



Australia's National
Science Agency

Destination Report

Undergraduate Research Opportunities Program

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Introduction

The CSIRO Education and Outreach Impact and Evaluation team (I&E team) produced this report to provide key stakeholders with high-level insights about the self-reported contributions the Undergraduate Research Opportunities Program (UROP) has made to participants' longer-term education and career outcomes. One of the main goals of UROP is to increase the retention of students in post-graduate biomedical education, and subsequent biomedical research careers.

The I&E team has made every effort to ensure the accuracy of the findings presented in this report. However, given certain constraints of the methodology (e.g. primarily based on self-report), some caution should be exercised when interpreting and responding to this report, particularly in relation to UROP causing versus contributing to certain outcomes.

The primary purpose of this report is to show the influence UROP had on participants several years after they took part in the program. This initial longitudinal research is contributing to the wider ongoing monitoring and evaluation of UROP outcomes – by helping supplement immediate program feedback with more in-depth and holistic perceptions of UROP through the lens of time. The report is not focused on program improvements and so recommendations were not in scope. Any learnings about UROP's implementation are explored in the annual monitoring updates provided to the CSIRO program team and the program's funder CSL, which focuses more on timely feedback and insights from recent UROP participants and supervisors.

The I&E team would like to thank all the previous UROP participants who generously volunteered their time to participate in interviews and provide detailed responses to the survey. Their insights were invaluable, and their education and career achievements were inspiring. In particular, we would like to thank Scott Gigante, Peter Hickey, Michelle Meilak, Catriona Nguyen-Robertson, Halina Pietrzak, Ben Porebski and David Riglar who participated in follow-up interviews and agreed to be featured in case studies (see Appendix B)¹.

Finally, thanks to CSIRO colleagues – Jason Barkla, Manager of Industrial Readiness Programs; Lisa Walker, Principal Advisor in Impact and Evaluation; and Renate Hays and Thomas Keenan from the CSIRO Impact and Performance team – for peer reviewing this report and providing constructive feedback.

¹ All interview participants consented to being named and featured as a UROP case study.

Executive summary

UROP is a paid work integrated learning program targeted at Victorian STEM undergraduates in their penultimate year of study. It has been operating since 2004, with 718 students completing their UROP placement by the time of writing this report. This destination research was conducted to gain a clearer understanding about the extent UROP has influenced participants' longer-term education and career pathways.

The findings in this destination report are based on:

- survey results from 65 former UROP participants, representing a 39 per cent response rate²
- seven case-study interviews³.

Self-reported feedback from former participants indicates a substantial positive perception of UROP. Key insights from the survey include:

- most stated that UROP had a 'significant' or 'extreme' impact on their education and/or career decisions (82%)
- the majority indicated that UROP had motivated them to pursue a career in STEM (60%)
- most were studying, or had completed a post-graduate qualification (81%)
- over a third of respondents were working in a job directly related to the research they completed during their UROP placement (35%)
- nearly all respondents said they would recommend the program to current undergraduate tertiary students (98%).

The case study interviews allowed for an in-depth follow-up to the survey data collected. Common themes from the interviews were:

- UROP had helped ease participants' transition into honours and post-graduate qualifications
- the UROP salary allowed participants to quit working part-time jobs unrelated to STEM and focus solely on their study and developing research experience
- UROP had exposed participants to research experience that would not have been possible through their undergraduate degrees.

² The destination survey was sent to a sub-sample of previous participants (n=167) who had agreed to be contacted after completing their UROP placement. Since 2004, over 700 Victorian tertiary students have participated in UROP.

³ The interviewees were selected from survey respondents who volunteered to be contacted for an interview. The interviewees were selected by a number of factors, which included: the year they completed their UROP placement; their education pathway; current profession, and open text responses.

Background

This section provides background information about the Undergraduate Research Opportunities Program (UROP) to assist in the interpretation of the findings.

About UROP

UROP was launched in 2004 by Biomedical Research Victoria, with CSIRO taking over facilitation of the program in 2020. It is currently financially supported by CSL.

The program is targeted at Victorian students studying STEM undergraduate degrees; providing approximately 50 students each year with the opportunity to complete paid work experience across a number of biomedical research organisations. The purpose of UROP is to provide students with exposure to genuine STEM research experiences, which will hopefully in turn support their transition into post-graduate STEM research and then onto biomedical careers.

CSIRO manages the sourcing of projects and supervisors, recruitment and matching of students with projects, and ongoing support throughout the placement. This includes an annual UROP conference day for students to present their research findings and to network with other UROP students and supervisors.

Research organisations pay participating students a casual research assistant hourly rate and are responsible for all placement administration. Supervisors are required to monitor student progress, and students work full time upon commencement during the summer or winter break and then roughly eight hours per week for between 6 and 12 months, depending on the arrangement they have with the research organisation.

Selection and demographics

The program is highly competitive, with students able to apply to for a placement twice per year. Students are selected to participate in the program based on a written application that outlines their motivations, interests in research, and their current skills and work experience. The application is further supported by their resume and university academic results. Students are eligible to participate in either a biomedical, computational or mixed biomedical-computational placements⁴.

