF 4.919)

Ghai R, Mobli M, Norwood SJ, **Bugarcic A**, Teasdale RD, King GF, Collins BM. (2011) Phox homology band 4.1/ezrin/radixin/moesin-like proteins function as molecular scaffolds that interact with cargo receptors and Ras GTPases. PNAS USA. May 10; 108 (19):7763-8. Epub 2011 Apr 21. (IF 9.681)

Scott SA, **Bugarcic A** and Blanchard H (2009). Characterisation of oxidized recombinant human galectin-1. Protein and Peptide Letters; October 16 (10), p1249-1255 (IF 1.281)

Kraschnefski MJ, **Bugarcic A**, Fleming FE, Yu X, von Itzstein M, Coulson BS, Blanchard H. (2009) Effects on sialic acid recognition of amino acid mutations in the carbohydrate-binding cleft of the rotavirus spike protein. Glycobiology. Mar;19(3):194-200. Epub 2008 Oct 30. (IF: 3.886 (Ranked #73 by impact factor out of 263 journals in the Biochemistry & Molecular Biology category))

Bugarcic A, Hitchens K, Beckhouse AG, Wells CA, Ashman RB, Blanchard H. (2008) Human and mouse macrophage-inducible C-type lectin (Mincle) bind Candida albicans. Glycobiology. Sep;18(9):679-85. Epub 2008 May 28. (IF: 3.886 (Ranked #73 by impact factor out of 263 journals in the Biochemistry & Molecular Biology category))

Bugarcic A and Taylor J. (2006) Rotavirus nonstructural glycoprotein NSP4 is secreted from the apical surface of polarized epithelial cells, Journal of Virology 80(24) (Epub ahead of print) (IF: 5.332 (Ranked #3 by impact factor out of 25 journals in the Virology category))

Conference paper:
Ghai R, Mobli M, Norwood SJ, **Bugarcic A**, Teasdale RD, King GF, Collins BM (2012) PX family proteins at the interface between intracellular trafficking and signalling. 22nd IUBMB Congress/37th FEBS Congress, SPAIN

Other publications:
****Bugarcic A and** Jackson K (2013) Case study: Oral presentations in biomedical science. TLO4 (Communication).

PART C: PROJECT ACTIVITIES AND OUTCOMES

Under the headings listed below, explain the project and its expected outcomes in a way that can be appreciated by all assessors. Applicants should be mindful that not all assessors will be experts in the field and should write in accessible language, avoiding the use of jargon. Assessors will be looking for clarity of expression.

- **Part C cannot exceed 6 pages of 12 font**
- **References are in addition this page limit.**

Application Assistance

C1   PROJECT TITLE

- Use the same title as in Section A2

Feedback Analytics – developing methodologies that relate patterns in student use of feedback to variations in feedback provision and academic performance

C2   ISSUE(S) TO BE ADDRESSED

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Feedback is one of the most potent teaching strategies known to produce student learning gains (Hattie 2009), yet the provision of feedback has been identified as one of the weakest elements of university practices (Graduate Careers Australia 2012). The emergence of online feedback tools has greatly enhanced the opportunity for delivering timely, expressive, digital feedback to large cohorts of students, and for evidencing the learning impacts of this feedback (Ellis 2013). In investigations of the impact of feedback modality (i.e. audio, typed, handwritten comments) on student use of feedback, students report that the provision of audio feedback increases their engagement with, and usefulness of feedback (Ice et al. 2007). However, students also report that a combination of typed and audio feedback is more useful than either typed or audio feedback alone (Still 2006). Importantly, how students actually use feedback, and the relationships between student use of feedback and changes in assessment performance are poorly understood.

We have developed an innovative online system that collects large-scale data on digital feedback provision, student accessing of feedback and changes in performance on assessment items submitted electronically (Zimbardi et al. 2013). Currently, the primary challenge common across the field of learning analytics, is interpreting these data readily and accurately, so that the findings can be translated into improved teaching practice and student outcomes (Dawson et al. 2011; Lockyer et al. 2013). This project is therefore focused on developing the methodological approaches that will unlock these enormous feedback databases, and begin to reveal the relationships between student use of feedback, academic performance and feedback provision. Ultimately these advances will support the development of digital feedback practices that improve students' effective use of feedback for maximal learning.

