

National Indigenous Science Education Program – Building Evidence for Effective Implementation into Higher Education

January 2015 to 30 December 2016

Associate Professor Joanne Jamie

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Higher Education Participation and Partnerships Programme (HEPPP)

2014 National Priorities Pool FINAL REPORT

National Indigenous Science Education Program – Building Evidence for Effective Implementation into Higher Education

January 2015 to 30 December 2016

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1. PROJECT SUMMARY (Conditions of Grant, clause 2.2(a)-(e) of Part A)

Objectives

Indicate the extent to which the Project Objectives specified in clause 3 of Part A of the Conditions of Grant were met. Where obligations established in the Conditions of Grant were not met, please identify these and provide an explanation of circumstances and consequences.

Table 1: Project objectives

IDENTIFIED OBJECTIVE	EXTENT TO WHICH THE OBJECTIVE WAS MET
<p>The Project Objectives were to systematically evaluate and critically assess the National Indigenous Science Education Program (NISEP) to:</p> <p>a) identify and document its essential features that allow it to enhance higher education access and participation of low SES students and,</p>	<p>Project objective was met. Extensive interviews/focus groups undertaken with NISEP stakeholders and the analyses of paper-based surveys identified the essential features that allow NISEP to enhance higher education access and participation of low SES students. These features have been documented in-house, in one publication, and presented at conferences.</p>
<p>b) develop an engagement and evaluation framework of guidelines for effective and sustainable incorporation into higher education outreach programs.</p>	<p>Project objective was met. Evaluation and engagement framework of guidelines has been incorporated into NISEP's framework and reported on in one publication and at conferences so as to advise others on its incorporation into higher education outreach programs.</p>

Project Activities, Milestones and Key Performance Indicators

Below, please specify whether:

- all project Activities specified in Schedule 1 of the Conditions of Grant were completed
- all Project Milestones specified in Schedule 1 of the Conditions of Grant were completed
- all Key Performance Indicators specified in Schedule 1 of the Conditions of Grant were met.

Where obligations established in the Conditions of Grant were not met, identify these and provide an explanation of circumstances and consequences.

Table 2: Project activities, milestones and KPIs

TIME FRAME	PLANNED ACTIVITIES AND MILESTONES	PROJECT ACTIVITIES AND MILESTONES COMPLETED	IDENTIFIED KEY PERFORMANCE INDICATORS	KEY PERFORMANCE INDICATORS OUTCOME
Jan, May – Aug 2015, Nov – Jan 2016	Redesign/ Development and Implementation of evaluation questions.	Completed. Paper-based surveys (first implemented in 2007) were assessed, updated, and new forms implemented. Successive rounds of interview/focus group questions were developed and implemented with secondary students, school staff, university staff, Indigenous Elders and community members and parents/carers.	Impact of specific core NISEP activities, and mode of engagement on higher education awareness, valuation and access measured.	Key performance indicators were met. Quantitative and qualitative data from the paper-based surveys and interviews/focus groups were assessed so as to determine which NISEP activities were the most impactful and efficient in increasing higher education awareness, valuation and access. This information is being used to steer the ongoing improvement of NISEP.
May – Aug 2015, Dec – Aug 2016	Case Study: Community Driven Program.	Completed. Analyses of the evaluation data identified the role and importance of community involvement in making NISEP more impactful on its target beneficiaries.	Case study produced.	Case study produced. Key performance indicators were met. These data resulted in a publication - Whiteford, G., et al. (2017). The River of Learning: building relationships in a university, school and community Indigenous widening participation collaboration. Higher Education Research Development, 36, 1490.
Jan & Jun – Aug, Oct – Nov 2015, Jan 2016, May – Jun 2016, Aug 2016	Engage Focus Groups.	Completed. Focus groups/interviews were undertaken with secondary students, school staff, university staff, Indigenous Elders and community members and parents/carers.	Focus Groups engaged.	Key performance indicators were met. Focus groups/interviews were undertaken with secondary students, school staff, university staff, Indigenous Elders and community members and parents/carers.
Jun – Nov 2015	Case Study: School Driven Program.	Completed. Analyses of the evaluation data identified the importance of the direct involvement of the partner schools in guiding NISEP's direction and activities	Case study produced.	Key performance indicators were met. The quantitative and qualitative evaluation data was coded into themes, allowing for its subsequent use in the improvement of NISEP's resources and processes

TIME FRAME	PLANNED ACTIVITIES AND MILESTONES	PROJECT ACTIVITIES AND MILESTONES COMPLETED	IDENTIFIED KEY PERFORMANCE INDICATORS	KEY PERFORMANCE INDICATORS OUTCOME
		in order for it to have the highest impact on its target beneficiaries.		related to school engagement. A publication is currently being written covering the overarching themes identified with further papers planned in future. The data and themes have been presented as case studies at conferences. The evaluation also resulted in outputs such as the video William's Story (https://youtu.be/nn7qWUOCZ0A).
Jun – Dec 2015, Jan – Feb and Jun – Aug 2016	Case Study: Comparative Stakeholder Challenges.	Completed. Analyses of the evaluation data identified the comparative challenges faced by NISEP stakeholders in participating in/implementing NISEP activities. A special focus was placed on university partners in this regard.	Case study produced.	Key performance indicators were met. The quantitative and qualitative evaluation data was coded into themes, allowing for its subsequent use in the improvement of NISEP's resources and processes related to addressing stakeholder challenges, particularly those faced by university partners. A publication is currently being written covering the overarching themes identified with further papers planned in future. The data and themes have been presented as case studies at conferences.

Highlights and Issues

Provide a summary of highlights and achievements arising from your project (maximum half page)

An iterative process of focus group/interview sessions with NISEP stakeholders clearly identified which of NISEP's activities/events/strategies were the most impactful and efficient in raising students' aspirations, motivation and confidence in completing school and going onto higher education. This critical evaluation led to a better understanding of NISEP's strengths and weaknesses and identified its core elements, including which events were the most impactful on its target beneficiaries. This has allowed for a more focused approach to strengthening these core events, the removal of unnecessary activities from the program, and the more efficient and impactful use of program funding.

In order to expand NISEP's reach through new partners, including other universities, the need for a stronger governance structure with quality control mechanisms related to the program's mission and values was identified. The evaluation process identified strategies to achieve this, and significant improvements have already been made to the program's resources, processes, event management, and support mechanisms (e.g. budgeting, data collection, reporting, student permission forms) which have led to ongoing positive feedback from our school and university staff stakeholders. A strong strategic plan for NISEP has been built and is being implemented ongoing. We are happy to report that this has led to Charles Sturt University (CSU) implementing NISEP School Science Shows through its Port Macquarie Campus with four new schools, Wagga Wagga Campus with two new schools, and Orange Campus with one new school. The evaluation process also clearly identified differences between school and university partners in terms of their needs and challenges and the need for flexible support mechanisms. This has made it easier to balance holding partner organisations accountable for maintaining NISEP's aims while allowing for flexibility according to each partner's circumstances. The evaluation data collected has been key in marketing NISEP to new partners, with 4 new universities currently looking to join the NISEP network.

This project has resulted in one journal paper and the research findings are currently being incorporated into further publications. These publications will acknowledge the contribution of the HEPPP National Priorities Pool funding.

The collected evaluation data has also been used to secure funding and awards for NISEP, including the PricewaterhouseCoopers 21st Century Minds Accelerator Program Grant for STEM social enterprises (2016, 20 awarded nationally), National Science Week Major Grants in 2016, 2017 and 2018 (funding for the annual Indigenous Science Experience at Redfern Community Centre), and NISEP was listed as one of four finalists in the Australian Financial Review Community Engagement Awards in 2016 and 2017.

Did the project lead to implementable outcomes? What changes will result at your institution/nationally? Are there activities resulting from this project that will be continued?

The evaluation data collected from this project resulted in changes being implemented at all levels of NISEP's structure, from the improvement of process documents and resources to the building of an overall strategy working towards a stronger governance structure and quality control procedures (implementation ongoing). The identification of NISEP's core elements which have the most impact on its target beneficiaries has allowed for the strengthening of these elements and the removal of others. For example, it has allowed for a streamlined approach to ensuring program funding is used to channel students through NISEP's School Science Shows to its Sydney based events, the Indigenous Science Experience and ConocoPhillips Macquarie Science Experience, as identified as the most impactful pathway for the students through the program.

The improved paper-based surveys and focus group sessions will be implemented on an ongoing basis so as to continue to build on the program.

The evaluation data collected through this project has allowed us to market NISEP to new university partners and build flexible strategies for working with groups with different needs and challenges. We now have four new university partners looking to come onboard including in Queensland, Victoria and the Australian Capital Territory, which will increase

NISEP's national reach. The evaluation data will also be used in future funding and award applications, and so will assist us greatly in ensuring NISEP can continue.

Did you undertake an evaluation of your project?

Yes No

Please summarise the findings and attach the evaluation report

Where applicable, indicate number of the following resulting from this project:

Student contacts	15
Journal (or other publication) submissions	1
Conference Presentations	5
Websites developed	1 www.nisep.org.au
Educational or marketing campaigns	N/A
Community organisations engaged	N/A
Schools engaged	9

Optional - If you included transformational/behavioural change KPIs in your EOI please summarise outcomes here:

Describe any issues that occurred during the year and any mitigation strategies you implemented.

2. OTHER PROJECT MATERIAL (Conditions of Grant, clause 2.2 (b)-(e) of Part A)

[List the titles of any published reports, pamphlets or other documentation produced in the course of the Project and attach them to this Final Report.]