Since 2004, UROP has hosted more than 700 undergraduate students from a range of degrees. Given UROP's focus on increasing the number of students transitioning into biomedical research, the program specifically targets students from undergraduate STEM degrees. The largest cohort are students studying a Bachelor of Science (42%), but others include those doing applied science or technology, medical or engineering degrees.

Wages and funding

UROP has been financially supported by CSL since 2010. This funding contributes towards the management and delivery of the program (including ongoing monitoring and evaluation). CSIRO covers any funding shortfalls required in the delivery of UROP. Salaries for participating students are funded in full by the research organisation that is hosting their placement.

⁴ Of the 706 historical UROP placements that have a placement type recorded, 68% were biomedical/wet lab, 25% computational, and 7% mixed.

Evaluation of UROP

Since CSIRO took over the facilitation of UROP in 2020, a proportion of program funding has been made available to resource the ongoing collection, collation and reporting of relevant evaluation data. A 'Theory of Change' approach has been taken with the evaluation of UROP, and an Impact Pathway⁵ developed to highlight key program outcomes.

This initial research makes up one component of the overall evaluation of UROP by focusing on the longer-term outcomes of past participants and using case-based evaluation techniques to illustrate impact. It has been written with key external and internal stakeholders in mind, however, insights gleaned from this report should help inform wider policy and program design.

Report methodology

To gain a more complete understanding about UROP participants' education and career pathways since their participation in the program, the I&E team sent an online survey in late 2021 to 167 participants⁶ who had finished their UROP placement between 2004 and 2021. One reminder was sent, and survey respondents had the option to volunteer to be contacted for a follow-up interview.

Data collected included:

- survey results from 65 former UROP participants⁷, representing a 39 per cent response rate
- seven case-study interviews with a selection of survey respondents.

Readers should note the potential selection bias associated with the data collected in this report, and take this into account when interpreting the results. It is strongly assumed that previous participants who had a positive experience of UROP are more likely to agree to be contacted by the program team and to subsequently complete a survey about their involvement than those who did not. This potential bias may be reduced in future years with the collection of education and employment information via LinkedIn.

In early 2022 the I&E team gained ethics approval to track UROP participants' education and career outcomes via LinkedIn commencing in 2022. It is expected that with participants' consent, the I&E team will be able to track the destination of UROP participants more effectively after they complete their placement; helping to gain a better understanding of the potential longer-term impacts of the program.

5 An Impact Pathway for UROP was developed in 2021, outlining its short, medium, and longer-term outcomes. Before this, the program operated with a smaller and more generic set of program goals. Therefore, this report does not retrospectively apply the more detailed set of outcomes to the findings from former participants. Rather, the findings are interpreted within the broad program goals of helping students gain real-world lab experience and facilitate education and career goals. As such, the Impact Pathway has not been included for reference in this report.

6 The destination survey was sent to a sub-sample of previous participants who had agreed to be contacted after completing their UROP placement. Since 2004, over 700 Victorian tertiary students have participated in UROP.

7 Sixty-three respondents fully completed the survey.

Key insights

The report findings are presented by key themes and against the overarching success criteria of UROP. Due to the type of data collected (non-experimental and mostly self-report), causation cannot be proved – rather only inferences in terms of the extent to which UROP has influenced previous participants’ skills, interest in STEM research and their education and/or career outcomes.

Please note, not all respondents answered every survey question. As such, when discussing proportions for each question, the sample size (n=X) is included to provide clarity around how many respondents completed that specific question.

UROP has greatly impacted participants’ education and / or career pathway decisions

Previous UROP participants stated that being exposed to genuine research and interacting with other researchers had meaningfully influenced their choices about what to do after undergraduate studies. In the survey, most respondents (82%) emphasised the significant or extreme impact UROP had on their education and/or career decisions (Figure 1). In a separate question (n=63), another 68 per cent ‘strongly agreed’ that UROP had informed their career pathway, and 60 per cent stated the program had motivated them to pursue a career in STEM. Of those who reported that UROP had an ‘extreme’ impact (n=14), 71 per cent had completed a PhD and 57 per cent were working in the Professional, Scientific, and Technical Services industry.

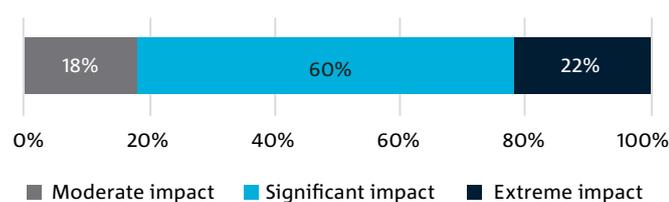


Figure 1: Impact of UROP on participants’ education and/or career pathways (n=65)

Note: no respondents selected ‘no’ or ‘slight’ impact for this question.

The majority of survey respondents chose to give detailed explanations about why UROP had impacted their education and career pathways (n=55), with most highlighting that working at reputable research institutes and/or laboratories for an extended timeframe had enabled them to make an informed decision about their career goals. For many, this exposure had positively influenced their decision to pursue a post-graduate qualification in STEM research.

Critically, this opinion was not just limited to recent UROP participants, with a large proportion of those completing the program prior to 2016 emphasising its importance, even after many years of post-graduate studies and employment.

