

Bridging the Gap: Connecting Science Education with the Real World an Overview

An innovation in preservice teacher industry engagement to increase student interest in STEM



Flinders University 2016

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An Innovation : STEM Industry Engagement

Bridging the Gap Project

What is an innovation in an educational context?

The process of assembling and maintaining a novel alignment of ideas, practices and actors to respond to site-specific issues and/or to **pursue a vision**

Tytler, Syminton, Smith & Rodrigues (2008)

What is the vision?

To investigate the potential to increase secondary school student interest in STEM by forging connections between university teacher education, schools and business & industry by engaging pre-service science teachers in short term STEM industry placement

→ In essence to facilitate a shift in mind set whereby Australian students view themselves not merely as passive recipients of STEM but as active creators and entrepreneurs of it



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Australia's chief scientist Ian Chubb (2015)

“Entrepreneurship is an economic activity requiring attention to the framework conditions for business creation and growth. But more importantly it is a **human endeavour**, requiring **attention to the way** that our **attitudes are shaped**, our skills developed, our networks formed. And so it is **inseparable from education** – not independent of it”.

foreword to *Boosting High-impact entrepreneurship in Australia*,



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Back ground : Industry & Government drivers → education

- ❖ Rapidly changing industry base, jobs at risk due to automatization and computerisation – particularly South Australia but also nationally and internationally
- ❖ led to a national advocacy for STEM - perceived as a field that actively practices problem solving and inquiry (AIGroup, Office of chief scientist)
→ need for innovation and creativity to solve authentic problems

Approached by Department of State Development (DSD)

- ❖ Consider ways to positively impact students' perceptions of STEM as a creative enterprise thus increasing the likelihood that they will pursue STEM careers
→ consider partnerships with business and industry in learning and teaching impacting future teachers of STEM ie Flinders preservice teachers



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Three Overarching Aims

To develop preservice teacher's

- ❖ understanding of the connections between theoretical science knowledge and its application in society through immersion in authentic experiential learning in an industry placement.
- ❖ capacity to innovate new approaches to learning and teaching in secondary schools, associated with creative problem solving, a spirit of enterprise and contemporary science in meaningful contexts.

Finally

- ❖ To positively impact secondary school students' perceptions of STEM as a creative enterprise thus increasing the likelihood that they will pursue STEM careers.



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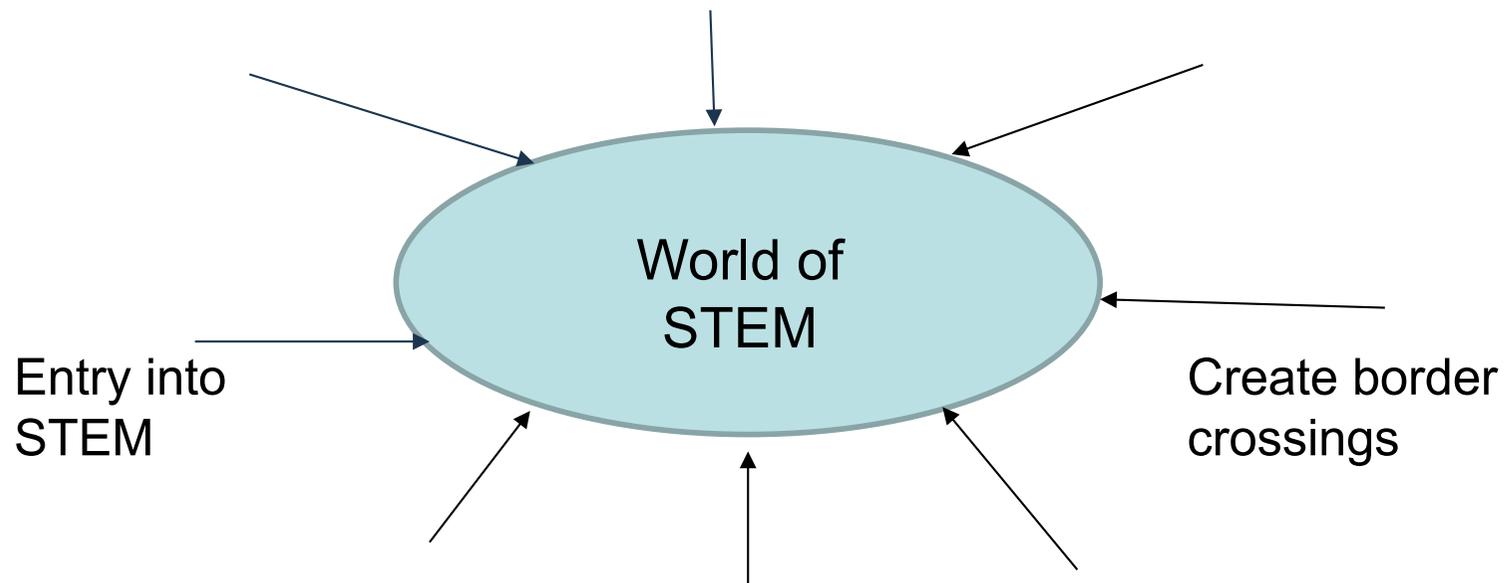
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Approach: Overarching Research Question

“What is the relationship between pre-service teacher industry engagement, entrepreneurial and creative thinking and student engagement and entry into STEM?”