Theoretical Frameworks

There are many theoretical frameworks aimed at improving feedback provision (Sadler 2010; Nicol & Macfarlane Dick 2006; Hattie & Timperley 2007). At the heart of each of these frameworks is the same core message: effective feedback that promotes learning, fosters students' self-regulation of learning. Without information about what students do in response to feedback, it is impossible for those who are providing the feedback to know whether they are implementing these frameworks appropriately.

To date, there are no well established theoretical frameworks for feedback use.

A recent, extensive review of 109 empirical studies reporting findings about how students use feedback (Jonsson 2013), found only two studies that employed methods that observe students actually using feedback (Dessner 1991; Dohrer 1991), while the remaining studies relied on surveys or interviews of students self-reporting how they used feedback. Importantly this review revealed a disconnect between the feedback attributes students valued, and the feedback attributes that supported student learning. Specifically, students typically request large amounts of specific, detailed and individualised feedback, but large amounts of highly directive, task specific feedback is detrimental to student learning (Jonsson 2013). Therefore, there is a clear need for evidence of student use of feedback to guide the development of theoretical frameworks that support students and academics in improving students' effective use of feedback.

This project will draw from recent advances in learning analytics research methods to further the current understanding of the relationships between feedback provision, feedback use and improvements in student performance on successive, related assessment tasks. The use of interactive, online technologies in education, is currently growing exponentially with the increased uptake of massively open online courses, and generating 'big data' in the form of click stream logs that document users' interactions with the diverse range of elements embedded in the educational interfaces (Long & Siemens 2011). A range of cluster analyses and modeling approaches are now commonly used in the field of learning analytics to interrogate warehouses of this user interaction data (Kizilcec et al. 2013; Southavilay et al. 2013). These analytical approaches are revealing important differences in the ways that sub-sets of learners are engaging with educational resources, and these findings are challenging traditional conceptions of effective learning behaviours (DeBoer et al. 2014; Jordan 2014). This project will employ clustering, modeling and visualisation approaches to identify and illustrate patterns in student use of digital feedback. These patterns in feedback use will then be related to variations in feedback provision and improvements in academic performance. In this way, the methodologies developed during this project will advance the fields of feedback analytics, and learning analytics more broadly, while the findings from this project will provide new avenues for research in wider field of feedback and assessment for learning.

Research Questions

1. What are the variations in the patterns of student use of feedback across large cohorts of undergraduate biomedical science students
2. How do these patterns of feedback use relate to differences in:
    a. Feedback provision across multiple modalities
    b. Academic performance across multiple related assessment tasks
    c. Co-variables e.g. prior academic performance, age, gender, etc.

C3 ACTIVITIES AND TIMELINE

We have developed, implemented and evaluated an open-source, online feedback and marking tool (known as "UQMarkUp") which collects (i) click stream logs of student interactions with feedback embedded in marked

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assessment submissions, (ii) metadata on the modality and amount of feedback provided, and (iii) longitudinal performance of students across all assessment items processed by the system. Using UQMarkUp, we have conducted proof of concept studies in 2012-2014 across 10 large undergraduate courses at 1st, 2nd and 3rd year levels in biomedical science involving 75 markers, marking over 10,000 written assignments (literature reviews, research proposals and laboratory reports) for 3,000 students, and over 40 oral presentations for 150 students. Importantly, our system provides data on feedback provision that is both quantitative (on average, markers provide 7±1 (mean±SEM) audio comments of 30±2 seconds, and 6±3 typed annotations of 9±1 words each per assignment) and can be qualitatively analysed to determine what markers are commenting on, and how comments are phrased. Our preliminary data analysis has also revealed that, on average, students access their digital feedback for ~3hr and are playing the majority of the audio completely, often multiple times. Against this backdrop, students who made large improvements in assessment performance between successive assessment tasks (>10% mark improvement), appear to access their marked assignments for significantly longer amounts of time, and play audio comments more times, than students who either made small gains or performed more poorly (p<0.05). **This project will be focused on the next level of in-depth analysis of student click stream data, and feedback content, to understand how patterns in student movement through the marked assessment items relate to changes in academic performance and feedback provision**. Therefore, aims of this proposal are to:

Aim 1: investigate the variations in the patterns of student use of feedback across large cohorts of undergraduate biomedical science students

Aim 2: investigate how these patterns of feedback use relate to differences in:

    a. Feedback provision across multiple modalities
    b. Academic performance across multiple related assessment tasks
    c. Co-variables e.g. prior academic performance, age, gender, etc.