The value of explicitly linking theory and real-world practice through work integrated learning (ACER, 2015) is exemplified by former participant Halina Pietrzak’s (see Appendix B.5) personal experience of UROP:

“ UROP was probably the best thing I have done to date. It bolstered my progression into science, gave me confidence and skills that set me apart from others, and led me to the lab where I am currently doing a PhD. I cannot thank the organisation enough for what it did for me; a young and inexperienced female scientist who just needed a bit of guidance and encouragement.

Of those interviewed, most participants highlighted how they did not have the opportunity to complete meaningful research and lab work during their undergraduate studies. For others, they were the first of their family to complete STEM-related tertiary studies. These experiences are supported by Australian-based research findings, which describe how science degrees, in particular, provide few opportunities for students to reflect on their learning and skills development (Fraser & Deane, 2002 in ACER, 2015).

In these instances, as emphasised by former participant Ben Porebski (Appendix B.6), UROP allowed participants to explore what research opportunities were available to them in ways that would not have been possible if they had just completed an undergraduate degree:

“ A lot of students who go through undergraduate science degrees generally don’t get a sufficient amount of exposure to actual real genuine research through their coursework. They have to actively go out and seek it from the research labs... I really do think that UROP is perfect for trying to pull people into that research environment.

Finally, it should be noted that a number of survey respondents (n=7) reported that even though they hadn’t pursued a career in STEM research, they still greatly valued their UROP experience, as it had increased their technical skills and informed their career and education decisions. This is also a valid outcome, as UROP helped students to understand that STEM research was not their ideal career path while still being an enjoyable experience.

Most UROP participants have pursued post-graduate qualifications

In total, 81 per cent (n=52) of survey respondents were studying, or had completed a post-graduate qualification since completing UROP. Of these, 60 per cent (n = 31) had obtained, or were in the process of completing, a doctorate degree; and 35 per cent (n=11) stated that their doctorate degree was related to the research they undertook during UROP. These results are considerably greater than the proportion of Australians (8.1%) who have completed a post-graduate qualification (ABS Education and Work, 2021), and most likely reflects the high calibre of students selected to participate in UROP.

All but one of the previous participants interviewed had, or were in the process of completing, a PhD. Many stated how they had limited exposure to academics and STEM research experience before UROP, and that the program had helped ease their transition into honours and other post-graduate qualifications. This was due to 1) the professional networks established during their placement that exposed them to post-graduate opportunities and 2) the development of key technical skills and publication authorship that made them more competitive in their post-graduate applications.

In the survey, a 2013 participant stated:

“ In my UROP placement I learnt many research/lab skills, and I continued in that lab doing a research unit for my degree. I believe my UROP experience assisted me in getting into my honours position and my research assistant roles since then.

Former participant Scott Gigante (Appendix B.1) also noted how UROP had prepared him for his masters and PhD:

“ I had published a short paper as part of my...UROP internship, and I think having that paper really bolstered my [Yale] application.

Additionally, the survey highlighted that the majority (62%) of participants (n=63) were offered post-graduate study opportunities by the research institution they completed their UROP placement with. These survey and interview data indicate that even if UROP participants intended to pursue a research post-graduate qualification in STEM regardless of whether they participated in the program, UROP had helped fast-track and/or supported their transition into competitive post-graduate placements.

UROP participants improved their research skills and employability

Survey respondents and interview participants held similar views about the professional opportunities they had accessed through UROP, and the positive impact these experiences have had on their technical research skills. Most survey respondents ‘strongly agreed’ that UROP had improved their research skills, and that they program had provided them with an opportunity to work on unique research projects (78% respectively, Figure 2).

Many participants stated how developing both their technical and enterprise STEM skills during UROP had given them a head start in future study and work. For some, it was learning how to communicate their research in conferences; being exposed to the expertise of established researchers; or having the opportunity to help co-author academic publications.

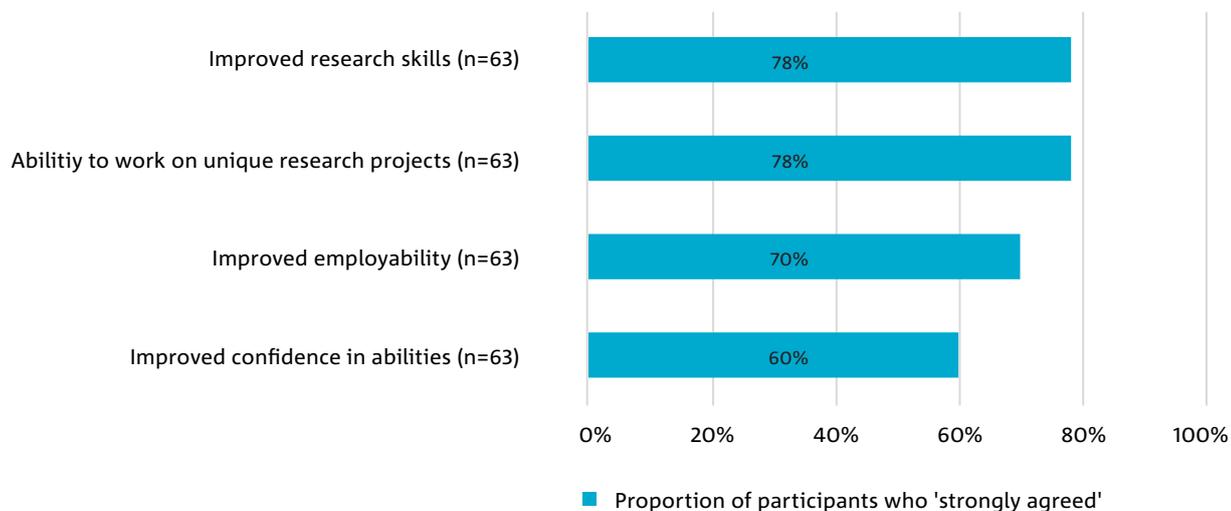


Figure 2: Self-reported impact of UROP on skills, confidence and opportunities

Comments from two survey respondents typified these sentiments:

“ UROP was fantastic...I was exposed to a completely different field of science than I would have considered, and learned a lot more than was in my degree, in both practical and theoretical knowledge.

“ UROP was my first chance to work in a lab and learn how to be a scientist. I learnt so much, met great scientists, and got a head start on building so many skills I still use today.

Approximately three quarters of the survey respondents were employed (77%, n=50)⁸, and 57 per cent of these were currently working in the Professional, Scientific and Technical Services (PSTS) industry. This proportion of UROP participants working in PSTS is more than double of all working Australian STEM graduates in this industry ((23% ABS Census, 2016), which may indicate that UROP has facilitated participants’ transition into STEM research. However, it should be noted that scientific research is just one of many professions categorised under the PSTS industry.

Finally, over a third (35%, n=17) were working in a job directly related to the research they completed during their UROP placement. One survey respondent stated:

UROP salary allowed participants to prioritise their studies

While not asked about in the survey, it is worth emphasising that a notable number of participants who were interviewed stated that the salary they received during UROP allowed them to quit working their part-time jobs and focus solely on their tertiary studies and developing their research experience. Others also noted that the salary helped give them a sense of confidence and belonging during their UROP placement.

⁸ Of those who said they were not currently employed, all had completed, or were in the process of completing, some type of post-graduate degree. Forty per cent of these had finished their UROP placement after 2018.

Former participant Peter Hickey (Appendix B.2) shared his experience:

“ The opportunity to get paid to do this – I basically was able to swap stacking shelves for actually doing something interesting, and financially ... [I] had to support myself to an extent. So, without that financial side...it would have been pretty hard for me to be able to afford to do.

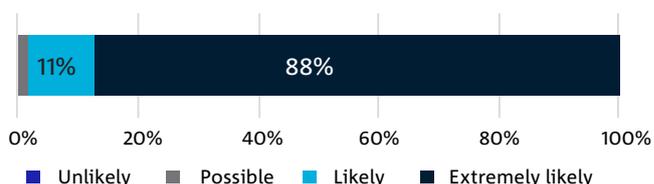
Additionally, former participant David Riglar (Appendix B.7) who now leads a research lab in the United Kingdom, highlighted the current equity issues associated with tertiary students trying to gain access to meaningful STEM research opportunities. He noted that programs such as UROP provide students with experience and a competitive edge in their post-graduate applications, which may not be possible otherwise:

“ ...sometimes having a publication can be the difference between a student being accepted to a PhD or not. But that’s a really privileged position if that involves being able to work with no pay over a summer...I think it is very biased in terms of the students that have that ability to be involved in research during undergrad versus not; apart from having these kinds of programs. So, it’s an equality issue as much as anything.

These experiences are worth highlighting to program stakeholders, especially when explaining the rationale behind the subsidised UROP salary.

Nearly all participants would recommend UROP

Finally, when asked in the survey if they would recommend UROP to current undergraduate students studying STEM, nearly all (98%) respondents said they were ‘extremely likely’ or ‘likely’ to do so (Figure 3).



Likelihood to recommend UROP to current tertiary students (n=62)

These results echo the case study interviews and numerous open-text responses collected in the survey, which were highly supportive of UROP and emphasised the positive impact the program had on their education and career pathways. One respondent typified this feeling:

“ I had a truly amazing experience in my UROP placement. It gave me purpose and direction and it taught me that a career in research is something that I want to do undoubtedly. I am incredibly grateful for this experience...

9 The destination survey was sent to a sub-sample of previous participants (n=167) who had agreed to be contacted after completing their UROP placement. Since 2004, over 700 Victorian tertiary students have participated in UROP.

Discussion

When interpreting the conclusions of this report, it should be noted that the self-reported data collected for this research (n=65) represents a small proportion of previous UROP participants⁹. Additionally, it is also assumed that the survey data collected likely suffers, to some extent, from sampling bias. Those selected to participate in UROP are also high achieving and ambitious students seeking practical work experience in order to gain exposure to technical STEM skills and/or to advance their careers. However, self-report data is a powerful method to understand former participants' feelings and attitudes toward UROP, and their assessment of its impact on their own behaviours and knowledge.