Table 3: Additional materials produced over the course of the project

TYPE	AUTHOR	DATE OF PUBLICATION	PUBLICATION DETAILS
Journal article	Whiteford, G., Hunter, J., Jamie, J., Pitson, R., Breckenridge, D., Yaegl Elders, Vemulpad, S., Harrington, D., & Jamie, I.	2017	The River of Learning: building relationships in a university, school and community Indigenous widening participation collaboration. Higher Education Research Development, 36(7), 1490-1502.
Video	Story Motive	2017	William's Story. YouTube - https://youtu.be/nn7qWUOCZ0A
Pamphlet	Macquarie University/NISEP team	2017	NISEP marketing flyer – please see attached.
Pamphlet	Macquarie University/NISEP team	2017	NISEP marketing flyer for new university partners – please see attached.
Website	NISEP team	2016	www.nisep.org.au
Conference Abstract	Jamie, J., Jamie, J., Singh, S., Vemulpad, S., Hunter, J.	2015	NISEP in Yaegl Country – Reflecting on the Power of Respectful Partnerships for Enhanced Indigenous Education Outcomes. Presented at the Higher Education Participation and Partnerships Program: National Forum on Indigenous Pathways & Transitions into Higher Education, Darwin, Australia.
Conference Abstract	Jamie, J., Jamie, J., Singh, S., Vemulpad, S., Wade-Leeuwen, B.	2015	“Can you help us help our youth?” Increasing Aspirations and Participation in Higher Education Through the National Indigenous Science Education Program (NISEP) Presented at the Higher Education Participation and Partnerships Program: National Forum on Indigenous Pathways & Transitions into Higher Education, Darwin, Australia.
Published Congress Abstract	Barnes, E.C., Yin, P., Akter, K., Jamie, I., Yaegl Community Elders, Vemulpad, S.R., Jamie, J.F.	2016	The role of natural products chemistry in the capability strengthening of Indigenous communities, <i>Planta Med</i> 2016; 82(S 01): S1-S381 Presented at the 9th Joint Natural Products Conference, Copenhagen, Denmark.

TYPE	AUTHOR	DATE OF PUBLICATION	PUBLICATION DETAILS
Conference Abstract	Jamie, J., Yaegl Community Elders, Barnes, E., Prenzler, P., Bedgood, D., Jamie, I., Vemulpad, S.	2017	NISEP – Enhancing Educational Outcomes for Indigenous Youth. Presented at the Royal Australian Chemistry Institute Centenary Congress, Melbourne, Australia.
Conference Abstract	Barnes, E., Yaegl Community Elders, Akter, N., Yin, P., Akter, K1, Malewska, T., Kichu, M., Islam, M., Ranganathan, S., Jamie, I., Vemulpad, S., Jamie, J.	2017	The capability strengthening of Indigenous communities through natural products chemistry. Presented at the Royal Australian Chemistry Institute Centenary Congress, Melbourne, Australia.

Appendix 1: NISEP Attachments



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The River of Learning: building relationships in a university, school and community Indigenous widening participation collaboration

Gail Whiteford, John Hunter, Joanne Jamie, Rhonda Pitson, Deborah Breckenridge, Yaegl Elders, Subramanyam Vemulpad, David Harrington & Ian Jamie

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The *River of Learning*: building relationships in a university, school and community Indigenous widening participation collaboration

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ABSTRACT

In this article, findings of a qualitative study of an Indigenous widening participation program are presented. The program, *River of Learning*, has been in existence since 2010 and represents a powerful collaboration between a rural high school in New South Wales (NSW) Australia, a metropolitan university, Indigenous Elders and non-Indigenous community members. An analysis of the narrative data generated through individual and group interviews with stakeholders provided findings with respect to the program including how it has contributed to the building and strengthening of university and community relationships and how important the interaction with Indigenous Elders and school and university staff is in development of confidence to engage in higher education in the Indigenous students. These findings are discussed and the article concludes with reflections on the learnings generated through such university, school and community collaborations and what these may mean in ensuring greater Indigenous representation in higher education in Australia in the future.

ARTICLE HISTORY

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KEYWORDS

Australia; collaborative learning; community engagement; culture; higher education; Indigenous education; learning outcomes

Introduction

Commitment to a Widening Participation in Higher Education Agenda gained momentum in Australia from 2009 onwards. Supported by the availability of Federal Government funds (Commonwealth of Australia, 2009), universities across the country significantly increased the scope and scale of activities aimed at improving higher education access and participation rates of under-represented groups. These groups include Australian Indigenous (Aboriginal and Torres Strait Islander) people, many of whom are from other under-represented groups, that is, low socio-economic status rural and regional communities (Bradley, Noonan, Nugent, & Scales, 2008).

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Australian Indigenous people often lack higher education opportunities (Asmar, Page, & Radloff, 2015). This is due in part to structural disadvantage and historical exclusion from mainstream education throughout Australia (Barney, 2013; Bat & Guenther, 2013; Behrendt, Larkin, Griew, & Kelly, 2012), which has left an ongoing, negative legacy (Bin Sallik, 2003), including a lack of Indigenous role models with successful educational attainment (Sikora & Biddle, 2015). This is compounded by the fact that many Indigenous students entering university are the first in their families to do so (Harrison & Murray, 2013; Larkins et al., 2009).

As programs and initiatives have been developed in universities focusing on enhancing the recruitment, retention and success of Indigenous students, it has become evident that activity aimed at enhancing participation needs to begin early in high school (Gale, Tranter, Bills, Hattam, & Comber, 2010; KPMG, 2015). Foci at this stage need to be on addressing confidence and a sense of familiarity with post-secondary educational environments (Bat, Kilgraiff, & Doe, 2014) as well as academic capability. Reaching and inspiring students (to envision themselves as participants in higher education) in their schools and communities is vital, as is a focus on the continued development of requisite academic skills (Behrendt et al., 2012). Understanding this – as well as the importance of university/school partnerships in developing pathways and opportunities for Indigenous students – has led to science academics at Macquarie University (in Sydney, Australia) to work in collaboration with the Yaegl northern NSW Aboriginal community and schools local to that community to enhance educational attainment of Indigenous youth. Together, they created a science engagement program for Indigenous secondary students. The innovative and inclusive nature of this program (www.nisep.org.au) has attracted national attention.

Over time, the science program has become linked to a broader Indigenous learning initiative, the *River of Learning*. Named so as to acknowledge the centrality of the Clarence River (on which the town and surrounds are located) geographically, physically, culturally and spiritually, to both Indigenous and non-Indigenous residents, the program is essentially focused on the transmission of local Yaegl Aboriginal knowledge to all Year 7 students of Maclean High School (on Yaegl Country). Such a focus is consistent with Canadian First Nations programs, which reinforce ‘sense of place’ as a strategy to bring together whole communities (Cairns, 2000).

The *River of Learning* program includes an interweaving of science, art, language, literature, physical education and geography and is underpinned by time spent on *Country* (a term meaning to be on traditional tribal grounds) with Yaegl Aboriginal Elders. The program relies on close community ties and supports, especially as the specific activities it includes are: an art exhibition; creation of traditional and contemporary craft objects; geophysical mapping; story telling; singing; dancing; autobiographical writing; cooking using traditional ingredients and participation in team based, Indigenous inspired games. All school staff are encouraged to participate and the extent to which each curriculum area has been Indigenousised by the teaching staff predates the scope and the depth of their involvement. Preparations take place across the term and culminate in the *River of Learning* Day in which Maclean High School students, staff, Yaegl Elders, community members and Macquarie university academics interact to showcase and acknowledge student achievements. All involved were recently affirmed in their collaborative

endeavours through the Nanga Mai state award that acknowledged the program's outstanding contribution to Australian Aboriginal history and culture.

Given the scope of involvement and the time contributed by all involved and the fact that the *River of Learning* has been in place since 2010, all stakeholders (including, importantly, the Yaegl Elders involved) agreed that it was timely to evaluate the meanings and broad outcomes associated with the project. This is in order to guide future directions for the program and also to inform other similar university/community initiatives nationally (and perhaps internationally) in terms of what can be achieved. As a qualitative case study, generalisation of findings is not appropriate, as context is central to such initiatives, but stimulating discussion and informing the practice of university members as they engage and build relationships with Indigenous communities was an aspiration of the researchers/authors from the outset. Accordingly, Ethics approval was granted by Macquarie University in 2013 for a multi-method evaluative research program. The qualitative research reported in this article represents one of the 'strands' of the research program, which focused on Indigenous staff, teachers and Elders and the relationship between the university, school and community; no students were involved in the study reported here.

Methods

Ethics approval

Macquarie University Human Ethics approval (reference 5201200891) was granted in 2013 and included approval for qualitative research to be undertaken with the Aboriginal staff and Elders involved in the *River of Learning*. Given that the research sites included Maclean High School, working with children checks were a requirement for the research team, though, as previously indicated, no students or minors were involved in the study reported here.

Recruitment and sampling

Following ethics approval and through close liaison with Maclean High School staff, it was agreed that the most appropriate timing for data collection would be during the June 2015 *River of Learning* event itself and the following days, onsite at the school and in nearby locations. In advance, all staff and Elders involved received information regarding the research and its purpose as well as a general invitation to let the research team know of their willingness to be involved. Yaegl Elders were also invited to be co-authors in publications arising from the research, including this article.

Subsequently, those individuals who agreed to participate suggested others in what became a 'snowball' sampling strategy (Atkinson & Flint, 2001). This included a parent who heard about the research and expressed an interest in participating. A separate recruitment and sampling strategy was enacted with the Yaegl Elders so as to ensure cultural safety and mitigate any risk of coercion. This included an experienced Indigenous researcher together with a Yaegl Aboriginal staff member of Maclean High School, who both acted as cultural informants when meeting with the Elders individually (and in small groups) to discuss the purpose for the research, their respective roles, any concerns

they may have as well as any related issues. Having had this preliminary in-depth discussion, nine Elders agreed to participate in a focus group interview.

