

The Kungullanji Program: Creating an Undergraduate Research Experience to Raise Aspirations of Australian Aboriginal and Torres Strait Islander Students in the Sciences

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Abstract

Australian Aboriginal and Torres Strait Islander communities face complex challenges that require Indigenous-led research. Increasing the Indigenous research workforce depends on structural change within higher education institutions, including better pathways to research training and careers for Aboriginal and Torres Strait Islander students. Undergraduate research experiences can improve student success and encourage more students to progress to research programs and careers. The Kungullanji Summer Research Program offers research experiences for Australian Aboriginal and Torres Strait Islander undergraduates while recognizing their contributions to research. The Kungullanji program approach is a strengths-based research training framework that recognizes existing ability outside of institutional definitions of success and adapts to student needs with multi-layered support. The initial results suggest that this approach increases students' self-confidence and interest in conducting research.

Keywords: *equity, Indigenous students, minority students, STEM, undergraduate research, underrepresented students*

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Despite the growing need for more diversity in the science workforce (Hernandez et al. 2013; Hurtado et al. 2009; Ong 2005; Villarejo et al. 2008) Aboriginal and Torres Strait Islander students in Australia are less likely to enroll in disciplines within science, technology, engineering and mathematics (STEM) (Kippen, Ward, and Warren 2006;

Trudgett, Page, and Harrison 2016). Aboriginal and Torres Strait Islander students also are underrepresented in higher degree research (HDR) programs and research positions. Although studies have investigated potential factors that affect undergraduate participation and HDR progression (Barney 2018; Behrendt et al. 2012; Hutchings et al. 2019; Kippen et al. 2006; Milne, Creedy, and West 2016; Pechenkina, Kowal, and Paradies 2011; Trudgett 2009; Trudgett et al. 2016), there is little understanding of how to bridge the divide between undergraduate coursework and graduate research programs (Hutchings et al. 2019). Globally, undergraduate research experiences (UREs) are used to bridge this divide and have shown to have numerous benefits, including increasing research skills, confidence, and progression to HDR programs (Garrison et al. 2010; Hernandez et al. 2013; Hunter, Laursen, and Seymour 2007; Hurtado et al. 2009; Linn et al. 2015, Lopatto 2004; Russell, Hancock, and McCullough 2007; Villarejo et al. 2008; Slovacek et al. 2012).

UREs also have been shown to have additional benefits for minority students (Adedokun et al. 2014; Garrison et al. 2010; Hernandez et al. 2013; Hughes et al. 2013; Hurtado et al. 2009; Linn et al. 2015; Moodie et al. 2018; Nagda et al. 1998; Slovacek et al. 2012). Underrepresented students in STEM can have the added challenge of balancing their professional identity with their social identity (Hurtado et al. 2009; Kang, Peterson, and Hernandez 2011; Ong 2005). Tailored URE programs that address needs of underrepresented students can provide social and emotional support to reduce isolation and tokenism (Kang et al. 2011) while developing their identity as a scientist or researcher (Hunter et al. 2007; Hurtado et al. 2009).

Although UREs have been shown to be successful for minority groups, including First Nations students outside of Australia (Garrison et al. 2010; Hughes et al. 2013; Naepi and Airini 2019), UREs in Australia are not designed to support Aboriginal and Torres Strait Islander students. Restrictive selection criteria of Australian UREs focusing primarily on grade point average (GPA) and institutional measures of success (Jewell and Brew 2010) can disadvantage Aboriginal and Torres Strait Islander participation. If designed specifically for this cohort, UREs could have the potential to address this institutional disadvantage and create a new space in the institution for Aboriginal and Torres Strait Islander research. This article explores the development of a URE designed to provide research training support for Aboriginal and Torres Strait Islander researchers while providing a platform to strengthen their voices in research.

