

# Enhancing Aspirations for STEM Careers in Rural, Regional and Remote Communities

10 November 2016 to 31 May 2018

Dr Philip Roberts

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Modifications: Changed to meet WCAG 2.0 accessibility requirements.  
Alternate text inserted for all images. Minor typographical errors corrected.

# Higher Education Participation and Partnerships Programme (HEPPP)

## 2016 National Priorities Pool FINAL REPORT

Enhancing Aspirations for STEM Careers in Rural, Regional and Remote Communities

10 November 2016 to 31 May 2017

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In accordance with the Conditions of Grant, you must submit to the Department a Final Report (Clause 6.1 of Part A) and an Acquittal Report (clause 6.4 of Part A).

To meet this obligation, please submit:

- the completed **Final Report** template, in Word and PDF
- the completed and signed **Declaration** form, in PDF
- the completed **Acquittal Report** template, in Excel and PDF.

All documents must be submitted to **equity@education.gov.au**.

If you require additional guidance or clarification, please contact us at **equity@education.gov.au**.

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# 1. PROJECT SUMMARY (Conditions of Grant, clause 2.2 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
To increase the knowledge base in relation to STEM in rural careers and rural innovation.	<p>This objective was met.</p> <p>The project gained insights from rural industries about the relationship of STEM subjects as understood by peak industry bodies and local industry bodies. This is being reported in a paper under review, has been shared with the universities outreach team, and linked into the curriculum.</p>
To understand how rural students' aspirations for rural STEM careers influences senior subject selection (which in turn influences university entry).	<p>This objective was largely met.</p> <p>In particular, the focus groups with students uncovered insights into how students understand subjects and make decisions in relation to these subjects. This is being reported in a paper under review, has been shared with the universities outreach team, and linked into the curriculum. Survey data showing this was poor due to the problems of conducting this research in schools (outlined below).</p>
To provide insights for universities to embed relevant curriculum links to rural STEM careers & Innovation to increase the relevance of university study.	<p>This was partially met.</p> <p>While the findings have been shared with the universities outreach team, and linked into the curriculum in the Education Faculty, some structural changes limited this objective. Firstly the combined Science, Technology, Mathematics and Education faculty was split into Education and Science &amp; technology. Avenues are being explored to share this with the new faculty. The work was presented at an education faculty seminar.</p> <p>More significantly the structure of outreach programs, and funding arrangements, changed during this period. Rather than engage in schools a teacher professional learning model was adopted – this research has been presented to teachers at these professional learning workshops.</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
Oct 2016 – Nov 2016	Establish Project Team & link partner organisations. Scoping literature review. Survey design.	Completed on time.	Partnerships developed. Scoping literature review completed. Survey designed.	Partner organisations provided insights that informed survey and established relationships to complete survey & focus groups. Scoping Literature review informed survey design. Relationships established. Survey was produced. Focus group questions produced.
Oct 2016 – Dec 2016	Submission of university & state ethics applications.	Completed on time.	Applications submitted.	Email confirmations of receipt.
Oct 2016 – Jan 2017	Full literature review	Completed on time.	Review completed.	Academic paper drawing on literature review submitted. This was accepted with revisions, which are being considered by the publisher. The main outcomes here are: <ol style="list-style-type: none"> <li>1. The literature regarding rural students careers aspirations is framed in relation to university pathways and not linked to rural industries.</li> <li>2. There is no significant body of work regarding schools subjects as linked to rural industry careers.</li> <li>3. Aspirations tend to be framed in terms of higher education only. Students that don't aspire to university seemingly have no aspirations.</li> <li>4. The literature implicitly links aspirations with leaving communities.</li> <li>5. Rural industries are concerned about new technologies, but</li> </ol>

TIME FRAME	PLANNED ACTIVITIES AND MILESTONES	PROJECT ACTIVITIES AND MILESTONES COMPLETED	IDENTIFIED KEY PERFORMANCE INDICATORS	KEY PERFORMANCE INDICATORS OUTCOME
				these are not represented in the education literature.
Dec 2016	Survey Pilot	Completed on time.	Survey piloted by partners & focus group drawing on the survey completed.	Survey revised and ready for roll out.
Jan 2017 – Mar 2017	Student Survey	Delayed due to state ethics processes problems. Completed October 2017. Did not reach threshold for significant results in all areas as per project plan.	Target was N=400 responses. A reasonable, yet not significant, Response was achieved in NSW & Qld following focus group sessions.	Each state has different ethics policies and procedures, which require different consent procedures and different data use protocols. Additionally Catholic and Independent schools in each state have separate procedures above this. Two states demanded changes to questions and processes. It took on average 2.5 months for states with no concerns to process and grant approval. In the extreme case it took 8 months with multiple negotiations. In two instances the required changes made the processes onerous for participants, and changed the validity across states. Ultimately 76 student surveys were received and 36 family/community survey responses were received.
Jan 2017 – Mar 2017	Industry Survey	Completed on time.	Survey completed by more than target number.	65 industry responses were received. The main outcomes here are: <ol style="list-style-type: none"> <li>1. Industry groups regard STEM subjects as very important for future industry development.</li> <li>2. Industry groups do not know the language of school subjects.</li> <li>3. Industry groups regard integrated technology skills, and '21st century' skills as more useful than traditional subjects.</li> </ol>
Apr 2017	Focus group arrangements.	Completed on time for Peak Industry focus groups. Student Focus groups delayed until September – December 2017 due to state ethics issues & the need for survey completion first). Local Industry focus groups similarly delayed (travelling to sites once provided greater efficiencies)	Undertake focus groups	Focus groups were conducted. See outcomes below.