Data collection

Once informed consent was obtained from participants, individual interviews commenced using a semi-structured format (Silverman, 2013). This included the experienced Indigenous researcher acting as lead interviewer and a Yaegl Aboriginal person acting as a cultural informant. Participants were interviewed where they felt comfortable and had privacy, and interviews lasted approximately 45 minutes to an hour. Interviews were recorded and subsequently transcribed. All transcriptions were de-identified to ensure anonymity of participants. The focus group undertaken with the Elders was structured around a social event, a 'morning tea'. This was their suggestion as for them it created a more relaxed, naturalistic environment in which they and the Indigenous and non-Indigenous staff and researchers, could 'yarn' ('yarn' in the Australian Aboriginal vernacular means to 'talk about', 'discuss') about the *River of Learning*. As with the individual interviews, the focus group was recorded and transcribed. All audio files and transcripts are stored securely electronically, with access only by members of the research team, and will remain so for a period of five years.

Data analysis

Once all transcripts were collected, a process of open coding began, followed by thematisation (Liamputtong & Ezzy, 2005) and the qualitative program NVivo10 QSR (Silverman, 2013) was used as a subsequent data organisation tool. Generally, a philosophical orientation informed by phenomenology (Van Manen, 2014) with a focus on the lived experiences of participants, informed the analytic process at the level of each individual. Subsequently, however, themes were clustered together around broader issues relating to the *River of Learning* and its impacts over time. As indicated by the data collectively, these appeared to be: the community; the students; the opportunities created and the relationship between the high school and the university.

Findings

The findings generated from analysis of the qualitative data are presented and discussed here and very much reflect the meanings associated with the *River of Learning* over time to the different stakeholders. Such meanings are multi-layered, complex, covert and in some instances, deeply culturally bound. Accordingly, in this section, we attempt to balance depth of data presentation with interpretive commentary.

They feel comfortable here: building and strengthening community ties

Discussion of the *River of Learning* as both a means through which the school depended on the community and in turn served to *coalesce* community connections, formed a significant dimension of the narrative data. As indicated in the narrative extracts below, the *River of Learning* created a 'space' and opportunity in which staff, parents, Elders and

students could all feel pride and a genuine sense of working together in a way that transcends Indigenous and non-Indigenous ‘mobs’ (an Australian Aboriginal term meaning groups), as one participant describes it:

For me I don’t think that anybody’s walked into this school is saying that this is an Aboriginal perspective ... they haven’t put the gap between one mob and another mob. They’ve just culturally accepted it and the non-Indigenous kids have just gone, well, this is how it is. This is part of our culture. We are Australian and this is how it’s supposed to be.

The community, I think it gets them involved with our school, which I think is what we really need. Because it’s – at the end of the day, it’s all of the community’s kids who are coming to the school, and we’re teaching them about our local community. I mean, I like to see the parents come in here, because a lot of times you get informal chats, they get to know who we are, we get to know who they are, the kids can show off. They’re pretty proud of the things that they do and they can see that all their things are displayed around the school, so they get a bit of a chance to feel good about themselves by what they’re producing. It’s got a, I think, a really good theme, because it’s all local information.

Because it brings the whole community together from the feeder schools right up to the high school and progresses right through with the children from kindergarten to Year 6 and follows along from Year 7 to Year 12. They get better each year with the things that they’re putting into the *River of Learning*. Not only that, it gives new teachers coming to the school a better understanding of the Aboriginal community that they’re coming into and they build stronger ties to the community and the Elders and the families build stronger ties with the school. I just believe it needs to go on and keep going on to keep the open communication between school and home.

Everybody gets out of it what they want to get out of it, so we have our community and our Elders. They get a tremendous deal out of it. It’s a great recognition for the culture and it’s recognition of them as the Elders.

Whilst participants reflected on the fact that closeness of community ties has been a feature of the *River of Learning* program, it was not always that way. Over time, the relationships between the school, community and university have strengthened and evolved so that previously concerning issues such as the non-attendance of Indigenous students is no longer problematic. This has required a real commitment by all involved, especially senior teaching staff at the school. Here, one of the senior staff involved in the beginnings of the program enacts leadership by getting out of the school grounds and spending time with Indigenous community members in their traditional ‘spaces’. This participant suggests that getting out and into the community is crucial in building relationships and that for them, it meant symbolically ‘taking the tie off’ to do so.

[you need to] ... bring the community on board first. Go out and speak to them [the Elders] and don’t be afraid to be criticised. Have a thick skin, basically, because you will get criticised. I mean, the mission at Yamba is quite an intimidating place for many people to go. Go there. That’s what I did, to begin with. I went there, I went with one of the Aboriginal workers, took my tie off, and went there and talked to the community.

It is interesting to reflect on what, in this context, ‘having a thick skin’ meant for this person and how this was important in the context of the ‘mission’ location. This was perhaps because of the challenging colonial history; the mission was a place where Indigenous people were forcibly moved to during the early 1800s. It does seem that, whether consciously or not, the strategy of ‘taking off the tie’ is an attempt at finding a post-colonial

way of 'joining with' the Yaegl Aboriginal community members rather than reinforce the segregated identities of the past. It would appear to have been a strategy that was important in real, if not symbolic terms, as over time the relationship with the Yaegl Elders has grown to be vital to the *River of Learning* program.

Here, participants comment on the central role of the Yaegl Elders in both developing and driving – as key figures – the *River of Learning* and its growth over time.

The only way is to have those Elders. I mean the aunties and the uncles are the driving force behind it ... , that's enormous. Without that connection to community in the schools, it's not going to be successful. You do need that connection.

I think the reason it works is that it is the Elders that you do see down the street, who are doing their shopping or going to the bank or the doctors ... people who do live here and who are recognised as someone's great Aunty or the lady down the road and [students and staff] didn't know that they had this knowledge and this significance in the community.

The Yaegl Elders in turn, it would seem, also strengthened ties between the Indigenous community and the school through their feedback about the *River of Learning*.

... the Elders used to go back, I think – and they used to tell their sons and daughters and grandchildren and others that it's [the school] not such a bad place after all and those people are doing a pretty good job.

From the reflections above then, it is possible to gain a sense of the *River of Learning* developing synergistically over time. In order to run it successfully, the school depends on the Elders, parents and volunteers who work alongside school staff – galvanised by a shared commitment to what the *River of Learning* stands for. We can also begin to appreciate how the *River of Learning* in turn strengthens community connections and increasingly builds levels of social and cultural capital. Of note also is the phenomenon of the transformation in the socially constructed identity of the Yaegl Elders within the community. From being a person who was previously seen as 'the lady down the road' this person is now regarded as an *Elder* with a powerful stock of cultural knowledge. Although in no way quantifiable, such transformed identities – and the according of greater recognition, respect and gravitas by association – has strengthened relations between Indigenous and non-Indigenous community members.

In this next section, consideration is given to what the *River of Learning* – and a school culture that centralises Indigenous culture, identity and knowledge – has meant to the Maclean students. Specifically, attention is given to the input of the Yaegl Elders and the Maclean Aboriginal teaching and support staff.

They come out of the 'shame' stage – the importance of elder and Aboriginal staff input in building confidence and identity

The importance of the involvement of the Elders in not just the *River of Learning* but in the school in general was emphasised by all participants. Their input in the form of knowledge sharing – sometimes in great detail – and building relationships is reflected upon in these narrative extracts.

I think the strength of this program is the involvement that the Elders have in the school and the say they have and the comment they have on the projects that the teachers have

presented ... Are we doing the right thing? Are we going on the right way? The Elders might say, no. Get rid of the didgeridoo. It's not one of our musical instruments. We use the sticks. We don't actually play the didgeridoo here, so don't use the didgeridoo.

[The reason why the *River of Learning*] has been so successful is because right from the get-go, we've involved our Elders, and I think they appreciate that. That's why they show up, that's why they keep coming back. Elders take the kids on the cultural tours ... so at the end of the day, it's their knowledge that we're sharing, so I think that it should come from them.

... you have to have the Elders running it. It has to be led through the Elders. I think that's the most important thing because their knowledge and wisdom and stories is really what makes the day for the kids.

All the Year 7 kids did their cultural tours with the Elders and they loved it. They come back raving about it. I have yet to see a kid disrespect the local Elders.

The final quote reflects the previous section in terms of how the *respect* (and with that the accordance of a transformed identity) the students gain for the Yaegl Elders through the transmission of cultural knowledge is so important for all involved. This is because the respect for the Elders seems to be generalised to respect for Indigenous knowledge, values and ways of being. As well as the importance of the Elders, however, participants commented on the value of the Aboriginal staff at the school and the following participant stresses the importance of bringing Aboriginal education workers into the school over time.

... when I started, I could see that if we could get Aboriginal workers into the school, then a lot of the issues would be resolved. So gradually, we went from an Aboriginal education worker, or AEO, to two, then three, then four, then five, and then six. As you can see here today, those Aboriginal workers in the school, they love this day ... they appreciate it that the school has genuinely tried to encompass their culture into the day-to-day running of the place. So that's been critically important.

Whilst this person speaks to the active role they play culturally:

They teach the kids. It was the Aboriginal workers who taught the kids how to do the welcome in Yaegl language. It wasn't the teachers, it was the Aboriginal workers. That's something significant. If you were trying to run this program at another school ... find some funds from somewhere to hire some really good Aboriginal people to come into your school on a permanent basis.

The Aboriginal education workers also have an important role, like the Elders, in endorsing the school as a 'culturally safe' space for Indigenous students. Perhaps, as indicated above, they may also bring an Indigenous way of being to the school environment that has a subtle yet pervasive effect on the school milieu. Within such a milieu then, the Indigenous students' identity is affirmed; indeed, as one student commented to the research team whilst onsite at the school 'Aboriginal stuff is cool'.