Overall, feedback from the survey and interviews indicate that:

- UROP has contributed to participants' decisions regarding their education and career pathways, including when they decided not to pursue a career in STEM research. Furthermore, this opinion was not just limited to recent UROP participants, with a large proportion of those completing the program prior to 2016 emphasising its importance, even after many years of post-graduate studies and employment.
- for most participants, UROP was the first opportunity for them to experience genuine research in labs, hospitals, and R&D areas of biomedical organisations
- this opportunity helped improve participants' technical and enterprise skills and exposed them to professional networks – giving many a competitive advantage with their honours and post-graduate placements. Furthermore, most self-reported that UROP had also improved their employability
- the salary participants received during UROP allowed many to stop working in their unrelated part-time jobs and focus solely on their tertiary studies, whilst also developing their research experience in a work placement that was benefiting their future education and career.

As discussed previously, it is recognised in academic literature that many students studying undergraduate STEM degrees, in particular science degrees (which is the largest UROP cohort) have limited exposure to reflect on their learning and skills development.

Given UROP's strong focus on these particular graduate cohorts, the program has exposed many participants to genuine research experiences for the first time in their tertiary education – helping amplify the program's impact. This exposure has been critical for the development of participants' career values and expectancies; allowing them to explore career options and consider how these experiences fit with their ideals and competencies.

There are many tertiary work experience programs operating across Australia, however, the above successes of UROP are likely related to the aspects of the program's design and implementation, including:

- Effectively targeting students from undergraduate STEM degrees with limited opportunities to participate in meaningful work experience placements
- selecting high achieving students for placements, helping increase buy-in from research organisations to pay a competitive hourly salary
- having long-term placements to allow more in-depth exposure to research
- matching students with highly regarded research organisations with established and diverse research programs.

Ongoing monitoring and evaluation of UROP will help better understand the extent of the contribution UROP is making to participant outcomes, and to identify any areas of improvement.

Appendix A: Survey data

Year participants completed UROP	Number	Proportion
2004/05	3	5%
2006/07	4	6%
2008/09	5	8%
2010/11	9	14%
2012/13	7	11%
2014/15	11	17%
2016/17	9	14%
2018/19	11	17%
2020/21	5	8%
Type of UROP placement	Number	Proportion
Biomedical	39	60%
Computational	20	31%
Mixed biomedical and computational	6	9%
Name of undergraduate degree	Number	Proportion
Bachelor of Science	35	54%
Bachelor of Biomedicine / Medical Sciences	19	29%
Bachelor of Engineering	2	3%
Bachelor of Pharmaceutical Science	1	2%
Other	8	12%
Complete undergraduate degree	Number	Proportion
Yes	62	95%
No	1	2%
Other – still completing	2	3%
Impact of UROP on education and career pathway	Number	Proportion
Extreme impact	14	22%
Significant impact	39	60%
Moderate impact	12	18%
Slight impact	0	0%
No impact	0	0%
Employment status	Number	Proportion
Employed	50	77%
Not employed	15	23%

Sector of employment	Number	Proportion
Professional, Scientific and Technical Services	28	57%
Education and Training	6	12%
Health Care and Social Assistance	6	12%
Public Administration and Safety	2	4%
Other	7	14%
Current job related to UROP placement	Number	Proportion
Yes	17	35%
No	23	48%
Unsure / hard to say	8	17%
Completed / completing a postgraduate degree	Number	Proportion
Yes	52	81%
No	12	19%
Postgraduate degree level	Number	Proportion
Postgraduate diploma	1	2%
Honours	2	4%
Masters	10	19%
PhD	31	60%
Doctor of Medicine	8	15%
Postgraduate degree related to UROP	Number	Proportion
Yes	16	31%
No	35	69%
Impact of UROP on ...	Number	Proportion
Improving research skills		
Strongly agree	49	78%
Agree	12	19%
Disagree	0	0%
Strongly disagree	2	3%
Not applicable / unsure	0	0%
Improving employability		
Strongly agree	44	70%
Agree	12	19%
Disagree	1	2%
Strongly disagree	2	3%
Not applicable / unsure	4	6%

Helping to inform career pathway		
Strongly agree	43	68%
Agree	18	29%
Disagree	0	0%
Strongly disagree	2	3%
Not applicable / unsure	0	0%
Increasing motivation to pursue a career in STEM		
Strongly agree	38	60%
Agree	14	22%
Disagree	8	13%
Strongly disagree	0	0%
Not applicable / unsure	3	5%
Providing unique opportunities to collaborate with research organisations		
Strongly agree	44	70%
Agree	10	16%
Disagree	4	6%
Strongly disagree	2	3%
Not applicable / unsure	3	5%
Giving insight into how skills can be applied in real life		
Strongly agree	39	63%
Agree	18	29%
Disagree	2	3%
Strongly disagree	2	3%
Not applicable / unsure	1	2%
Improving confidence in abilities		
Strongly agree	38	60%
Agree	23	37%
Disagree	0	0%
Strongly disagree	2	3%
Not applicable / unsure	0	0%
Giving opportunity to work on unique projects		
Strongly agree	49	78%
Agree	9	14%
Disagree	1	2%
Strongly disagree	2	3%
Not applicable / unsure	2	3%