→ involves collection of qualitative and quantitative data



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Project Objectives

- ❖ Equip a cohort of future STEM teachers with the skills and confidence to build effective and sustainable partnerships with industry, congruent with a spirit of enterprise.
- ❖ Strengthen these teachers' ability to interpret and translate how STEM is utilised in the work place into inspiring and stimulating contexts for students.
- ❖ Enhance these pre-service teachers' capacity to innovate and create new curricula and resources for the learning and teaching of secondary science that is congruent with creative problem solving and contemporary science.

→ **Enable a shift in secondary school students' mindset regarding the relevance of STEM in society.**



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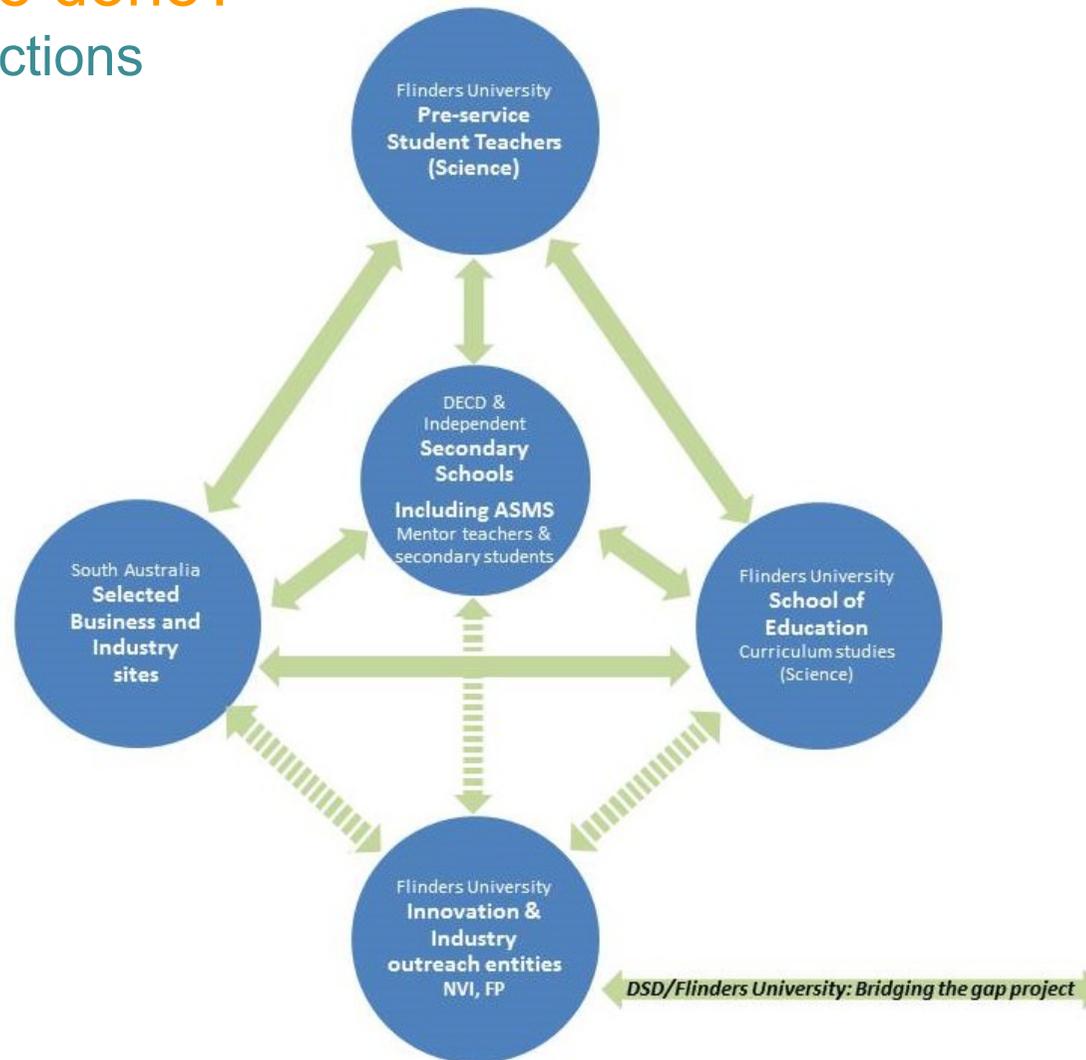


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Connecting communities of practice

How will this be done?