Aim 1 Research Plan:

This phase will investigate variations in the ways that students access their marked assessment items, in relation to the embedded feedback annotations. Variables will include:

1. the paths students take through their assessment items (e.g whether students scroll to the mark first or work systematically (or sporadically) through the document, the degree to which students scroll back and forward between feedback annotations and criteria sheets, whether they access annotations in different orders based on modality or location),

2. how long students spend in, and how many times students return to, each section of their assessment and each feedback annotation,

3. how many times students access the marked assessment item and the timing of this in relation to subsequent assessment due dates.

Extracting these variables from the raw click stream data will require a substantial amount of pre-processing. For example, developing quantitative indicators of variables like the degree to which students scroll back and forward through their assessment documents, that can be used in the

subsequent analysis, will take several reiterative cycles of raw data extraction and trial analysis to optimise.

Following the extraction of variables of feedback use, cluster analyses will be used to identify major categories of patterns of student use of feedback. Where possible, hierarchical clustering and the Euclidean distance model will be used due to the lack of theoretical frameworks on student use of feedback available to inform reasonable estimates of the number of clusters likely to represent the variations in student behavior. However, where datasets are too large for hierarchical clustering and cannot be reasonably segmented, k-means clustering will be used for preliminary analysis of the behaviour patterns.

Aim 2 Research Plan:

The results of the cluster analysis will be used to build classification models, which are appropriate for both categorical and continuous dependent variables that do not fit to linear relationships with the independent variables. These classification models will be used to investigate the relationships between the patterns of student feedback use (dependent variable) and three categories of independent variables: (i) assessment performance, (ii) feedback provision variables, and (iii) key co-variables.

The feedback provision variables will include the amount of feedback provided, relative use of audio and typed feedback, positioning of feedback throughout the document, etc. Sample sets of the audio annotations will be transcribed, and along with sample sets of the typed annotations, will be qualitatively analysed for content and affective cues (e.g. anger, concern, frustration, confusion etc.). This data will also be included as independent variables in the classification modeling to determine features of annotation content and phrasing that relate to differences in the patterns of student use of feedback.

Key co-variables found previously to impact on academic performance and student engagement, such as age, gender, language and prior academic achievement, have been successfully extracted from UQ student records for the 2012 and 2013 datasets. These variables will be used as independent variables in building the classification models, to reveal co-variables associated with variations in student use of feedback and assessment performance.

Timeline

Month	Activity
June	Hire analyst Survey & interview academic staff to determine variables of interest Preprocessing of data (pull down and check 2014 Sem 1 data; transcribe 2012 & 2013 interviews; link all previous assessment, co-variables, interview and survey data by UQ ID and de-identify)
July - Oct	Initial cluster analysis and classification model building Cross-check findings from cluster/model analysis with survey and interview data Write up progress for Final Report
Nov	Discuss preliminary findings with coordinators for courses that generated data Begin drafting visual representations
Dec - Jan	Present preliminary findings at CUBEnet and AuPS Preprocess 2014 Semester 2 data Additional cluster/model analysis from coordinator feedback Continue drafting visual representations

Feb	Check revised findings and visual representations with course coordinators
	Write up progress for Final Report
March - April	Revise analysis and visual representations
	Interview academics, markers and students to identify potential dashboard visual representations
	Determine feasibility of automating key analyses and embedding visual representations into UQMarkUp interface
May	Finalise Final Report

Concurrent academic activities of CI:

2014 Semester 2: Course Coordination and lectures (6L) for PHYL2064/5 (~230 students); Course Coordination of and lectures (12L) for PHYL1007 (~380 students); Practical Coordination of BIOM3015 (~170 students); Lectures in BIOM1052 (2L), BIOM2010 (2L), BIOM3011 (4L)

2015 Semester 1: Lectures in BIOM2009 (5L), BIOM2015 (4L)

Expertise

CI: Zimbardi led the large Faculty of Science grant projects that developed the UQMarkUp iPad App into a full feedback analytics capture system capable of tracking the provision, and use, of feedback for large cohorts of students. Zimbardi conducted the initial analysis of feedback analytics data presented at the beginning of Section C3, and has been developing skills in data analytics through a MITx course (15.071x The Analytics Edge) including performing linear and logistic regressions, CART and random forest classification trees, and cluster analyses in R. Zimbardi also has extensive experience in teaching and SoTL as a teaching focussed academic in biomedical science, and therefore has the background necessary to supervise the analysis proposed in this study and ensure the findings are applicable to improving teaching and learning practices.