Providing professional connections		
Strongly agree	35	56%
Agree	21	33%
Disagree	3	5%
Strongly disagree	2	3%
Not applicable / unsure	2	3%
Opportunities arising from UROP		
	Number	Proportion
Offered employment		
No	26	42%
Yes	25	40%
Not applicable / unsure	11	18%
Offered a study opportunity		
No	14	22%
Yes	39	62%
Not applicable / unsure	10	16%
Authored / assisted in a publication		
No	20	32%
Yes	39	62%
Not applicable / unsure	4	6%
Nominated for or received a prize		
No	41	65%
Yes	16	25%
Not applicable / unsure	6	10%
Offered employment		
No	26	42%
Yes	25	40%
Not applicable / unsure	11	18%
Likelihood to recommend UROP		
	Number	Proportion
Extremely likely	54	87%
Likely	7	11%
Possible	1	2%
Unlikely	0	0%
Extremely unlikely	0	0%
Unsure/hard to say	0	0%

Appendix B: Individual case studies

Of the 63 respondents who fully completed the survey, 41 indicated that they were willing to be followed-up for an interview. The I&E team contacted eight individuals, and seven were subsequently interviewed to be featured as UROP case studies.

Candidates for the interview were shortlisted by a number of factors, which included: the year they completed their UROP placement; their education pathway; current profession, and open text responses. In particular, the I&E team focused on individuals from varied backgrounds that were established in their STEM research careers and indicated that UROP had influenced their career pathways. This purposive sampling was meant to highlight a range of former participants who could articulate UROP's impact on their education and career pathways.

B.1 Dr Scott Gigante – Senior Machine Learning Scientist

Bachelor of Mathematics and Statistics (University of Melbourne), Master of Science, PhD in Computational Biology and Bioinformatics (Yale University)

Education and career pathway

In 2016, Scott completed a computational UROP placement within the Bioinformatics Division at the Walter and Eliza Hall Institute (WEHI). With the help of his UROP supervisor, Scott successfully applied for a dual masters and PhD program at Yale University in the United States, where he completed a PhD in Computational Biology and Bioinformatics. He is currently working as a machine learning scientist for the biotech company Immunai in New York City.

Impact of UROP

Scott emphasised how his undergraduate studies at the University of Melbourne were predominantly focused on exams and solving mathematical problems, with little emphasis placed on developing research and writing skills. He stated that UROP allowed him to improve his soft research skills; teaching him about authorship and how to read and structure scientific papers. As a result of his work at WEHI, Scott also published a journal article, which he believed gave him a competitive edge in his applications to American universities and further prepared him for his masters and PhD:



I had published a short paper as part of my...UROP internship, and I think having that paper really bolstered my [Yale] application.

Professional connections

The professional relationships that Scott developed through UROP also proved pivotal to his education and career pathway. He was supported by his UROP supervisor to apply for PhD programs in the United States, and other WEHI colleagues greatly inspired his interest in STEM research. Scott still remains in contact with a number of the professional contacts he made during his time at WEHI:



...it was really inspiring to see how excited somebody [WEHI colleague] could be at age 70, coming into the office three days a week for free just because he loved science...I'd already had an idea of maybe that this could be a career path for me, but seeing that and participating in it really inspired me to make concrete steps to actually follow that career path. As opposed to just thinking about it and then taking the easy pathway, which would be just a job in straight tech.

Scott's exposure to passionate researchers working in STEM was one of the most important parts of his UROP placement. This shows that while UROP can help improve participants' technical research skills, it also exposes undergraduate students to engaging research environments that can inspire them to continue with pursuing a research career.

B.2 Dr Peter Hickey – Senior Research Officer

Bachelor of Science majoring in Mathematics and Science (Hons) (University of Melbourne), PhD in Statistics (University of Melbourne)

Education and career pathway

In 2009, Peter undertook one of the first UROP computational placements at the Walter and Eliza Hall Institute (WEHI). He remained at WEHI to do his honours, and then moved onto the University of Melbourne to complete a PhD in statistics. In 2016, Peter moved to the United States to complete a Post Doctorate Fellowship at the Johns Hopkins Bloomberg School of Public Health but returned to WEHI in 2018 and is currently a Senior Research Officer, leading their bioinformatics research in single cell genomics.

Impact of UROP

Peter described how when he first started his undergraduate science degree majoring in mathematics and statistics, he was the first in his family to attend university and had little idea where his degree would lead professionally. It was only when he started his UROP placement that he was exposed to the bioinformatics science sub-discipline, which he has stayed working in ever since:

“ I'd never heard of bioinformatics at that point. But once I started doing that work with UROP, I found I really enjoyed it... It was pretty apparent early on that mix of statistical work; learning about new areas of science; and quite collaborative work; really appealed to me and played to my strengths as well. So since then – that's more than 10 years ago – I've not really sought out other careers beyond bioinformatics, because I've really found that's what I enjoy.

Peter also highlighted how beneficial it was to be placed in one of the most well-regarded research labs in Australia. And like a number of other UROP participants interviewed, stated that the salary afforded to him by UROP had allowed him to quit his retail job and support himself through university; while also being able to focus on a job that was aligned to his education and future career aspirations.

Mentoring UROP students

After returning back to Australia and WEHI, Peter made the decision to supervise a UROP student – noting how defining the program had been for him many years earlier. He felt it was a fantastic opportunity to help upskill an undergraduate student and intends to do it again in future years, if possible.



I knew once I was doing this for a little while, that I'd like to repay the favour of having a [UROP] student come through, because of how important it had been to me...that was something I really wanted to do.