Cool or not, the presence of the Aboriginal education workers and the incorporation of Aboriginal culture is the basis upon which the school is regarded as 'genuine' when it comes to Aboriginal education.

... this is a good school in terms of Aboriginal education, your child will like it here because these people are genuine in what they're trying to do. Look, we've got an Aboriginal education committee here with half a dozen Aboriginal workers on it, that if you feel like there's any issues, you can come to them first and we'll help you ...

In this respect then, being perceived as ‘genuine’ is very much linked to the visible, quantitative commitment, that is, the sheer number of Aboriginal staff employed by the school and the existence of an Aboriginal Education Committee. As Trudgett (2010) reminds us, the visibility (of other Indigenous people) is very important for Indigenous community members.

Visibility is very much the focus in the next two narrative extracts, in which it is possible to gain some appreciation of how the *River of Learning*, school culture and Aboriginal staff have influenced the Indigenous students in a positive way. This seems to be through providing a strong platform through which Indigenous identity is able to be affirmed and asserted and through which confidence and skills can be enhanced.

The dancing was spectacular. It’s always spectacular. It’s fantastic for the kids to get up there and paint themselves up and stand in front of their peers. It’s a big thing for those kids, you know? Some of those girls that stood up in the choir, it’s the first time they’ve ever stood up in front of them.

I think they get to show, show everyone ... a bit of their culture and what happens and they’re happy to – I don’t know – put it out there to show.

Linked to, but different from, visibility per se, is a sense of comfort in being the focus of attention in different settings, including within the classroom. Indeed, one of the subtle yet positive impacts of the *River of Learning* and interaction with Yaegl Elders and Aboriginal staff is that it can facilitate a process of ‘coming out of shame’. ‘Shame’ refers to a deep self-consciousness and a discomfort with being isolated as an individual from the collective or group and is a common term Indigenous youth use. Here, two Aboriginal staff members, (Participants 1 and 2) discuss it and what can assist *moving out of it* and into a space of greater self-confidence.

- P1: When they start to get stronger in their confidence and feeling more comfortable and they don’t shame, they’re happy to step up ... they’re totally different kids once they come out of the shame stage
- P2: [you want me to explain] what shame is? I think some of the kids are scared of what – like what people are going to think about them. Like if they get up and do something or say something, am I saying the right thing, am I doing the right thing? I don’t know, sometimes that could be a shame factor I think.
- P1: Shame means having attention on you whereas they feel comfortable in a group because it’s not just an individual attention. When they’re in groups, totally different, aren’t they?
- P2: Oh – we do still get some kids that are still shame in groups.
- P1: Yeah but like when they know that no one’s watching, they’re just themselves and they can have a laugh and whatever. With the likes of certain students here who didn’t have that shame factor [its] because they learn at a young age – no need to be shame. Be proud. Okay and that’s what we try to encourage these students to do.

It’s worth it – creating opportunities to enhance understandings, familiarity and choices

The *River of Learning* and the many ‘scaffolded’ activities associated with it – including those run by and/or facilitated by Macquarie University (www.nisep.org.au) – have provided a range of learning opportunities for the students over time. Both Indigenous and

non-Indigenous students have had formal and informal learning experiences that have provided different ways of understanding themselves as lifelong learners and of the range of possibilities accessible to them. The participant below reflects on how a sense of the ability to achieve is created through the nested activities around the *River of Learning*, which include for example, the creation of artwork – publicly displayed in an exhibition – geophysical mapping, oral history recordings, science displays and public speaking and performances. Here, the link is made by participants between the opportunities and the impact on sense of self.

The students that we lose statistically from education are often Indigenous students who will be possibly the ones who drop out of school at 15 or 14 ... and who are possibly less easy to re-engage. So we need to find ways of them having a sense of (a) self-belief that I can achieve things in the education system and (b) that I might have a future in completing my education and even going beyond that and I'm perfectly capable of doing that, and (c) being recognised so that they're an important part of the school community. That's what this, I think, why it's [the *River of Learning*] significant and important is because it keeps that connection going.

So the girls went away to Bangarra [an Indigenous Dance Company based in Sydney] dance workshop and as a result of that they did – beautiful stuff – and so that's the part of it ... it's those opportunities that arise because you put on something that's culturally sensitive that give kids opportunities that they would not normally have had – and in a big arena – a big arena.

So two of the Aboriginal girls that performed yesterday now want to do music. So it's the layers that you create, and if we didn't have that *River of Learning* program, then those opportunities wouldn't be there.

As well as direct experience, such as those described above, the *River of Learning* activities provide a platform for story telling and sharing between the Elders and the students. These stories can be powerful in shaping understandings and aspirations, especially of the personal nature of a journey into and through higher education. The next person suggests that the story of a Yaegl Elder who has gone through many challenging life events to complete undergraduate and postgraduate studies and who was awarded an honorary doctorate could provide a powerful role model.

... it's the link to education. They heard the Elder talk yesterday and that person is someone with an honorary doctorate who's actually talking to them about going on to Year 12. A parent told me yesterday that if they didn't get anything from listening to that Elder yesterday, they'd never get it from anyone. That sums it up – because people are here, imparting knowledge, encouraging people. Everybody who sat there, all year 7 – Indigenous or non-Indigenous – heard an Elder, an Aboriginal person saying that [education] is important.

In this respect, then the Yaegl Elder (who attained two degrees before being awarded the honorary doctorate) becomes a role model for both Indigenous and non-Indigenous students. This is potentially powerful for all involved, particularly for the Indigenous students who can, possibly, see themselves as the Elder and relate to the narrative and the journey into the university and through the system.

However, as this participant reminds us, for many Indigenous people in regional/rural/remote areas, whatever opportunities may exist for participation in higher education – it is usually a long way from home.

They don't want their kids to go away. But if they are hearing, as the parents do – if they're hearing about what opportunities lie out there and where their kids can go, then that's the hook and that's what it's about.

The uni has been vital – creating change through a long-term relationship

Universities are large, complex organisations that have social and community responsibility as part of their missions. To fulfil their missions, they are dependent on the relationships they have with a range of communities. The nature and depth of these relationships vary as does the extent to which each commits to a shared vision of transformative action. Macquarie University's relationship with Maclean High School is one that was established in 2005 – a not insignificant amount of time – and this arose from a developing collaboration of several years with the Yaegl Elders. From the reports of participants, this relationship with the school and the Elders seems based on trust and mutuality. Here, we can gain a sense from the narrative of its early development.

If I talk about the *River of Learning* program – and I talk about the development of it, it started with an idea and then I went for a flight to Macquarie University. We took some senior students and it was a chance to sit down and talk with some of the uni people ... the staff [Macquarie] and we had a bit of an idea of starting and having a book or having something that the kids could take with them when they were on a cultural tour ... the idea was to then tap into the relationship that Macquarie Uni had already developed then with the Elders. There was a real respect with the Elders and Macquarie University and what they were doing, and we started that way. So [they] came up and talked with the Elders, science staff, and they went on a visit with the Elders. They had a look at some of the cultural sites. We came up with an idea that we could design a book which then through the help of the Elders and then, we had it printed and the *Resource Book* was established.

The Resource Book, *Yaegl Country: From the river to the sea*, has become not only a vital resource in the *River of Learning* process, but is one that has also assisted in language preservation, an important longer term outcome for those in the region. The support and contribution of Macquarie University in achieving such an outcome seem to have been vital – as one participant states:

If you want to talk about inclusivity and reconciliation – and to me they're just so important [as is] the sharing of knowledge before it's lost. I think the Yaegl Aboriginal language is an example of that – if you want to be able to do that, then I guess what we're doing it [and] our support from the Macquarie Uni has been vital.

Of course, to some extent, the achievement of significant outcomes from a collaborative relationship is dependent on the individuals involved and the degree to which they trust each other to do what they say they are going to. One of the big commitments that Macquarie University has made and that represents an extension of the *River of Learning* is the annual visit by Indigenous students, staff and Elders to the university campus, which is approximately 700 kilometres away from the community. Some insights into just what the visit can mean, especially to understanding the relevance of school *now* (having gained a sense of what may be possible in the future) to a young Indigenous person, are captured in the reflections by two teachers below.

Look, I just think the links we have with the university and the kids that have been down there and come back, they come back so much more enlightened, I suppose. We're

dealing with families that have not had anything to do with university and it's their aspirations, because if we can make school more relevant for them.

So if they [the students] go and visit the universities and have a look and say, yeah, this is what I want to do, this would be good. Therefore, to get there, I've got to do this ...

These reflections about the 'ripple effect' of opportunities relative to expanded horizons are captured in the story about Robert [a pseudonym] – an Indigenous student – as relayed by one of the teaching staff. It is a compelling story of what 'going through the process' can mean. As the closing narrative extract, it is most appropriate as it 'speaks to' the meanings associated with the *River of Learning* as a close collaboration between university, school and community.

You've got the role model aspect of it ... Robert – he needs to go to Macquarie Uni – I'm quite serious about it. He's a prime example. If you want to have a case study of a student who went through the *River of Learning*, went down to Macquarie Uni, then got selected out of 47 kids to go to Canberra to do the work experience program where he met [former Prime Minister] Tony Abbott – if you want to look at a kid who's been through the process and now he's so articulate – he's a prime example. So if we look at the successes of *River of Learning* and Macquarie University and its involvement in all those sorts of things, then that's a prime example. So that's a kid that's going to go on and make a huge difference. He's going to come back to this community and he's going to be held up in high esteem. So how good is that?

This is a compelling account of a student and the opportunities afforded, but at heart lies the question of *what comes next?* Although he has, from this account, support and perhaps a widened sense of possibility when it comes to higher education, the real significance will lie in what Robert ultimately does, that is, to what extent he is enabled to *make a difference* in his community. It is interesting that non-Indigenous students do not seem to have such pressures placed upon them in terms of being responsible for their communities; discussion is more usually focused on individual achievements, career goals, professional roles, travel, salaries and so on.