TIME FRAME	PLANNED ACTIVITIES AND MILESTONES	PROJECT ACTIVITIES AND MILESTONES COMPLETED	IDENTIFIED KEY PERFORMANCE INDICATORS	KEY PERFORMANCE INDICATORS OUTCOME
May 2017 – Jun 2017	Undertake focus groups, Inc. participation verification.	Completed on time for Peak Industry focus groups. Student Focus groups delayed until September – December 2017 due to state ethics issues & the need for survey completion first). Local Industry focus groups similarly delayed (travelling to sites once provided greater efficiencies).  Participant verification completed.	Peak Industry focus groups completed on time with 24 participants.  Student & local industry focus groups completed with 6 locations in NSW, 2 in Qld, 2 in Victoria, 2 in South Australia, 2 in Western Australia and 1 in the Northern Territory. This was less than planned due to the ethics delay and need to do these before the end of the school year.  336 students participated in the focus groups. This exceeded expectation.	The participation in focus groups exceeded expectations and more than makes up for the shortfall in the survey.  See below for outcomes.
Nov 2017	Survey Data report	Industry survey analysis completed on time Student survey analysis completed February 2018 - due to ethics delay.	Industry survey completed by above the target number  Student survey mainly completed in NSW & Qld	The participation in focus groups exceeded expectations and more than makes up for the shortfall in the survey.  Peak Industry Outcomes: <ol style="list-style-type: none"> <li>1. Technology is central to the industries future.</li> <li>2. Schools 'should' be focusing on integrated technology skills not subjects of yesterday.</li> <li>3. Not enough students have an interest in the agriculture sector (broadly defined)</li> </ol> Student Outcomes: <ol style="list-style-type: none"> <li>1. Student career decisions are more influenced by family and friends than teachers.</li> <li>2. Students have very limited knowledge of local industries.</li> <li>3. Students have very limited knowledge of the relationship between school subjects and careers in the broadly defined Agriculture sector.</li> <li>4. Students interested in university are choosing 'high level' subjects, whereas those not interested in university are now studying 'high level' subjects.</li> </ol>

TIME FRAME	PLANNED ACTIVITIES AND MILESTONES	PROJECT ACTIVITIES AND MILESTONES COMPLETED	IDENTIFIED KEY PERFORMANCE INDICATORS	KEY PERFORMANCE INDICATORS OUTCOME
Dec 2017 – Feb 2018*	Analysis of focus group data & focus group report.	Completed as per revised schedule.	Data analysed manually by research team.	<p>Peak Industry Outcomes:</p> <ol style="list-style-type: none"> <li>1. Technology in the agriculture industry chain is the key to future development, and</li> <li>2. There is a lack of skills &amp; training re technology for the sectors and its future.</li> <li>3. Industry growth is being limited by lack of technology knowledge.</li> <li>4. Industry doesn't know or understand school subject links.</li> </ol> <p>Student Outcomes:</p> <ol style="list-style-type: none"> <li>1. Students that were considering university had chosen a subject pathway.</li> <li>2. Students not considering university intended to work in less skilled local jobs.</li> <li>3. Students not considering university did not see the relevance of specific subjects to local industry and careers.</li> <li>4. Students that were considering university did not have a clear understanding of the broadly defined agricultural sector links of their subjects.</li> </ol> <p>Local Industry outcomes:</p> <ol style="list-style-type: none"> <li>1. Local industry is more focussed on the community, and community integration, than technology.</li> <li>2. Local industry has more immediate, and less skilled, workforce concerns than peak industry.</li> </ol>
Feb – May 2018	Share findings & implement recommendation in university outreach.	<p>Dissemination – achieved through conferences and papers have been submitted.</p> <p>Implement into outreach – changed due to faculty split and changed structure</p>	<p>Publications in development.</p> <p>Insights shared.</p> <p>Insights shared and integrated into the outreach strategy.</p>	<p>Publication:</p> <ul style="list-style-type: none"> <li>• 1 journal publication has been revised following initial review -re the literature review.</li> <li>• 1 journal publication is under review – re industry data &amp; focus groups.</li> <li>• 1 journal publication is in preparation - re student focus groups.</li> </ul>

