SUPPORTING STUDENT ENGAGEMENT AND TRANSITION THROUGH UNDERGRADUATE RESEARCH EXPERIENCES IN MICROBIOLOGY

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BACKGROUND
The Undergraduate Research Experience (URE) is an effective method used to engage students in scientific inquiry. Students are able to establish ownership of their investigations in authentic research projects, and develop transferrable critical reasoning skills as part of their undergraduate coursework. However, the widespread implementation of UREs can be limited by the resource-intensive nature of these initiatives, and their sustainability hinges on the implementers' ability to demonstrate long-term benefits for student perceptions and motivations.

AIMS
This project aimed to evaluate the benefits of program-wide URE implementation on student learning and engagement. This data will help highlight the long-term value of UREs across multiple year levels, and provide insight into the feasibility and sustainability of URE implementation across undergraduate science programs.

DESIGN AND METHODS
In this study, pre and post survey data was collected from undergraduate students who participated in UREs offered in second and third-level microbiology courses at The University of Queensland (UQ) from 2012-2014 (n=600). Learning gains in transferrable scientific skills, perceptions towards science, and future educational and career goals, were progressively monitored through each URE. Statistical analyses and focus-group interviews were conducted to highlight trends in student learning gains in response to URE engagement, and whether these learning gains are sustained and expanded upon in subsequent UREs.

RESULTS
Statistically significant increases in student confidence in scientific skills and engagement with science were observed following the completion of each URE in second and third level microbiology courses at UQ from 2012-2014 ($p<0.05$ using the Mann-Whitney U-test). Students who had participated in multiple UREs demonstrated higher learning gains than those who had not previously engaged with UREs until the final year of their undergraduate studies ($p<0.05$). Thematic analysis of interview responses identified appropriate guidance and scaffolding of learning activities, authenticity of research projects within UREs, and ownership over novel investigations, as strong motivating factors for student learning.

CONCLUSIONS
This study has evaluated the sustained impact of URE implementation on student learning as they transition throughout undergraduate science programs. Notably the student learning gains derived from URE participation were cumulative, and facilitated their engagement in further studies in Science. These outcomes demonstrate the importance of strategic scaffolding and embedding of UREs in curriculum design at the program-level, and the value of research-led learning in Science Education.