Peter's long-term career in bioinformatics and full-circle experience of UROP shows how the program can expose participants to areas of science that may not be commonly known, especially for those with little personal connection to STEM research and professions. This increase in awareness is critical for expanding the diversity of STEM researchers, improving equity, and retaining passionate researchers in the field of biomedical research.

B.3 Michelle Meilak – Compliance Manager

Bachelor of Science (Hons) (Swinburne University of Technology), Diploma of Education (Monash University)

Education and career pathway

In 2006, Michelle completed a biomedical placement at Monash University focusing on DNA vectors and the differences in protein levels in stomach cancer. She continued with this research throughout her honours but decided against pursuing a PhD to do more varied work as a research assistant. Michelle continued working at the same lab as her UROP placement, but after a change in the lab's funding, she moved to The Alfred Hospital before undertaking a Diploma of Education. Despite considering a career in teaching, Michelle returned to the research space and is now a compliance manager for the School of Biological Sciences at Monash University.

Impact of UROP

During her undergraduate science degree, Michelle ambitiously pursued industry-based learning so she could gain practical lab experience and have employable skills upon graduating. Prior to starting her UROP placement, Michelle did two six-month work placements at other Victorian research organisations – one being the Walter and Eliza Hall Institute, which is how she learned about UROP. As with many other participants interviewed, Michelle emphasised that UROP helped her transition into honours, especially as she continued with the same research she undertook during her UROP placement.



[UROP] gave me some more lab experience, it gave me confidence to go straight into honours and know exactly what I was doing, which made my honours year feel easier...I could just go straight into it, and I felt confident being in a lab.

While UROP was predominately a steppingstone for Michelle during her final year of university between industry-based learning and honours, it still remains a key part of her work history, even today:



Even now...people ask me about the fact that I did industry-based learning and that I did UROP. It's the three things that people still talk to me about in an interview, because that's what stands out on my resume.

Michelle is now no longer working as a researcher due to preferences around work-life balance but remains affiliated with the industry through her current role in compliance at Monash University. UROP was a key part of her early professional experience, and gave Michelle the opportunity to further explore research after her undergraduate studies, even if this was not what she decided to pursue long term.

B.4 Catriona Nguyen-Robertson – Research Assistant and Science Communications Officer

Bachelor of Science (Hons) (University of Melbourne), PhD candidate in Cellular and Molecular Biology (University of Melbourne)

Education pathway

In 2014, Catriona completed a biomedical UROP placement at Western Health where she supported osteoarthritis and pregnancy and pre-eclampsia research projects. Catriona is currently completing her PhD in Cellular and Molecular Biology at the Peter Doherty Institute focusing on skin allergies, whilst also working as an associate editor at Immunology and Cell Biology journal and teaching science communication at the University of Melbourne.

Impact of UROP

During her undergraduate degree Catriona had initially wanted to be a paediatrician, but after hearing about UROP decided to apply for the program to discover more about research, and play a key role in the development of research questions. Catriona emphasised how UROP had significantly influenced her decision to pursue honours and a PhD.



I was planning on doing a medical degree to become a physician, but I discovered a passion for research because of UROP – especially during the holidays, when I would go into the lab every day. It was fun and exciting doing lab work, and I loved the idea that I would be at the forefront of something if I were to be a researcher.

Instead of pursuing a post-graduate medical degree, Catriona applied for an honours placement at the Peter Doherty Institute with the support from her UROP colleagues. This decision has led to her having a successful career in science communication. Again, as with many other UROP interviewees, Catriona was able to more easily transition into her honours year because of the technical lab skills she had developed during her UROP placement. In particular, Catriona stated that UROP had helped her more effectively read academic literature and ascertain the quality of the research.



...once I moved into a new lab to start honours, they didn't have to teach me as much, because I already was comfortable pipetting, I was comfortable with analysing data and doing all sorts of things related to immunology kind of experiments.

Catriona is a passionate biomedical researcher and STEM educator, working both in science communication and teaching whilst completing her PhD. Catriona's experience of UROP shows how the program can completely change a participant's career aspiration when they are exposed to the creativity of research and have the ability to take ownership of their research questions.

B.5 Halina Pietrzak – Research Assistant

Bachelor of Science (Hons) (University of Melbourne), PhD candidate in Medical Biology and Parasitology (University of Melbourne)

Education pathway

In 2016, Halina completed an 18-month biomedical UROP placement at the Burnet Institute, focusing on malaria. After UROP, Halina continued her specialisation in malaria by joining the infectious diseases and immune division at the Walter and Eliza Hall Institute (WEHI) as a PhD candidate, where she is now in her final year researching the immune and memory responses to the parasite.

Pathway to UROP

In high school, Halina was passionate about science and biology and was committed to pursuing either a STEM or medical degree at university. In the end, she decided to undertake a Bachelor of Science at the University of Melbourne because of its immunology and the infectious diseases program and established connections to the hospital and other research organisations. Having not completed any other kind of lab experience, Halina found out about UROP when taking the initiative with some friends to walk into WEHI and talk to staff about opportunities.