AI: Dekker created the current UQMarkUp system and therefore has the expertise to alter the design of the system to extract the variables of interest, and to embed the visualisations found to be useful in guiding feedback interventions, and in determining the impact of those interventions.

AI: Bugarcic, a current coordinator and lecturer, has been an active driver of the development, implementation and evaluation of the UQMarkUp system. Bugarcic has demonstrated insight in critically analysing the usefulness of the data produced by UQMarkUp, and preliminary visual representations of this data, for driving evidence-based feedback interventions and innovations.

C4 COLLABORATION

This study is focused on the analysis of data drawn from a range of undergraduate biomedical science courses over the past 3 years, and will engage the academics who coordinate these courses as collaborators throughout the project duration through evaluative interviews. Throughout the study, interviews with academics and workshops at national conferences will be used to engage academics more broadly in the evaluation of the study approaches, findings, and utility of the outcomes for guiding teaching and learning innovations, which has been shown to be an effective way of eliciting engaged dissemination (Hinton et al 2011). Previous presentations of the UQMarkUp system and findings have already drawn a large amount of national

- Identify areas, either within your own discipline, or across other disciplines, that are affected by the issue to be addressed.
- Provide a summary of the expertise required to adequately address the issue and describe how you would identify and involve other scholars in the field.

and international interest, and several active collaborators (see Section C5).

C5   PROFILE-BUILDING AND DISSEMINATION

Presentations of preliminary findings from the UQMarkUp system illustrating the capabilities and simplicity of the system (e.g. Zimbardi et al. 2013) have engaged academics at University of Sydney, Curtin University, University of Auckland and University of Edinburgh who are eager to collaborate on the adaption and adoption of this tool at their institutions. These future adopters have also brought in key change enablers from each of their institutions (IT innovators and support staff, representatives of the DVC Academics), to collaborate on a large OLT project proposal (see section A9). The massive amount of data, and almost limitless suite of variables that have already arisen during the UQ trials in 2012-2014, has highlighted the need for suitable analytical methods that reduce the overwhelming data down to the most informative elements. Leading the development of these analytical methods will build and cement our profile substantially as we move into the large international collaboration where the volume of data will grow exponentially.

C6   GRANT OUTCOMES

The development of analytical methods to use large databases of feedback data to investigate the relationships between feedback provision, feedback use by students and improvements in academic performance will:

1. advance our understanding of student feedback use, and what represents effective use of feedback that leads to improved assessment performance
2. be used to develop visual representations which are readily interpreted by academics, and can be used to guide their feedback interventions
3. in conjunction with key co-variables, lead to the development of early stage indicators of students at risk of poor academic performance
4. develop our profile as leaders in the field of feedback analytics
5. establish the analytical process to be used at several institutions in the related OLT project focused on wide-spread dissemination of UQMarkUp.

C7   EVALUATION METHOD

Formative evaluation of the project progress will be conducted at several points throughout the life of the project. Surveys and interviews with academic staff will be used to determine which variables academic staff believe are important in the relationships between feedback provision, feedback use and academic achievement. This will reveal which variables academics expect to see in the analytics models, and provide insights necessary to evaluate and defend expected and unexpected results of the analysis. Several reiterative cycle of analysis and evaluation of the models through interviews and conference workshops, will be used to refine the project outcomes (both models and visual representations as indicated in the Timeline).

As the analysis reveals which variables impact on the relationships in our model, the findings will be checked against the qualitative data collected previously from students and markers through interviews and surveys, providing a internal validation through triangulation of multiple data sources.