Historical Context

Represented as the most highly researched populations (Bessarab and Ng'andu 2010; Moodie et al. 2018; Walker et al. 2014) are the Aboriginal and Torres Strait Islander peoples (the word *peoples* is used respectfully here to recognize the diverse groups of people within this demographic, each with their own cultural practices). This is symptomatic of the colonial history and subsequent research conducted with non-existent, minimal, or tokenistic involvement of Aboriginal and Torres Strait Islander peoples in the research design and implementation of research outcomes (Garrison et al. 2010). More research engagement and Indigenous leadership are needed (Kippen et al. 2006), which requires a larger community of Aboriginal and Torres Strait Islander researchers to change the conduct of research and ensure that Indigenous knowledges are respected, protected, and included (Barney 2018; Behrendt et al. 2012; Hutchings et al. 2019; Moodie et al. 2018; Trudgett 2009, 2010; Kippen et al. 2006).

Although research can be perceived as unfamiliar and foreign (Kippen et al. 2006), Aboriginal and Torres Strait Islander peoples are not new to research and have been researched and studied by researchers and scientists for many thousands of years (Rigney 2001). Long before colonization, each generation passed on and perfected knowledge and practices that supported communities to live and thrive in diverse and dynamic environments (Morrison et al. 2019). Therefore, research is not new; however, non-Indigenous institutions are now seen as the primary knowledge creation spaces, and access is determined by the non-Indigenous academic elite. This results in research production and training in universities excluding and systemically discriminating against Aboriginal and Torres Strait Islander peoples (Behrendt et al. 2012; Hart and Whatman 1998; Rigney 2001). Further efforts are needed to address structural disadvantage in research training of Aboriginal and Torres Strait Islander

students. This could be addressed by creating new spaces in these institutions for the recognition and respect of Aboriginal and Torres Strait Islander research and empower researchers from the undergraduate level to produce research of importance to Aboriginal and Torres Strait Islander peoples and their communities.