Impact of UROP

Halina emphasised how her placement increased her confidence and assisted her undergraduate studies by exposing her to scientific techniques and language. She was able to practise particular lab techniques over and over again; sometimes failing and learning from these errors. Halina mostly assisted a post-doctorate with their research on the proteins the malaria parasite uses to export waste, but also had the opportunity to work across a number of other research projects and co-author a paper.



UROP gave me very realistic picture of what research is. It was never flowery and happy. Like, stuff would always go wrong... I'd have to repeat things six times. I left the lids of things open accidentally and everything evaporated.

During her UROP placement, Halina was exposed to multiple labs within the Burnet Institute – allowing her to explore other areas of malaria immunology that were entirely different to her main UROP project. This exposure led to Halina applying for an honours position at WEHI. On top this, the professional connections developed, and lab experience she gained, helped Halina's confidence and transition into honours.



I see it with our honours students that we have now; you come in from this undergrad and you just are launched into this massive year of intense research, and you barely know how to pipette. And UROP just bridged that whole gap for me – it just made it less stressful.

It was apparent when speaking to Halina that she was likely to have pursued post-graduate studies in STEM with or without participating in UROP. However, her varied UROP experience was critical in developing her confidence and gave Halina the opportunity to explore other avenues of immunology for her honours year that were entirely different to her original UROP placement.

B.6 Dr Benjamin Porebski – Investigator Scientist

Bachelor of Science (Hons) (Monash University), PhD in Biochemistry and Molecular Biology (Monash University)

Education and career pathway

In 2011, Benjamin completed a mixed biomedical-computational UROP placement at the Department of Biochemistry and Molecular Biology within Monash University. Afterwards, he successfully completed his PhD in Biochemistry and Molecular Biology at the same lab as his UROP placement – and under the supervision of his previous UROP supervisor. In 2016, Benjamin moved over to the United Kingdom to undertake a Post Doctor Fellowship at the highly regarded MRC Laboratory of Molecular Biology (LMB) research institute in Cambridge. He is now an Investigator Scientist at the same institute, specialising in protein engineering and high throughput drug discovery, and is hoping to commercialise his current research in partnership with the pharmaceutical sector.

Pathway to UROP

Benjamin emphasised that he didn't do well with traditional schooling and exams, and his grades meant he had to take an alternative pathway – via the Australian Army – into his undergraduate science degree. However, it was clear when interviewing Benjamin that he was a passionate student who took great initiative to seek out extra-curricular research opportunities beyond his university studies. In particular, he travelled to Boston with the iGEM program before participating in UROP.



It was a really, really good experience and [iGEM] kicked off my interest in research, and then the UROP program instilled it for me.

Impact of UROP

UROP gave Benjamin an insight into genuine research, and allowed him to enhance his skills across multiple disciplines by working in both wet labs and on computational analyses; helping provide him a competitive edge in the future. Importantly, the salary he received during UROP allowed him to quit his job with the Australian Army and focus solely on research and his studies.



So because of the UROP program I was essentially able to not have to work for the military and I could spend more time doing research; and it really did give me that sort of exposure that I may not have been able to get without it.

Benjamin's successful academic path, and now career at an internationally recognised research institute (which has been awarded 12 Nobel Prizes since 1958), is an example of how a program like UROP can provide students who aren't necessarily following a traditional academic pathway into research, with genuine and in-depth exposure to STEM research.

B.7 Dr David Riglar – Advanced Research Fellow

Bachelor of Science (Hons) (University of Melbourne), PhD in Cellular and Molecular Biology (University of Melbourne)

Education and career pathway

Like a number of other participants interviewed, David completed his UROP placement at the Walter and Eliza Hall Institute (WEHI) in 2008. David remained at WEHI to complete both his honours and PhD on malaria, before moving to Harvard Medical School in Boston to undertake post-doctorate training in synthetic biology. David is now an established scientist, leading a research lab focusing on the gut microbiome within the Department of Infectious Disease at Imperial College London, United Kingdom.

Impact of UROP

David had previously completed research lab work before participating in UROP. However, during his time at WEHI, David supported a post-doctorate researcher with their cell culture experiments – exposing him to a range of different scientific techniques and methods that have been beneficial to him throughout his studies and career. Reflecting back on his placement – now as a senior researcher – David emphasised how impressive it was to be included in such central research experiments.

“ [I completed] a lot of work with proteins and mammalian cell culture and those - some of those techniques - certainly the methods I was learning were beneficial for me throughout my honours and PhD, and even now I guess, into postdoc and beyond.

David also engaged in UROP above and beyond his placement, acting as a student representative on the UROP committee and staying on as an alumni for some years afterwards. This work helped expose him more to the administrative side of running programs like UROP. Echoing the sentiments of other participants, David noted how he was exposed to the creativity of science during his UROP placement, something which was not evident during his undergraduate degree.



I do think that the opportunities early on in your career to work in a research lab and to see what it's like I think is really powerful. I do have a strong memory ... of realising that doing research science is very, very different to studying science in a bachelor's degree, and the whole process uses a whole lot of different skills.

UROP helped David gain lab skills and be exposed to the creativity of science, all while being paid a salary. Importantly, he highlighted how authoring a publication is sometimes the deciding factor for students being accepted into competitive PhD programs, and for David, this represents an equity issue within research. Many students without family support are unable to gain this kind of experience without being paid, which highlights the importance of programs like UROP.

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