Discussion/conclusion

In this article, we have presented the findings of research focused on the perceptions of Indigenous and non-Indigenous teachers, staff, parents and Elders of the *River of Learning* program and related activities. The *River of Learning*, developed by Macquarie University and Maclean High School staff and Yaegl Aboriginal Elders working in collaboration, provides an alternative narrative that prioritises Indigenous representation, respects Indigenous cultural values, philosophies and ideologies, and provides material support (Keddie, 2013). Specifically, the *River of Learning*, framed as an initiative that represents such an alternative narrative, has built and strengthened community ties and assisted in the development of confidence and identity in Indigenous students through contact with Elders and Indigenous staff and teachers. The meanings associated with the *River of Learning*, from the perspectives of the participants, are those associated with the creation of more positive Indigenous and non-Indigenous interactions and the development of more respectful relationships based on acknowledgment of culture, identity and place.

With respect to the implications for university/school/community collaborations focused on Indigenous students, there seem to be some salient lessons that can be gleaned from the

data, and it is the hope of the authors that these may serve to inform the practices of others in universities undertaking initiatives in this important arena. First is that the development of the relationship between the university, school and cultural/geographic community is one that needs to be founded on the twin pillars of trust and commitment if they are to be sustainable and make a difference to the stakeholders. Second, in an Indigenous context, the involvement of the Elders is vital. As is evident in the narrative data presented and discussed in this article, the Yaegl Elders input into and ownership of the *River of Learning* has been fundamental to the successful development of the program over time and the meanings associated with it for both Indigenous and non-Indigenous students and staff. The contribution of the Elders over time has built the recognition of the program, created positive links within the community and to Macquarie University and assisted in the development of 'both ways' of learning (Hall & Wilkes, 2015), that is, where Indigenous and non-Indigenous people learn, grow and benefit together. The reported 'transformed identity' of the Yaegl Elders in the eyes of non-Indigenous community members, and the esteem with which they are apparently subsequently held, is a very positive outcome and worthy of further exploration. There are several other areas worthy of further, multi-method investigation that include, for example, understanding how best to develop confidence and pride in young Indigenous students at an early age and then, subsequently, tracking their journeys into and through higher education so we can understand what supports matter most at what points, how they should be delivered and by whom.

The *River of Learning* findings support suggestions by Keddie (2013) that perhaps the appropriate frame for university/school and Indigenous community collaborations is as deeply collaborative endeavour in which all partners are equal in *radical transformative action* (UNESCO, 2015). Such radical, transformative action, it is hoped, becomes the engine room for social change.

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NISEP

NATIONAL INDIGENOUS SCIENCE EDUCATION PROGRAM

Starting from a small program, NISEP has steadily grown to become a unique collective of science academics, Aboriginal Elders and school staff that provides measurable enhanced educational outcomes and aspirations for Indigenous youth from 15 low socioeconomic status rural and regional schools.

Key NISEP events, outcomes and achievements



2004

Yaegl Elders of Northern NSW ask Macquarie scientists (now NISEP Directors) *Can you help us help our youth? Can you make them leaders and motivate them to complete school?*

2005

In January, Northern NSW Indigenous youth attended the Science Experience at Macquarie University. Since then, 10-15 Indigenous youth have annually participated or been leaders at this event (see www.youtube.com/user/nisepmq). This is the only Science Experience event in Australia to have coordinated groups of Indigenous students attending.

Indigenous youth and parents from Northern NSW attend Macquarie University's Open Day to obtain academic advice and learn about support avenues. The youth also demonstrate to the public in the Chemistry for Kids Tent. Around 8-10 Indigenous students from NISEP partner schools now annually attend this event.

First school science shows run at Casino and Maclean High Schools, Northern NSW, with Indigenous youth demonstrating science activities to junior students alongside Macquarie University/NISEP science staff and students. Shows at Casino and Maclean High Schools have since run annually.

2007

School science shows extended to Lismore High School and run annually ever since.

2008

School science shows extended to Bidwill, Shalvey, My Druiitt, Dunheved and Senior Campuses of Chifley College, Western Sydney, and run annually ever since.

2010

River of Learning Cultural Immersion Program commences with Maclean High School and Yaegl Elders, supported by Macquarie NISEP academics. Run annually since 2010 with all Year 7 students of school. Received Nangai Mai award in 2016.

2011

Australian Learning Teaching and Council Award for NISEP.

2012

Inspiring Australia grant awarded to extend NISEP's model of engagement.

Inaugural Indigenous Science Experience event held by NISEP in 2012 and run annually from 2013 at Redfern Community Centre, with National Science Week grants 2012-2017 (-\$20k pa) and as an official Sydney Science Festival event 2015-2017.

2013

Expanded to Charles Sturt University (CSU) Wagga Wagga and Edith Cowan University (Perth). Mt Austin High School science shows run jointly with CSU (Wagga) and Macquarie NISEP team annually since 2013.

2016

NISEP chosen for the 2016 PwC STEM 21st Century Minds Accelerator Program.

Extended to CSU Port Macquarie and 5 new schools, in collaboration with CSU Future Moves. Winner of 2016 PwC Innovator of the Year.

2017

NISEP expanding to CSU Orange and Albury campuses and the University of Queensland.



Empowering our future leaders

1 JULY 2016 – 1 JULY 2017

Over the last 12 months we trained and mentored 182 Indigenous secondary students as leaders of science events, with over 2000 people as their audiences. This was in collaboration with 15 NISEP partner schools, from Western Sydney, Northern NSW and the Riverina, Yaegl and Wiradjuri Aboriginal Elders, CSU science academics and other NISEP partners. Events included:

School Science Shows – NISEP Indigenous youth became role models, demonstrating hands-on experiments to around 1000 junior (Year 5-7) students of their schools and feeder schools – across July, August and October 2016 and June 2017.

Indigenous Science Experience @ Redfern – NISEP students, Aboriginal Elders, Macquarie students and NISEP staff showcased Indigenous and Western Science at the Redfern Community Centre to 550 participants (Inspiring Australia funded) – August 2016. See “*Science Skills Hands On*” – feature story of Indigenous Science Experience Family Science Fun Day on ABC Evening News, 19 August 2016. “*Indigenous Science Gets its Spotlight in Community Events*”, SBS Online at goo.gl/sfFM8V, 23 August 2016. “*Hands-on Science Gets Kids Involved*”, 2SER 107.3, 29 August 2016. “*Indigenous Science Experience @ Redfern: from traditional knowledge to 21st Century Minds*”, Inspiring Australia at goo.gl/SjqRtH, 30 August 2016. (see goo.gl/Vzxieq)

Macquarie University Open Day – NISEP students and community members gained study advice and familiarised themselves with university options, while being guided by NISEP staff and students – August 2016.

Macquarie Science Experience – NISEP and Macquarie students lead three days of STEM activities for 60 Year 9 and 10 students (ConocoPhillips supported) – January 2017. (see goo.gl/GPRAHK)

River of Learning – 150 Year 7 Maclean High School students learnt firsthand from Yaegl Elders about their cultural practices – March - May 2017. See “*The River of Learning: building relationships in a university, school and community Indigenous widening participation collaboration*”, Higher Education Research & Development, 2017. (see goo.gl/Fm3otV)



“NISEP has been an incredibly rewarding experience for the both of us, as it has given us the opportunity to expand our knowledge and build our confidence as leaders. Being able to share our experiences with other young Indigenous students is definitely a powerful way of encouraging others to participate.”

SHANAYE WATERS AND OLIVIA SKINNER-SPEIRS (ABOVE), MACLEAN HIGH SCHOOL NISEP STUDENT LEADERS SINCE YEAR 7, NOW YEAR 12



Will Frazer

“Through my participation with NISEP I have been fortunate enough to be offered many opportunities fostering and furthering my interest in science, whilst gaining a perspective in this field at a university level. The program has also extended my confidence and built leadership skills, whilst allowing me to share knowledge and engage with my own community. These opportunities can be hard to come by in a rural Indigenous circumstance.”

WILL FRAZER, FORMER NISEP STUDENT LEADER YEARS 7 - 12, CASINO HIGH SCHOOL – NOW STUDYING SCIENCE AND LAW AT MACQUARIE (SEE GOO.GL/2Z9DKC)



Angela Froud

“Our students love to demonstrate science activities to younger students, staff and visitors. They overcome shyness and grow in confidence. They love to interact with the University staff, and some can see themselves attending University. All of our participants can relate to the activities they are demonstrating, sometimes being surprised that they are enjoying science. Some of these student demonstrators have the privilege of attending the Indigenous Science Event at Redfern, and the Science Experience at Macquarie University. Students have told me that they feel more connected to their Aboriginal culture and heritage as a result. I love the impact it has on the self-esteem of our Indigenous students, and on their application to their studies.”

ANGELA FROUD, NISEP PARTNER SCHOOL TEACHER, CASINO HIGH SCHOOL



Renee Cawthorne

“My involvement with NISEP had provided me with the skills that has lead to further my employment pathways. I currently am employed at the Australian Museum as the Indigenous Education Project Officer and still have a strong affiliation with NISEP.”

RENEE CAWTHORNE, FORMER MACQUARIE STUDENT AND NISEP VOLUNTEER

Impact on participating students



Anonymous evaluations have shown that 7 in 10 student leaders after NISEP events had an increased desire to complete year 11 and 12 and to go onto higher education, 8 in 10 had an increased interest in science, and 9 in 10 found being a leader a good or inspiring experience.

Focus Group interviews, independent of NISEP Directors, with teachers, school support staff and community members confirm the positive impact of NISEP.