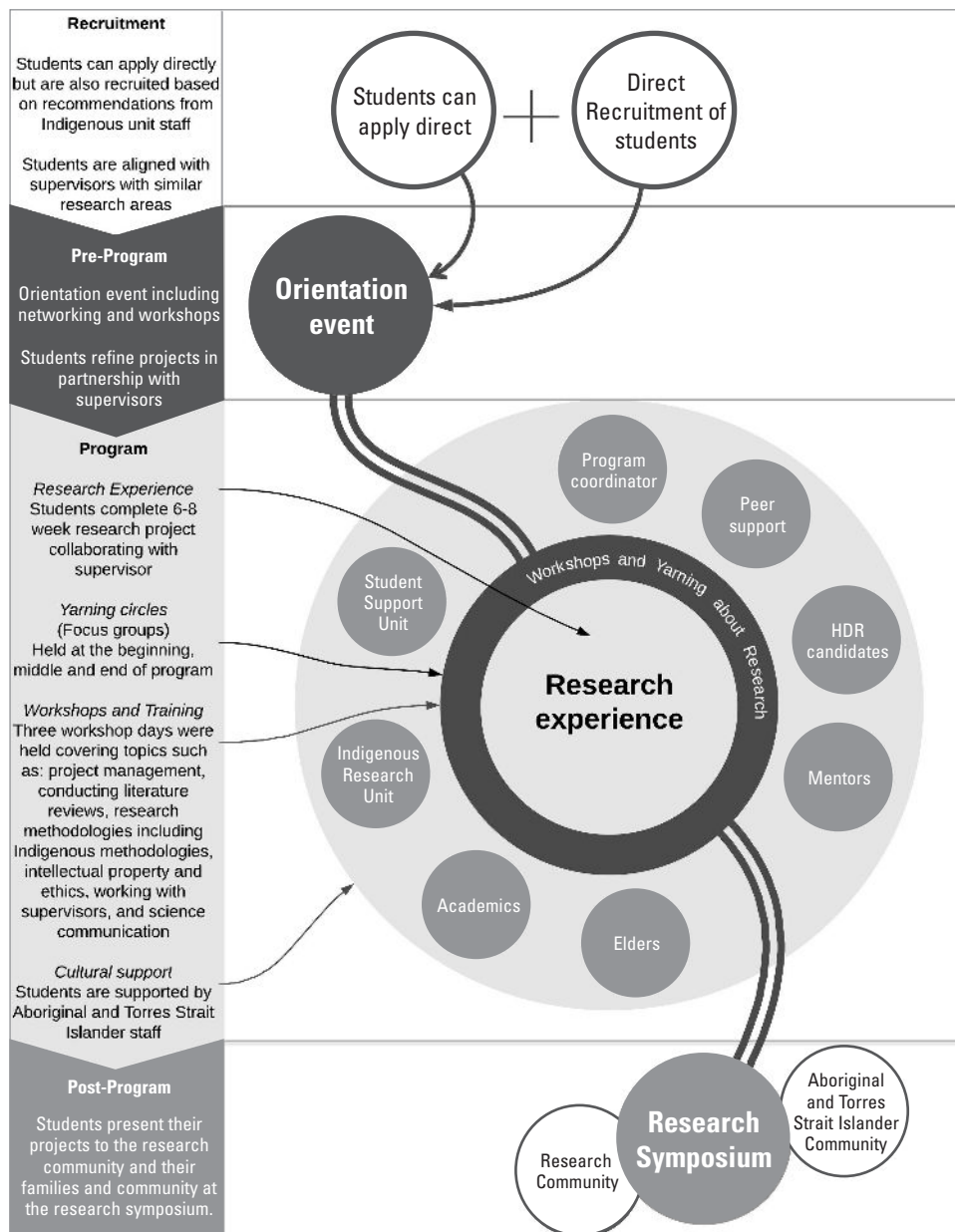
The Kungullanji Summer Research Program

To address the need for better research training opportunities for Aboriginal and Torres Strait Islander students, and support the transition from undergraduate to HDR programs, a new URE designed for a cohort of Aboriginal and Torres Strait Islander students was piloted at Griffith University, a public research university on the east coast of Australia. In 2014, when the first Kungullanji program commenced, Griffith University had more than 40,000 students in undergraduate and graduate programs, of which 1.4 percent were Aboriginal and Torres Strait Islander students (Griffith University 2014). At the time, Griffith University was one of the top universities for attracting Aboriginal and Torres Strait Islander students; however, most of these students were enrolled in non-STEM fields of study, and the students who were in STEM were not progressing to higher degree research (HDR) programs.

The Kungullanji Summer Research program (hereafter the Kungullanji Program) is named in the Yugambeh language (the Aboriginal language of the Gold Coast region) and translates as “to think” (Griffith University 2020; Yugambeh Museum 2020). The Kungullanji Program therefore challenges Aboriginal and Torres Strait Islander students to think about research careers and to think about how they can reclaim research spaces. Led by Aboriginal and Torres Strait Islander staff, the Kungullanji Program consists of several key components (as shown in Figure 1) such as supplying training in research skills, offering an opportunity to participate in a research symposium, and providing overarching cultural support.

The Kungullanji Program aims to improve cultural safety in research by creating a new space within the institution for Indigenous undergraduate research so as to better support inclusiveness, leadership, and cross-cultural collaboration between Aboriginal and Torres Strait Islander students and non-Indigenous researchers. As the students are engaging with research dominated by non-Indigenous ideologies and knowledge, creating a culturally safe space is paramount in empowering students (Trudgett 2009). Cultural safety allows students to conduct research in a spiritually, socially, and emotionally supportive environment, where their views are acknowledged, respected, and valued, allowing them to be confident in their own identity without being harassed or challenged (Behrendt et al. 2012; Garrison et al. 2010; Kippen et al. 2006; Trudgett 2009; Williams 1999).

FIGURE 1. Structural Elements of the Kungullanji Program



Culturally safe spaces are created in the Kungullanji program by (1) incorporating cultural approaches and methodologies in the workshops; (2) using Indigenous methodologies for program evaluation such as yarning, also known as talking circles (Bessarab and Ng’andu 2010; Garrison et al. 2010; Walker et al. 2014); (3) supporting students through a network of Aboriginal and Torres Strait Islander academic staff, general staff, and Elders; and (4) recognizing their unique contributions to the research through the symposium event (see Figure 1). Additionally, the use of a cohort model also encourages peer support—an important enabling factor (Eagan et al. 2013)—and encourages sharing of interdisciplinary perspectives across the group.