- Explain how you will use the outcomes of this project to enhance your professional profile.
- The effective dissemination and uptake of project activities and outcomes is an important goal of the scheme. Plan a range of approaches to dissemination, for example, the creation of opportunities to promote the project activities and to explain goals and outcomes. Emphasise engaged dissemination, not just publication and conference presentations. Refer to the D-Cubed Guide: Planning for Effective Dissemination on the OLT website

- Provide information about the outcomes of the grant and how these outcomes might be embedded within the teaching and learning practices at UQ.
- Describe how the project could be developed further and submitted to an external agency.
- Detail the project's contribution to the scholarship of teaching and learning.

- Evaluation should be carried out throughout the project. When the project is completed you will be asked to provide a Final Report. The Final Report requires that you evaluate the activities and outcomes of the grant. Describe the strategies you will adopt to address on-going and final evaluation.

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PART D: BUDGET

D1   BUDGET DETAILS

Detailed Budget *(List all items individually)*	$ Amount Requested 2014-2015	Total
Personnel *(include type of appointment and on-costs) Note: Academic Research Staff cannot be employed under this scheme (this includes Part-Time appointments). Support is only available for research/technical assistance (HEW Levels 1 – 7). Advice on the qualifications and/or experience associated with various support-staff categories is available:*http://www.uq.edu.au/research/research-management/budgeting-for-direct-costs		
Analyst (HEW 6, level 1) (0.2 FTE x 11 months @ $73,822.54 pa FT; base rate = 67,572.12 pa + 9.25% superannuation)	$13,534	
Research Assistant (HEW 4, level 1) (10 hours @ $35.76/hour incl on costs)	$358	
Total:	$13,892	
Equipment *(hardware and software items costing more than $1,000 each) Indicate the cost of equipment and installation. Base the cost of equipment and installation on the latest prices (excluding GST) obtained from the supplier at the time of application and do not estimate cost.*		
Total:		
Maintenance *Include in this category consumables, as well as equipment items costing less than $1,000. Estimate the prices that will apply at the time of purchase.*		
Total:		
Travel *Designate the costs clearly, itemising origins and destinations for travel, daily allowances, etc. When calculating travel costs, applicants should provide an economical estimate of actual costs in 2012.*		
Workshop at conferences (CUBEnet)	$300	
Total:	$300	
Other *Include any items that cannot be appropriately placed in other categories*		
Transcription of 2012 & 2013 interviews (@$2.64/min x 4hr) **Transcription of audio annotations (@$2.64/min x 1hr (sample of 120 annotations averaging 30 sec each)**	$792	
Total:	$792	
Grand Total	$14,970	

Additional notes:
Personnel (salaries + on-costs)
The terms 'research assistance' and 'technical assistance' are used to designate set amounts for less specific funding of personnel. It is intended that funds provided in these instances should be used by the chief investigator(s) to purchase services in order to further the progress of the project efficiently and effectively.

Persons engaged for these services may be employed on a full-time or part-time basis. On-costs of 27.988% for non-casual staff and 16.828% for casual staff must be added to basic salary rates to meet the cost of workers compensation insurance, payroll tax, leave loading, long service leave contribution and superannuation costs. A schedule of salaries for support staff may be accessed at the following address: http://www.uq.edu.au/current-staff/index.html?page=11206
Teaching Relief
Heads of School will consider requests for support to relieve a staff member of teaching and other duties on a case-by-case basis and will only award Teaching Relief where they are convinced that this is essential for the successful outcome of the project (e.g. If travel to access information is only possible during semester.). A statement of how the position will be filled for the period in question should be endorsed by the Head of School and attached to the application. Grant monies may only be used for teaching relief where this has been specified in the application.
Travel
Visits to collaborators, holdings of libraries or laboratory facilities may be funded, even if the travel is outside Australia, provided the project as a whole is based in Australia and the activities involved is related directly to the project. Travel and

subsistence funds may be made available to bring in a person from overseas who will collaborate in the project, particularly where that person will contribute specialised skills necessary to the project.

Budget Information

Salaries: http://www.uq.edu.au/current-staff/index.html?page=11206

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/travel-dev/index.html?page=117116&pid=0

D2   JUSTIFICATION OF YOUR BUDGET

In **no more than one A4 page,** fully justify in terms of need and cost, each budget item requested. Structure your budget justification under the same headings used in the table above (Personnel, Maintenance, etc).