FROM FOCUS GROUP INTERVIEWS ON SCHOOL SCIENCE SHOWS

"I've noticed a significant change in the students ... when they go in, it's like science, it's so boring. But once they actually get taught things and then realise this is their opportunity to feel like a teacher, you see the big changes in them ... you sit in the classes with them and you notice their body language is way different. They're more proud. Like their self-esteem has been lifted. They also have shown a greater respect for their teachers. So this sort of program does help students. Because then for the students to actually achieve this – what do you call it? Self-esteem, right? It also benefits the community. Gives out positive energy."

ON SYDNEY EVENTS

"The value is more than just a trip to Sydney – the value is they [parents] would see differences, if you asked them, in their students approach to learning. They definitely do. I have one girl here who, like I said, was quite reluctant.

She was quite morose and unhappy in early years at school, is now a leader here, laughs, has a ball and her teachers are all saying what a difference they have noticed in her. All different. Because of the beauty – if I can just digress – of this program is that students are given the opportunity to be leaders. They may start off quiet, but by the end of the sessions they are speaking out and having a lot of fun. So they really get those verbal skills practiced in a way that is not artificial ... making it a real situation where you've just learnt something and you are demonstrating it to someone else – it's the best way to learn something anyway – and they then become a marvellous example for the younger students."

ON NISEP OVERALL

"I think it should just keep on running. Because it's doing wonders and I wish whoever was in charge of the money or whatever could come here and see firsthand exactly the impact that it's making for our kids, and that's the main thing, we're all doing it for our kids."

"It [NISEP] really opens the kids' eyes and it's open mine, too. I didn't have a lot of knowledge about Aboriginal culture, so it's been very beneficial. It's important. Very important. We've made great connections with the community through it, with the Elders and even the families. It really has been a positive for the school."

"The main thing you see is the confidence of the students change over time ... we're not really here to create just scientists out of the kids, but we're trying to get them more engaged in their learning through science. You see that and you see them move on to leadership roles within the community ... They get the confidence from doing that here in front of their peers."

Facilitator: "So in summary, what do you think is particularly good about NISEP?"

Respondent 1: "Community, unity, respect."

Respondent 2: "Self-esteem, participation, engagement, motivation."

“Working in partnerships is core to NISEP providing diverse and impactful opportunities for Indigenous youth and their communities and is also immensely valuable for the community partners.”

ASSOCIATE PROFESSOR JOANNE JAMIE, NISEP DIRECTOR

Partnerships and community impact



“I used to walk through the back door, now I go through the front door with pride.”

UNCLE RON HERON (CENTRE) AFTER RECEIVING AN HONORARY DOCTORATE FROM MACQUARIE IN 2014 WITH NISEP DIRECTOR, JOANNE JAMIE (LEFT) AND DEPUTY CHANCELLOR, ELIZABETH CROUCH (RIGHT)

“The relationship with Macquarie NISEP has always been open and friendly and we work together in a spirit of cooperation.”

NOELINE KAPEEN, CEO, YAEGL LOCAL ABORIGINAL LAND COUNCIL

ON THE INDIGENOUS SCIENCE EXPERIENCE AT REDFERN

“The Aboriginal community wholeheartedly embrace the Indigenous Science Experience public day event as it is culturally inclusive of the rich history of the First Nations people by sharing cultural practices since millennia with Aboriginal and non-Indigenous people. The local primary school students who attend the program at our centre are visibly captivated by the hands on interactive science activities and their relationship to Aboriginal culture. More so having senior and tertiary Aboriginal students facilitating will have a lasting impact of the possibilities of education in the fields of science.”

KRISTINA KARASULAS, REDFERN COMMUNITY CENTRE MANAGER



“The Indigenous science experience offers like-minded agencies the opportunity to collaborate and maximise the impact of our individual programs. It encourages us to focus and adapt our regular science engagement activities with inclusiveness and cultural authenticity in mind. It also enables our Indigenous Science Educators to reach and inspire new audiences.”

MIKE BARTLETT, SYDNEY OLYMPIC PARK AUTHORITY

“I commend NISEP on a quality program of hands-on science activities showcasing Aboriginal and Torres Strait Islander knowledge. I appreciate the opportunities the program gives to Aboriginal and Torres Strait Islander students and Elders to lead and teach, and as a result, feel proud.”

CLOVER MOORE, SYDNEY LORD MAYOR



Innovation, sustainability and scalability

From its small beginnings, NISEP has developed into an innovative, sustainable and scalable model of engagement with proven benefits for Indigenous youth and their communities. It is actively being adapted to become a social franchise to enable more university, schools and communities to benefit more Indigenous youth across the nation.

“The Macquarie NISEP team have developed a framework of activities that can be adapted by universities and other higher education institutes and can also be scaled to local events and state wide initiatives.”

PROFESSOR TIM WESS, EXECUTIVE DEAN, FACULTY OF SCIENCE, CSU (NISEP UNIVERSITY PARTNER)

“The NISEP program will provide an excellent platform on which to expand our activities to connect with and excite Indigenous students about science and encourage them in further studies of science in their senior secondary years.”

JACKIE MERGARD, OUTREACH MANAGER, THE FACULTY OF SCIENCE, THE UNIVERSITY OF QUEENSLAND

“NISEP was selected from over 125 applications across Australia as one of the 21CM Accelerator Program STEM education initiatives. We believe the initiative has the potential for growth and will help build Australia's future innovators.”

TONY PEAKE, GOVERNMENT SECTOR LEADER & STEM LEADER, PWC

Visit www.nisep.org.au, www.facebook.com/NISEP.MQ and www.youtube.com/user/NISEPmq

NISEP

NATIONAL INDIGENOUS SCIENCE EDUCATION PROGRAM

NISEP uses science to place Indigenous secondary students in leadership roles at school, community and university events so they gain the confidence, motivation and aspirations to finish school and pursue pathways to university and science, technology, engineering and mathematics (STEM) based careers.

NISEP was born in 2004, when scientists from Macquarie University began collaborating with Elders from the Yaegl and Bundjalung Indigenous communities of northern NSW to learn about bush remedies. The aim was to create an equal partnership, using ancient wisdom and modern science to preserve this important cultural knowledge and apply it for economic, education and health benefits. The Elders saw an opportunity to extend this collaboration beyond a single project and create stronger, more empowered communities. They asked:

“Can you help us help our youth?”

From this question grew NISEP - a consortium of communities, schools, universities, and science and Indigenous outreach organisations with the shared aim of helping encourage Indigenous students to unlock their potential by engaging them in STEM and education. Through the support of these groups and volunteer university students who work with our secondary student leaders, we are able to implement our program.

We target disengaged and shy students from low socioeconomic communities so as to provide opportunities for those who need it most.

NISEP broadens students' ideas of what's possible and empowers them to become role models in their communities by:

- Showing students how to teach and inspire others
- Mentoring students across their high school years
- Building confidence and motivation to succeed in school and go onto university
- Working collaboratively with Indigenous communities, academics, and schools to increase our impact
- Providing access to in-school programs
- Driving peer-to-peer coaching and mentoring
- Providing university student and academic role models
- Reconciliation

NISEP provides the 'spark' in confidence, motivation and/or aspirations needed for students to actively pursue and take part in further opportunities, whether that be other STEM based learning experiences, going well at school or applying for university.



NISEP's Reach

OUR EVENTS

NISEP secondary student leaders (Years 8-12) present science activities to younger students, their peers, family members, and the general public. We empower around 200 secondary students annually, with around 2000 people acting as their audiences. Our events include:

School Science Shows

These core NISEP events are where our leaders demonstrate hands-on experiments to junior (Years 5-7) students of their schools and feeder primary schools.

Indigenous Science Experience @ Redfern Community Centre

At this National Science Week event NISEP staff and student leaders work with Aboriginal Elders and community members, Macquarie scientists, and STEM outreach organisations to showcase Indigenous and Western Science to the broader public (see goo.gl/kgfKQX).

ConocoPhillips Macquarie Science Experience

NISEP student leaders lead three days of STEM activities for 60 Year 9/10 students (see goo.gl/GPRAHK).

Macquarie University Open Day

NISEP students gain study advice and familiarise themselves with university options, scholarships and opportunities.



NISEP has grown into a consortium comprising Macquarie University, Charles Sturt University (CSU) Wagga Wagga and Port Macquarie, Yaegl and Wiradjuri Aboriginal Elders and 15 partner schools across Northern NSW, Central Coast NSW, Western Sydney and the Riverina. In late 2017/2018 the program will expand to further schools through CSU Orange, CSU Albury and the University of Queensland.



Will Frazer

"Through my participation with NISEP I have been fortunate enough to be offered many opportunities fostering and furthering my interest in science, whilst gaining a perspective in this field at a university level. The program has also extended my confidence and built leadership skills, whilst allowing me to share knowledge and engage with my own community. These opportunities can be hard to come by in a rural Indigenous circumstance."

WILL FRAZER, FORMER NISEP STUDENT LEADER YEARS 7-12, CASINO HIGH SCHOOL, NOW STUDYING SCIENCE AND LAW AT MACQUARIE (SEE WILL'S JOURNEY HERE: <https://goo.gl/yzYEka>)



Angela Froud

"Our students love to demonstrate science activities to younger students, staff and visitors. They overcome shyness and grow in confidence. They love to interact with the University staff, and some can see themselves attending University. All of our participants can relate to the activities they are demonstrating, sometimes being surprised that they are enjoying science. Some of these student demonstrators have the privilege of attending the Indigenous Science Event at Redfern, and the Science Experience at Macquarie University. Students have told me that they feel more connected to their Aboriginal culture and heritage as a result. I love the impact it has on the self-esteem of our Indigenous students, and on their application to their studies."