Admission and Selection of Summer Scholars

Prior to the program implementation, the program coordinator met with Aboriginal and Torres Strait Islander students to discuss their interest in research. After direct discussions with undergraduate students, it was found that many students did not feel comfortable applying for existing “mainstream” undergraduate research experiences because of the restrictive selection criteria, intimidating application process, or feelings of “it wasn’t for them.” The recruitment of students for the Kungullanji Program takes a different approach by recruiting in two ways. First, students can apply directly to the program through the website (Griffith University 2020), which attracted students

TABLE 1. Demographic Data on Kungullanji Program Participants, 2014–2015

Demographic	Demographic details	<i>n</i> = 8
Gender	Female	5
	Male	3
Year level	First year	1
	Second year	5
	Third year	2
	Fourth/final year	0
Discipline	Engineering (four-year program)	2
	Environmental science (three-year program)	5
	Biomedical science (three-year program)	1

already looking for summer opportunities but believing they would not be eligible for existing UREs. Second, students were recruited directly, based on recommendations from Aboriginal and Torres Strait Islander staff, especially if they had shown an interest in pursuing a personal research project or developing research skills. This direct recruitment led to students taking part in the program who would not normally consider applying but who have done so because they were directly encouraged and mentored to apply. This also created mentoring relationships prior to the start of the program between the program coordinator and potential summer students. Unlike UREs that have competitive selection criteria (Jewell and Brew 2010), students do not need to be in their final year or have a record of high academic achievement. In the recruitment process, the Kungullanji Program admits all Aboriginal and Torres Strait Islander STEM students regardless of GPA or year level. This recognizes the research capacity of all students regardless of academic achievement in coursework. This is supported by several researchers who share the view that undergraduate research allows all types of students, regardless of grades or year, to thrive in the research environment (Jones, Barlow, and Villarejo 2010; Nagda et al. 1998; Rowland et al. 2014; Russell et al. 2007; Schneider 2002). The first program held in 2014–2015 supported eight Aboriginal and/or Torres Strait Islander summer scholars from STEM disciplines at Griffith University (demographic detail is in Table 1).

Project and Supervisor Selection

The selection process, rather than focusing on the students, focuses instead on selecting the right supervision based on the students' interests. Rather than predefined projects decided by the supervisors, the students propose a research area of interest and co-design the project with a mentor. Examples of projects can be found on the program website (Griffith University 2020).

Research Skills and Training

The Kungullanji Program approach focuses on creating layers of support (see Figure 1) that are flexible and adaptable to each student's needs. This support structure has been discussed as crucial to supporting Aboriginal and Torres Strait Islander students (Milne et al. 2016). Although the workshops and research skills training are centered on developing transferable or generic research skills (see Figure 1), they change depending on the needs of the students who attend and recognize the diversity of student experience and existing knowledge. This flexibility also allows discussions to emerge about Indigenous research, including topics such as Indigenous methodologies, ethics, and resilience.

Program Evaluation and Feedback

Throughout the program, yarning circles (focus groups) are held to obtain ongoing feedback throughout the program as well as to provide a culturally safe space for students to discuss their experiences. A yarning circle is a conversational, semi-structured interview style that incorporates the cultural practices of yarning, storytelling, and sharing of experiences in a relaxed and informal setting. Yarning circles are recognized as a credible Indigenous research methodology (Bessarab and Ng'andu 2010; Hutchings et al. 2019; Walker et al. 2014) and have been used to provide cultural support in a similar program outside of Australia (Garrison et al. 2010).

Yarning circles are used in the Kungullanji program to create a peer mentoring and group feedback session by creating a safe space where students can openly share their opinions and feelings about research. To open the session, focus questions are used to guide the conversation, building trust, confidence, and conversational freedom. Some questions used include the following: "How do you feel your research is going so far?", "What have been some of

TABLE 2. Averaged Self-Reported Scores for Confidence and Interest in Research

	Pre-program	Post-program
Confident “doing research”	3.57	4.00
Confident presenting research	2.86	4.17
Confident communicating with researchers/academic staff	3.43	5.00
Confident working with researchers/academic staff	3.43	4.83
Interested in doing an honors program	4.14	4.50
Interested in doing a PhD program	2.71	3.67
Interested in a research career	3.29	4.17

Note: scored on a 5 Likert scale of 1 = strongly disagree to 5 = strongly agree ($n = 7$)

