

## Providing authentic research experiences: Comparison of two research programs

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Undergraduate students are increasingly becoming engaged in research to gain a competitive advantage in employment and to increase their academic skills. At Monash University students in biomedical sciences are able to undertake a semester long undergraduate research project with a supervisor in a research lab. These research units are popular with students and research staff and provide an authentic experience of research. However, the time and resource intensive nature of the units means that only a small proportion of students are able to take these units. Developing an integrated curriculum to provide an authentic experience of research for a large class that is inclusive of all students is challenging. At Monash we have developed a “capstone” unit in the Biomedical Science that contains a number of tasks (5) designed to develop a range of research skills and to engage students with researchers in a meaningful but less time consuming manner than the laboratory placements.

We surveyed two groups of students, those undertaking the research units (RU) and those undertaking the Capstone unit (CU) to determine their skills development and experience of the research environment. Information was gathered by a survey based on the Undergraduate Research Student Self-Assessment (Hunter et al 2009), which was administered at the end of semester 1 in 2014. Questions on the survey were structured to give information from each group (RU and CU) about: 1) Thinking and working like a scientist; 2) Personal gains; 3) Gains in skills; and 4) attitudes/behaviour as a researcher. A Mann-Whitney U test was used to test for significant differences between the 2 groups.

1. Thinking and working like a scientist: Gains in “analysing data for patterns”, “Figuring out the next step in a research project”, “identifying limitations of research methods and designs” and “understanding the connections among scientific disciplines” were significantly greater for students doing RU than those doing CU. CU and RU were both equally valuable for “problem solving in general”, “formulating a research question that could be answered with data”, “understanding the theory and concepts guiding my research project” and “understanding the relevance of research to my coursework”.
2. Personal gains: The RUs were significantly better for developing “confidence in my ability to contribute to science”, “confidence in my ability to do well in future science courses”, “ability to work independently”, “developing patience with the slow pace of research” and “taking a greater care in conducting procedures in the lab/field”. CU and RU were equally valuable for developing “confidence in discussing scientific concepts with others”, “comfort in working collaboratively with others” and “understanding what everyday research work is like”.
3. Gains in skills: Gains in “writing scientific papers”, “keeping a detailed lab book” and “conducting observations in the lab/field” were significantly greater for student doing RU than those doing CU. CU and RU were both equally valuable for “making oral presentations”, “defending an argument when asked questions”, “explaining my project to people outside my field”, “understanding journal articles”, “conducting database or internet searches” and “managing my time”.
4. Attitudes and behaviour as a researcher: The RUs were rated significantly higher for “engaging students in real world science research”, enabling them to “feel like a scientist” and making students “work extra hours because they were excited about the research”. CU and RU were both equally valuable for enabling students to “think creatively about the project”, “feel responsible for the project”, interact with scientists from outside your discipline” and “feel like a part of the scientific community”.

Conclusion: Exposure to research is valuable for all students. Our results have illustrated that a range of research related activities, including interviews with directors of research labs can engage students in the research environment and can provide an authentic research experience.

Hunter, A.-B., Weston, T.J., Laursen, S.L., & Thiry, H. (2009). URSSA: Evaluating student gains from undergraduate research in the sciences. *CUR Quarterly*, spring 2009.