ANGELA FROUD, NISEP PARTNER SCHOOL STAFF, CASINO HIGH SCHOOL



Renee Cawthorne

"My involvement with NISEP provided me with the skills that has led to further my employment pathways. I currently am employed at the Australian Museum as the Indigenous Education Project Officer and still have a strong affiliation with NISEP."

RENEE CAWTHORNE, FORMER MACQUARIE STUDENT AND NISEP STAFF

Impact on participating students

After participating in a NISEP event, of our secondary student leaders:



7 in 10

Had an increased desire to go onto year 12 or higher education.



8 in 10

Had an increased interest in science

After a NISEP event, school staff indicated that of our secondary student leaders:



8 in 10

Demonstrated improved motivation, behaviour and/or concentration



7 in 10

Demonstrated increased teamwork, enthusiasm for learning and/or completed school work

FROM FOCUS GROUPS AND INTERVIEWS

PARENTS AND SCHOOL STAFF: ON SCHOOL SCIENCE SHOWS

"I've noticed a significant change in the students ... when they go in, it's like science, it's so boring. But once they actually get taught things and then realise this is their opportunity to feel like a teacher, you see the big changes in them ... you sit in the classes with them and you notice their body language is way different. They're more proud. Like their self-esteem has been lifted. They also have shown a greater respect for their teachers. So this sort of program does help students. Because then for the students to actually achieve this - what do you call it? Self-esteem, right? It also benefits the community. Gives out positive energy."

ON SYDNEY EVENTS

"The value is more than just a trip to Sydney - the value is they [teachers] would see differences, if you asked them, in their students approach to learning. They definitely do. I have one girl here who, like I said, was quite reluctant. She was quite morose and unhappy in early years at school, is now a leader here, laughs, has a ball and her teachers are all saying what a difference they have noticed in her. All different. Because of the beauty - if I can just digress - of this program is that students are given the opportunity to be leaders. They may start off quiet, but by the end of the sessions they are speaking out and having a lot of fun."

So they really get those verbal skills practiced in a way that is not artificial ... making it a real situation where you've just learnt something and you are demonstrating it to someone else - it's the best way to learn something anyway - and they then become a marvellous example for the younger students."

ON NISEP OVERALL

"I think it should just keep on running. Because it's doing wonders and I wish whoever was in charge of the money or whatever could come here and see firsthand exactly the impact that it's making for our kids, and that's the main thing, we're all doing it for our kids."

"It [NISEP] really opens the kids' eyes and it's open mine, too. I didn't have a lot of knowledge about Aboriginal culture, so it's been very beneficial. It's important. Very important. We've made great connections with the community through it, with the Elders and even the families. It really has been a positive for the school."

"The main thing you see is the confidence of the students change over time ... we're not really here to create just scientists out of the kids, but we're trying to get them more engaged in their learning through science. You see that and you see them move on to leadership roles within the community ... They get the confidence from doing that here in front of their peers."

SECONDARY STUDENTS:

"NISEP really opens your eyes to encourage you to believe in yourself and to have confidence within yourself to go up there and be the person that you want to be."

"Macquarie University [NISEP] has shown me that there is a lot of things that are available for Indigenous people and what they would like to do after they finish school. It was such an amazing experience to go down to Sydney and become part of the uni. It has really pushed me more to go to uni after I finish school and I'd love to do it again. Now I can see that I have a future in what I want to be and that I'm always going to look back at what I've achieved."

"I loved the experience of going to Macquarie University. It showed me a lot of things that are available for Indigenous people who are looking to complete further education. It has changed my mind of not going to university. Before the Macquarie experience, I didn't really want to go to university. I'm glad I went along with the others from my school and I wish to go again"

"If you know someone that does it [NISEP] and they tell you to do it, trust them because it's a good program."

"Working in partnerships is core to NISEP providing diverse and impactful opportunities for Indigenous youth and their communities and is also immensely valuable for the community partners."

ASSOCIATE PROFESSOR JOANNE JAMIE, NISEP DIRECTOR

Partnerships and community impact



"I used to walk through the back door, now I go through the front door with pride." DR. UNCLE RON HERON (CENTRE) AFTER RECEIVING AN HONORARY DOCTORATE FROM MACQUARIE IN 2014 WITH NISEP CO-DIRECTOR, JOANNE JAMIE (LEFT) AND DEPUTY CHANCELLOR, ELIZABETH CROUCH (RIGHT)

"The relationship with Macquarie NISEP has always been open and friendly and we work together in a spirit of cooperation." NOELINE KAPEEN, CEO, YA EGL LOCAL ABORIGINAL LAND COUNCIL

Innovation, sustainability and scalability

We want every student in Australia to have the chance to unlock their potential and become our leaders of tomorrow.

NISEP has a strong history of collaboration. From its small beginnings with the Yaegl community, NISEP has developed into an innovative, sustainable and scalable model of engagement with proven benefits for Indigenous youth and their communities.

We have actively been adapting the program into a social franchise model so as to enable more universities, schools and communities to help us benefit more Indigenous youth across the nation.

We are now seeking new university partners that share our values and are looking to create opportunities for Indigenous youth.

Follow us at:

www.nisep.org.au

<https://www.facebook.com/NISEP.MQ/>

www.youtube.com/user/NISEPmq



"The Macquarie NISEP team have developed a framework of activities that can be adapted by universities and other higher education institutes and can also be scaled to local events and state wide initiatives."

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TONY PEAKE, GOVERNMENT SECTOR LEADER & STEM LEADER, PWC

Becoming a NISEP University Partner



We are looking to greatly expand our reach and impact through new university partners. In order to do this, we will need to request some funding assistance from your university, but will provide a suite of resources and services which represent a high return for a small investment.

Making connections within your university

We are happy to assist you in identifying and speaking with university groups/individuals who will help the successful implementation of NISEP at your university. We recommend speaking with STEM, outreach, Indigenous and widening participation departments/units within your university to look at how NISEP can be embedded and supported within your university's setting. NISEP's impact is supported through the involvement of university student and academic volunteers, who act as role models for the secondary students. We can explore avenues for the recruitment of such volunteers through your STEM and Education based departments.

Roll out of NISEP by your university

The first NISEP events you implement will be School Science Shows with schools of your choosing. The only restrictions we place on school selection are that they are of low socioeconomic status (ICSEA score < 1000) and have a reasonable Indigenous student cohort (> 5%). You can use the My School website (www.myschool.edu.au) to find out this information. On successfully implementing School Science Shows with new partner schools we can explore how your secondary student leaders can be involved at university and community based events.

What we will provide your university

On becoming a NISEP partner, the assistance we will provide you will include:

- Face to face training
- Resources - e.g. demonstrator handbook, risk assessments and safety documents, frameworks for events
- Assistance and advice on connecting with schools, communities and collaborators
- Collection and collation of evaluative data for impact assessment and potential research publications
- Connections with our network of STEM collaborators
- Ongoing support from NISEP team

Your contribution to NISEP and what it will cover

To become a NISEP partner university we request monetary contributions of:

- \$10,000 in the initial year
- \$5,000-15,000 each ongoing year (negotiable, dependent on our involvement in supporting your new events and costs associated with new Experiment Kits)

You may also like to budget for salary costs to go towards staff at your university to help run/manage your NISEP events.

In the first year the \$10,000 contribution will cover:

- One Experiment Set - includes 10 science demonstrations (Elephant's Toothpaste, Bean Race, Disappearing and Reappearing Messages, Slime, Smelling Genius, Fingerprinting, Traffic Lights, Milk Magic, Dry Ice, and Cornflour Slime) - \$2,600/set
- Travel costs for NISEP team representative to provide training and attend school shows
- Some salary components to assist us in, for example, time taken to set up your experiment kits and provide administration support

For further information please contact:

NISEP Co-Director Associate Professor Joanne Jamie - joanne.jamie@mq.edu.au

NISEP Program Manager Dr Emma Barnes - emma.barnes@mq.edu.au



HIGHER EDUCATION PARTICIPATION AND PARTNERSHIPS PROGRAM: NATIONAL FORUM ON INDIGENOUS PATHWAYS & TRANSITIONS INTO HIGHER EDUCATION

22-23 October: Darwin, Northern Territory

FORUM THEME:

Engagement at the interface: Indigenous pathways and transitions into Higher Education

Oral Presentation

NISEP in Yaegl Country – Reflecting on the Power of Respectful Partnerships for Enhanced Indigenous Education Outcomes

Authors: J. Jamie, I. Jamie, S. Singh, S. Vemulpad, J. Hunter

In 2004, Yaegl Aboriginal Elders of northern NSW asked Macquarie University scientists engaged in bush medicine research with them to help motivate their youth to complete high school and consider further education. This led, as a best ethical response, to the National Indigenous Science Education Program (NISEP), directed by the Macquarie University scientists, with Yaegl Elders as core partners.

Using science as a tool for engagement, NISEP aims to motivate secondary students, especially Indigenous youth, to reach their academic potential through completion of their high school education, and to promote tertiary studies as a viable post-secondary education pathway. Key aspects of NISEP include working inclusively with local schools and Aboriginal communities; Indigenous youth demonstrating science to peers, parents/carers, Elders and the wider public; having on-going close associations with university staff and students, highlighting the value and access of higher education; and providing role models (both Indigenous and non-Indigenous, secondary and tertiary).

From its inception, NISEP has embraced a community-inclusive approach in a respectful manner. This is especially true in Yaegl country, where Yaegl Elders and Maclean High School staff have played an essential role in the design of NISEP activities that place Indigenous youth in leadership roles, celebrate their achievements and broaden the understanding and acceptance in the community of Indigenous culture.