TABLE 3. Average Rating Scores on the Program Elements

Program element	n	Is useful	Is informative	Feel more supported	Feel more confident	Is enjoyable	Is essential
Orientation	7	4.43	4.43	4.43	4.43	4.43	4.57
Workshop 1	5	4.80	4.80	n/a	n/a	4.80	4.40
Workshop 2	2	4.50	4.00	n/a	n/a	4.00	4.50
Workshop 3	5	4.80	4.80	n/a	n/a	4.80	4.80
Yarning circles	7	4.71	4.43	4.71	4.71	4.57	4.57
Symposium	7	4.71	4.57	4.71	4.71	4.71	4.86

Note: scored on a 5 Likert scale of 1 = strongly disagree to 5 = strongly agree, n/a = not asked ($n = 7$)

the challenges and successes?”, and “What do you want to achieve/What are your goals?”. It is important to note that the questions asked are not as important as creating supportive relationships and space where students feel they can discuss topics freely.

A survey also was administered pre-program and post-program asking students to self-report their confidence doing research, presenting research, working with research staff, as well as responding to statements about their views on honors and PhD programs, and pursuing a research career. In addition, the postsurvey asked students to evaluate aspects of the Kungullanji program structure.

Initial Findings from the 2014–2015 Pilot Cohort

Seven out of eight of the summer scholars responded to the survey administered. The responses are summarized in Tables 2–4. Table 2 shows that the program has influenced the greatest increases of a point or more in students’ self-reported confidence “presenting research” and “communicating with researchers.” Although there was an increase in self-reported interest in honors and PhD programs, this was a smaller change.

Table 3 demonstrates that the students rated all program components highly, but the most essential element was the research symposium at the conclusion of the program. Table 4 further elaborates on these findings, showing that the symposium was possibly rated highly because it was perceived as an enjoyable experience and provided an opportunity to the students to present, showcase their research, and have a voice in the research community. A key finding raised in the open-ended questions (see Table 4) was that the students valued the program being offered to all Aboriginal and Torres Strait Islander STEM students who wanted to participate rather than admitting only high-achieving students based solely on GPA requirements.

Outcomes and Progression to Postgraduate Degrees

Since the first Kungullanji Program in summer 2014–2015, most of the summer scholars have continued to engage with research. Of the eight students discussed here, two students completed the program again. Three of the students completed honors work, and one completed a master’s of science degree. Another student is enrolled in a doctoral program in medicine, and two are enrolled in a PhD program.

TABLE 4. Participant Responses to Open-Ended Questions in the Post-Program Survey

Question	Typical response	<i>n</i>	Sample quotes
Further comments about the yarning circles	Increased confidence from discussing similar issues	2	“It made me feel more comfortable with my progress in my research as it made me realise that most of the problems I was having someone else was experiencing”
Further comments about the symposium	Opportunity to present	3	“I think it was great to show how deadly our research was, and it also allowed barriers to be broken (i.e. stepping out of our comfort zone)”
What was the most enjoyable part of the program?	Hands-on experience	5	“. . . being able to do field work and my own lab work”
	Presenting at symposium	2	“Presenting our work at the symposium and having people asking questions and showing their interest in something we’d been working on was very rewarding . . .”
What was the most useful part of the program?	Getting to know academic staff	3	“Getting to know academics and understanding how research is carried out”
	Support provided by the program and peers	3	“. . . being able to talk to each other and discuss issues or achievements throughout the program”
Suggestions for improvement	Increasing opportunities	2	“Make sure it’s a long-term program! Everyone should have the opportunity to have this exposure to research”
	Timing of scholarship/program	3	“Starting earlier to prevent running into the semester”
Would you apply again?	Yes (or similar response)	7	“Yes, I would, I enjoyed the program thoroughly”
What would you say to other undergraduate students thinking of doing research?	Do it (or similar response)	6	“Do it!! It is one of the best things you can do to get your name out there and meet and work with some great researchers/academics”
	Start early (or similar response)	2	“Start everything as early as possible”
General comments	GPA/admission requirements	3	“I loved that there was no GPA cut-off . . . some students might need a program like this to receive the confidence boost to achieve more. Also, just because someone is just passing [in coursework] doesn’t mean that they can’t do research it just means they haven’t been given the opportunity to shine”