TIME FRAME	PLANNED ACTIVITIES AND MILESTONES	PROJECT ACTIVITIES AND MILESTONES COMPLETED	IDENTIFIED KEY PERFORMANCE INDICATORS	KEY PERFORMANCE INDICATORS OUTCOME
		of the outreach approach. Though, the work has been presented in the new structure and delivered to teachers via outreach professional learning sessions.		Outreach. The nature of this outcome changed due to administrative changes at the institution. However the findings have still been shared with the Outreach team. They have been shared at Professional learning sessions for teachers run by the outreach team.

*\* NB revised timeline approved 8/12/2017 to accommodate ethics delays and researcher illness. Revision to see project completed 31 May 2018.*

## Highlights and Issues

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

- This project identified what we are calling a ‘language gap’ regarding school subjects.
  - We identified that there is a common language regarding school subjects between teachers and students who are intending to pursue university education – however this language does not refer to the rural industry production chain. Instead, the shared language is in relation to subjects as discussed in university terms and abstract applications. These students also engage positively with the necessity of leaving.
  - Students who are not intending to pursue university education, and who generally intend to work and live locally, do not have a language to discuss their possible careers with their teachers, generally speaking. Teachers did not have knowledge of the rural industry production chain and jobs – and consequently were not able to make the connections regarding their subjects for students intending these career pathways. Teachers did however have knowledge of less skilled service sector work. Here we hypothesise that this ‘language gap’ may be encouraging students to ‘opt out’ of tertiary study at an early age. The study could not prove a causal relationship – this however should be the focus of future research.
  - Peak industry bodies were solely focussed on ‘AgTech’ as the future of the sectors production chains. These peak bodies were not clear on what school subjects links were beyond an abstract sense of ‘STEM’, but were more focussed on application and integration of technology skills.
  - Local industry groups were more concerned with general workforce demands than big visions ‘AgTech’ futures. They were not clear on school subject links.
- Consequently, this project showed that the education sector, and the agriculture industry production chains, needs to develop a language pertaining to the relevance

of schools subjects for the future agricultural workforce (broadly defined). At present, the lack of knowledge of the sector by many teachers is limiting their ability to show students the relevance of subjects like advanced mathematics, physics and chemistry for these careers. This is a concern given the high-tech nature of modern agriculture and its strong global technology links.

- Not studying these subjects often precludes students from university entry, or high enough entry ratings.
- University outreach has a key role here in drawing the links between subjects needed for university entry, and the application of university study to living and working in the rural sector. This needs to begin early in students secondary education.

*Did the project lead to implementable outcomes? What changes will result at your institution/nationally? How is research being translated into practice? Are there activities resulting from this project that will be continued?*

- From this project we have worked closing with our widening participation team to share the insights gained. Project members have spoken with teachers at Professional Development organised by the widening participation team. Together we are working on ongoing work to address this identified gap through outreach programs.
- Arising from this project we are working with a number of schools in our vicinity to explore school-community-industry links in the curriculum.
- Further research is being scoped arising from this project.

Did you undertake an evaluation of your project?

Yes  No

*Please summarise the findings and attach the evaluation report.*

An evaluation was not part of the project proposal.

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

<b>Student contacts</b>	Focus Groups: 336 Survey: 76
<b>Journal (or other publication) submissions</b>	3
<b>Conference Presentations</b>	2
<b>Websites developed</b>	N/A
<b>Educational or marketing campaigns</b>	N/A
<b>Community organisations engaged</b>	Focus Groups: 32 Survey: 65
<b>Schools engaged</b>	14
<b>Parental/family contacts</b>	Survey: 36

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

N/A as this project was under the 'building the knowledge base' component.

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

## 2. OTHER PROJECT MATERIAL (Conditions of Grant, clause 2.2 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
Conference presentation	Roberts	29 September 2017	Society for the Provision of Education in Rural Australia conference.
Conference presentation	Roberts	6 December 2017	Australian Association for Research in Education conference.
Journal publication (revised following initial review) – re the literature review.	Bottrell & Roberts (Bottrell was the project research assistant)	TBC Revision submitted April 2018	Rural Society
Journal publication (under review) – re industry data & focus groups	Roberts & Bottrell	TBC Submitted May 2018	Agriculture & Human Values
Journal publication is in preparation – re student focus groups.	Roberts & Bottrell	TBC intended submission October 2018	Australian Journal of Education