Formal evaluations, focus groups and other quantitative and qualitative indicators show that NISEP within Yaegl country has contributed to raised student aspirations, confidence and educational outcomes at Maclean High School within both Indigenous youth and the greater school cohort. There have been significant increases in retention of Indigenous youth to completion of year 12; they have engaged in more leadership roles including as school captains; and are aspiring to higher education in increasing numbers. NISEP has also successfully engaged both parents and the wider Indigenous community, which in turn has enhanced their understanding of higher education offerings and pathways, and strengthened their capacity to support students to achieve their potential. Evaluations in 2014 of parents of Maclean High School students that had demonstrated NISEP activities indicated that 14 out of 15 parents surveyed had become more involved in their child's education as a result of NISEP. Further, better knowledge of the benefits associated with higher education and options available for their child was reported by 24 out of 25 parents/carers surveyed.

This reflective presentation will showcase Indigenous education achievements that have arisen from the respectful relationships of over a decade between Macquarie NISEP, Yaegl Aboriginal Elders and Maclean High School. It will include case studies of Yaegl Indigenous youth to showcase the impact of NISEP and the importance of community relationships in these outcomes.



HIGHER EDUCATION PARTICIPATION AND PARTNERSHIPS PROGRAM: NATIONAL FORUM ON INDIGENOUS PATHWAYS & TRANSITIONS INTO HIGHER EDUCATION

22-23 October: Darwin, Northern Territory

FORUM THEME:

Engagement at the interface: Indigenous pathways and transitions into Higher Education

“Can you help us help our youth?”

Increasing Aspirations and Participation in Higher Education Through the National Indigenous Science Education Program (NISEP)

Authors: J. Jamie, I. Jamie, S. Singh, S. Vemulpad, B. Wade-Leeuwen

“Can you help us help our youth?” This simple request from Aboriginal Elders of northern NSW to Macquarie University scientists in 2004 led to the establishment of the National Indigenous Science Education Program (NISEP). This community-inclusive university-facilitated program consists of a consortium of Aboriginal communities, Australian universities, science and Indigenous outreach organisations and high schools in metropolitan and rural low socio-economic regions. The overall objective of NISEP is the enhancement of educational outcomes within community, especially of Indigenous youth, using science engagement to provide them with the confidence, motivation and leadership skills needed to complete their secondary studies while providing pathways into higher education. Core NISEP activities include Indigenous secondary students, working alongside University students and staff, demonstrating relatable Western and Indigenous science activities to their peers, Aboriginal Elders, parents/carers and the public.

Despite an overall expansion of the Australian higher education sector during the last decade, and greater access to further education among some historically under-represented groups, Indigenous students continue to be under-privileged in Australian tertiary institutions (Gale & Parker, 2015). In 2009, in response to the Bradley Review (2008) findings, the Federal Government released Transforming Australia’s Higher Education System, which set a new agenda to enable wider and more equitable participation in higher education. A key aspect of fulfilling this mandate, and increasing completions of Year 12 or equivalent, especially for Indigenous students, was one of the related reform goals in the report. NISEP, supported through the Higher Education Participation and Partnerships Programme (HEPPP), provides an important avenue in addressing these goals.

A multi-method longitudinal study involving surveys, focus groups and interviews with students, parents/carers, teachers, Aboriginal Education Assistants (AEA’s) and Aboriginal Elders has been conducted to evaluate NISEP’s impact, especially of its core engagement activities on the secondary student demonstrators. Anonymous post-activity evaluations of student demonstrators (typically years 8-11) showed that 73% (n=505) desired to continue with senior schooling and held optimistic aspirations for higher education. This was supported by teacher and AEA evaluations (n=178) 1-2 months post-activity noting a 33% increase in interest of the student demonstrators in higher education. These evaluations also identified positive learning and engagement changes in the student demonstrators including a 68% increase in concentration; completion of work up by 69%; and motivation, willingness to work with others and enthusiasm for learning up by 78%, 79% and 81%, respectively. Teachers, AEAs and local community members also acknowledged NISEP’s impact more broadly through increased classroom engagement and higher educational aspirations of student cohorts across the NISEP partner schools.

This presentation details NISEP's main modes of engagement and highlights the quantitative and qualitative findings in NISEP's secondary and higher education aspirational outcomes.

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The role of natural products chemistry in the capability strengthening of Indigenous communities

EC Barnes, P Yin, K Akter, I Jamie, CE Yaegl, SR Vemulpad, JF Jamie

The Indigenous Bioresources Research Group (IBRG) and National Indigenous Science Education Program (NISEP) utilise natural products chemistry to achieve outcomes beyond fundamental chemistry research. In 2004, a partnership was established between the Yaegl Indigenous community, northern New South Wales, Australia, and Macquarie University researchers on the preservation, analysis and development of traditional plant knowledge to improve health and economic outcomes within this community.

Comprehensive interviews led to the documentation of 90 medicinal plants [1]. Extracts and natural products isolated from plants used in the treatment of skin infections and wounds, areas with high national and global disease burdens, were then assessed for their antimicrobial and antioxidant activities [2, 3]. A number of bioactive natural products have been isolated and the formulation of plant extracts into healthcare products (e.g. antiseptic soaps and creams) is ongoing. This successful workflow has also been used in a partnership with an Indigenous community in Nagaland, North East India [4].

During scientific discussions, Yaegl Elders also asked scientists the question, "Can you help us help our youth?" The Elders were concerned by the alarmingly low numbers of Indigenous youth completing secondary school and wanted novel ways to motivate them. This led to the establishment of NISEP, which uses science as an engagement tool to provide Indigenous youth with the skills and support to succeed in their secondary education and pathways to tertiary education. The students act as leaders of fun science-based activities which are presented to other students, parents/carers and the wider public.

The IBRG and NISEP provide a framework for culturally competent research leading to the improvement of socio-economic outcomes for Indigenous peoples. Natural products chemistry is at the core of both these programs, demonstrating how it can be used to achieve multiple outcomes.

Keywords: Traditional medicine, ethnopharmacology, bioactive, antimicrobial, science outreach.

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- [4] Kichu M, Malewska T, Akter K, Imchen I, Harrington D, Kohen J, Vemulpad SR, Jamie JF. An ethnobotanical study of medicinal plants of Chungtia village, Nagaland, India. *J Ethnopharmacol* 2015; 166: 5 – 17

NISEP – ENHANCING EDUCATIONAL OUTCOMES FOR INDIGENOUS YOUTH

Jamie, J¹, Yaegl Community Elders², Barnes, E¹, Prenzler³, P, Bedgood, D³,
Jamie, I¹, Vemulpad, S¹

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University, Wagga Wagga, NSW, Australia*

“Can you help us help our youth?” This request from Aboriginal Elders of northern New South Wales, Australia, led to the formation of the National Indigenous Science Education Program (NISEP). NISEP uses science to place Indigenous youth in leadership positions so they gain the confidence, motivation and skills to engage with their schooling and consider pathways to higher education. The program targets secondary students from low socioeconomic and rural/regional areas. It is a unique collective of Aboriginal Elders, science academics and high school staff, committed to helping the educational attainment of Indigenous youth in a meaningful way. Our model of engagement involves secondary student leaders demonstrating predominantly chemistry activities to junior students, their peers, family and the general public at our in-school, community and university based events. We currently incorporate 15 high schools and 3 universities. Key aspects of NISEP’s success include our commitment to the long-term mentoring of our students, the provision of university academics and students as role models, and our best ethical approach of working inclusively with schools and Indigenous communities. After participating in a NISEP event, 82% (n=690) of students have expressed an increased interest in science and 72% (n=537) an increased desire to complete school and go onto tertiary education. They have also consistently reported that NISEP has provided them with increased confidence and educational aspirations. This presentation will describe our achievements and highlight key research outcomes arising from intensive interviews and focus groups we have undertaken with our NISEP student leaders and school staff.

THE CAPABILITY STRENGTHENING OF INDIGENOUS COMMUNITIES THROUGH NATURAL PRODUCTS CHEMISTRY

Barnes, E^{1,2}, Yaegl Community Elders³, Akter, N¹, Yin, P¹, Akter, K¹, Malewska, T¹,
Kichu, M¹, Islam, M⁴, Ranganathan, S⁴, Jamie, I², Vemulpad, S^{1,2}, Jamie, J^{1,2}

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²*National Indigenous Science Education Program, Department of Chemistry and Biomolecular Sciences, Faculty of Science and Engineering, Macquarie University, Sydney, NSW, Australia*

³*Yaegl Local Aboriginal Land Council, Maclean, NSW, Australia*

⁴*Department of Chemistry and Biomolecular Sciences, Faculty of Science and Engineering, Macquarie University, Sydney, NSW, Australia*

In 2004, a partnership was established between the Yaegl Aboriginal community, northern New South Wales, Australia, and the Indigenous Bioresources Research Group on the preservation and development of their customary (traditional and contemporary) plant knowledge so as to improve health and economic outcomes within their community. Comprehensive interviews led to the ethnobotanical documentation of 52 Yaegl foods and medicinal plants. Plant extracts customarily used in the treatment of skin infections and wounds were assessed for their antimicrobial and antioxidant activities, and a number of bioactive natural products have been isolated. Working collaboratively with the Yaegl people has additionally led to community capability strengthening outcomes beyond our initial expectations. For example, in collaboration with Yaegl Elders and bioinformaticians, the web-based Customary Knowledgebase has been built to store both public access and community secure data on customary medicines and foods. Projects have resulted in co-authored scientific publications with the Yaegl community and a medicinal handbook that is used as an education resource. The Yaegl partnership has also led to the highly successful National Indigenous Science Education Program and the cultural immersion program, River of Learning. Similar outputs have been achieved in an international partnership with a tribe in Nagaland, North East India. Overall a culturally competent and reproducible research framework for working with Indigenous peoples to improve socio-economic outcomes has been built. This presentation will showcase our work and how natural products projects can be used to provide diverse community capability strengthening outcomes.