Discussion

Supporting more Aboriginal and Torres Strait Islander peoples in research builds research networks with stronger links to communities and builds community capacity for research (Smith 2006). This promotes self-determination within research, empowering communities to make decisions about the topics of research conducted (Hart and Whatman 1998; Smith 2005). One way to address this is to have Aboriginal and Torres Strait Islander students leading research, even at the undergraduate level. This can be created through undergraduate research experiences like the Kungullanji Program. In comparison to other initiatives that might focus on attracting high-achieving students (Jewell and Drew 2010), this program offers a strength-based approach by recognizing the students’ existing abilities regardless of university-based research experience or GPA. The Kungullanji Program creates a new undergraduate research space specifically for Aboriginal and Torres Strait Islander undergraduate students to explore their research interests and develop research skills.

Rather than a traditional internship or apprenticeship model (Linn et al. 2015; Rowland et al. 2014; Seymour

et al. 2004), the students have a more active role in the direction of the project. This view is consistent with approaches advocated in the literature to move from deficit thinking and toward creating cultures of success with a strength-based approach (Moodie et al. 2018; Naepi and Airini 2019). Flipping the selection process and encouraging students to design their own projects based on their strengths and interests encourages more positive relationships through collaboration between students and academic staff. This results in students feeling like an active part of the research community (Kang et al. 2011). By valuing students’ contribution to research more highly, this could also lead to better acknowledgment of, and respect for, students’ cultures and knowledge by the supervising academic staff (Milne et al. 2016).

Through the program, students receive continuous individual support from the program facilitator prior to commencement and continuing after the completion of the project, an approach shown to be an integral component of successful educational programs (Gould and MacPherson 2003; Naepi and Airini 2019). The students also are supported by many different Aboriginal and Torres Strait

Islander staff, including administration support staff and academic staff. In addition, increased frequency of contact between students and staff has been shown in other studies to correspond to an increase in retention (Jones et al. 2010; Nagda et al. 1998) and aspiration to apply for graduate research programs and pursue careers in science (Eagan et al. 2013; Hurtado et al. 2009; Slovacek et al. 2012; Villarejo et al. 2008).

The yarning circles and workshops also create spaces for sharing experiences and building a peer-support cohort model. In addressing the need to increase support for Aboriginal and Torres Strait Islander researchers, some of the students commented in the survey on the value of having support from the wider university community and their peers (see Table 4). The symposium event also allowed an opportunity for students to develop and demonstrate their ability to synthesize research findings, demonstrate autonomy and leadership, engage with a broader audience, and receive constructive feedback in a low-risk environment—findings that are consistent with other studies (Spronken-Smith et al. 2013). This event also created an opportunity to showcase Aboriginal and Torres Strait Islander researchers and student voices. Students were encouraged to invite family and community members to share in the experience and to create a “sharing space” of cross-cultural knowledge among supervisors, students, and the wider community. This support from family and community members has been discussed as critical to supporting the education of Aboriginal and Torres Strait Islander students (Milne et al. 2016).

Since completing the program, several students have commented that they felt they pursued advanced study because of the skills, awareness, or confidence gained during the Kungullanji Program. Further research is in progress to explore and evaluate program benefits and student outcomes for the cohort discussed in this article as well as subsequent programs since 2014. Exploration of the themes that emerged during the yarning circles also will be examined in detail in future research.

Conclusion

UREs create an opportunity to raise the awareness, aspirations, and skills of student researchers. These types of programs also recognize and value the unique knowledge and perspectives of researchers while facilitating cross-cultural knowledge exchange and interdisciplinary research. This creates the potential to support projects led by Aboriginal and Torres Strait Islander communities. The Kungullanji Program has demonstrated initial benefits of implementing an URE with Aboriginal and Torres Strait Islander students in STEM, including increased student self-confidence and participation in the university research community. The structure of the Kungullanji Program explored here presents a foundation for creating and improving research

spaces for undergraduate Aboriginal and Torres Strait Islander students. UREs such as those offered through the Kungullanji Program present an untapped potential to improve educational disadvantage, increase student success, increase visibility of Indigenous research, and encourage students to pursue STEM and research careers.

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