Personnel:

Analyst – the CI (Zimbardi) and the AI (Dekker) have expertise in the types of analysis and visualisations that need to be conducted, but insufficient time to analyse the extensive database collected from the 2012-2014 trial of UQMarkUp in SBMS courses. Therefore Zimbardi and Dekker are able to appropriately supervise an analyst with a Hons/PhD student level of knowledge and skills in analytics.

Research Assistant – a basic level of skill in analysing qualitative data will be needed to (i) analyse the content and affective cues (eg anger, concern, frustration, confusion, etc.) of audio and typed feedback, and (ii) extract key information from 2012 and 2013 interviews and surveys to validate conclusions drawn from cluster and modelling analysis

Travel:

Conference workshops – are a key part of the evaluation and dissemination strategies to engage wider groups of academics in the evaluation of the study approaches and findings in a way that promotes engagement with the study outcomes and improves the rate of sucesful uptake of the work at additional institutions. CI Zimbardi and AI Bugarcic have already been invited to present at AuPS which will be held at UQ in December 2014 (covering registration, no accommodation costs). Travel to, and accommodation in, Canberra for CUBEnet, also in December 2014, will be subsidised by funds for other projects that the CI will also be presenting at the forum, substantially reducing the costs from this project.

Other:

Transcription of interviews from 2012 & 2013 – this information is key to ensuring internal validity of the study, specifically that the findings from the cluster and modelling analysis provide a reasonable account of the feedback provision and feedback use behaviours described by a sample of the populations who generated the feedback data.

Transcription of audio annotations – this information is vital to including independent variables about feedback content and affect in the modelling analysis. Our initial analysis has shown that the majority of assessment items contain ~6x 30 second audio annotations. This budget allows for a sample of 120 audio annotations to be transcribed for qualitative analysis by the project Research Assistant.

- It is not sufficient to claim that certain equipment or personnel costs $X. Rather, you should explain, in terms of its importance to the project, why the equipment is required, or why a full-time technician with a specific level of expertise is required.

- Justify any funding being requested for relief from teaching or other duties for any member of the project team.

- Justify any funding being requested for major items of equipment. Requests for any major items of equipment for the project are considered on their merits. You must plan to use existing equipment wherever possible. If you are seeking funding for new equipment, please describe how the equipment will be used and provide details of the manufacturer, supplier, cost and installation based on quotations obtained.

![The University of Queensland Australia]

PART E: APPLICATION CERTIFICATIONS

Certification by Chief Investigator/s
I certify that:

i) To the best of my knowledge, all the details on this application form are true and complete.
ii) I have complied with the *UQ Early Career Scholarship of Teaching and Learning Grant Scheme Funding Rules 2014 and Instructions to Applicants* and if I am successful I will accept the Conditions of Award relating to this scheme.
iii) I will comply with all necessary UQ policies and procedures in discharging my responsibilities under this grant.
iv) I understand and agree that all ethical clearances must be met before the proposed research can commence.
v) In submitting this application, I consent to its referral to internal (UQ) assessors for consideration.

Certification by Head of School: I certify that:

i) The project, if funded under this grant 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 project, if funded under this grant application, carried out in my organisational unit under the circumstances set out by the Applicant/s.
iii) I have noted the amount of time that the Applicant/s will be devoting to the project and agree that it is appropriate to existing workloads. I agree that teaching relief will be arranged if assessors accede to a request for teaching relief.

Signatures of Chief Investigator(s) and Head(s) of School/Institute/Centre

Person	Surname, title and initials (Printed)	Signature of Chief Investigator	Signature of Head of School
1			
2			

PART F: NOMINATED ASSESSOR

Applicant Details

Surname of First-named Chief Investigator	Grants Scheme	Project Title
	UQ Early Career (SoTL) Grants Scheme	

Assessment will be undertaken by a panel appointed and chaired by the DVCA or nominee, with independent (internal) assessment where appropriate. However*, independent assessment will be the exception, rather than the rule*. Applicants are invited to nominate **one** independent University of Queensland assessor for their proposals.

Nominate one independent University of Queensland person who is qualified to assess the <u>project and is not associated with it. Please ensure that the nominee is willing to respond if approached.</u>

Nominee 1	
Surname	
First Name	
Title	
University of Queensland School	
Phone	
Email	
Reason for nomination	
Has the nominated assessor agreed to assess the project?	☐**Yes** ☐**No**