→ Forging connections



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Connecting communities of practice

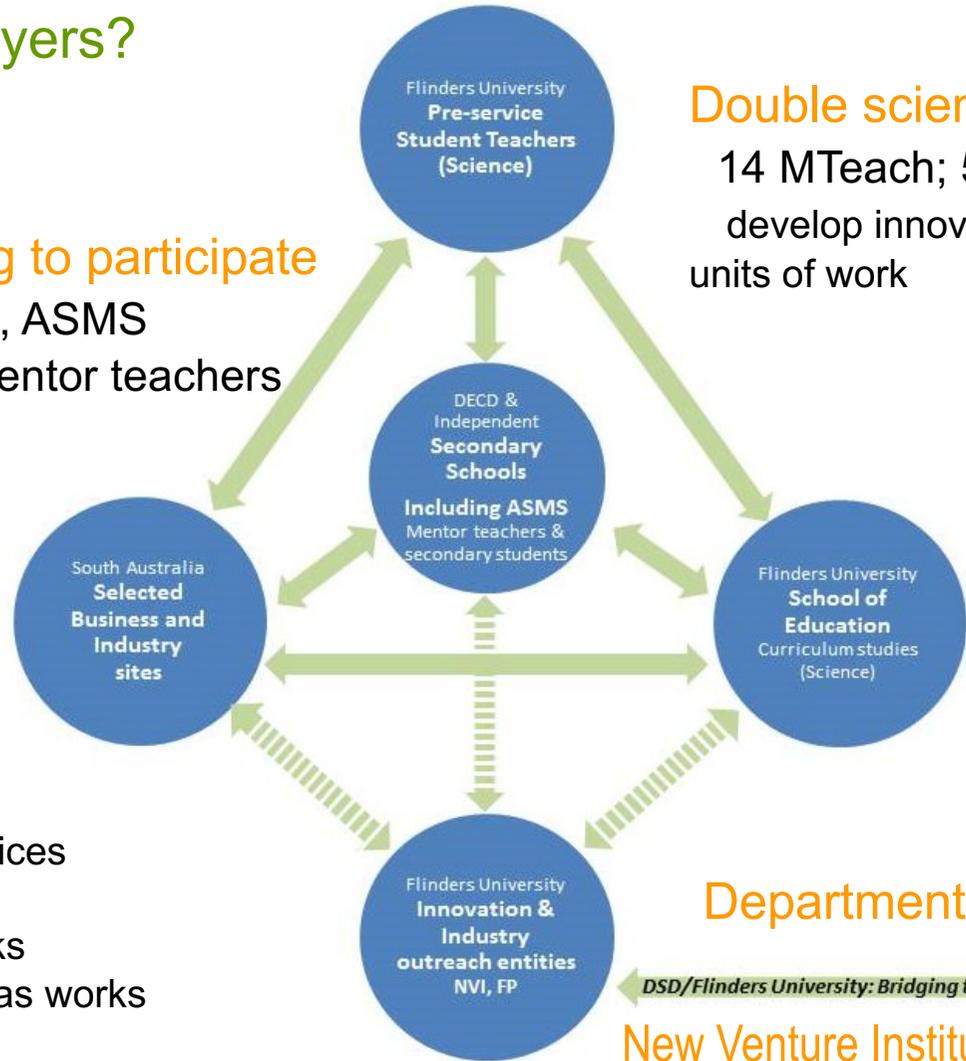
Who are the Players?

Schools seeking to participate

DECD personnel, ASMS
Conference for mentor teachers

Industries: 9

Redarc
Arium Mining
BAE Systems
Basil Hetzel
Beach Energy
Dept Human Services
SAGE Automation
SA Power networks
APA Australian Gas works



Double science majors :19

14 MTeach; 5 BEd BSc
develop innovative resources & PBL
units of work

Curriculum studies

A1 & B1
Science as human endeavour
Creative problem solving
Design Thinking

Department of State development

New Venture Institute
Flinders Partners

Facilitate approaching
industry



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Project Plan

❖ Stages

Stage 1: Creating a Web based Platform & Resources

- digital space that captures current best practice
- space where project participants business and industry can interact

Stage 2: Industry Engagement and ongoing Communication between Communities of Practice

- student teachers placed with industry partners 3 weeks@ 4 hrs per week
- develop units of work based on industry experience

Stage 3: Placement of Preservice Teachers in STEM Industry Focused Schools

- Students undergo final practicum in industry partnership school



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Connecting Communities of practice: Stage 2

Phases of Preservice Teacher Engagement

Identify

Visit 1 1st week in October
4 hours at the industry site

The student teacher will **identify** where and how science, technology, engineering and maths is being used in your industry; and with your help, an issue/problem related to STEM in your industry.

Translate

Analysis of Visit 1
between industry visits

The student teacher will **translate** the STEM problem into scientific approaches towards a possible solution; with help from a suitable **research scientist**, facilitated by **Flinders Partners**.

Communicate

Visit 2 3rd week in October
4 hours at the industry site

The student teacher will **communicate** possible ways of approaching a solution to the industry problem, accompanied by a suitable **research scientist**, facilitated by **Flinders Partners**.

Student teachers will incorporate their industry experiential learning in their teaching placement at a high school in May 2017



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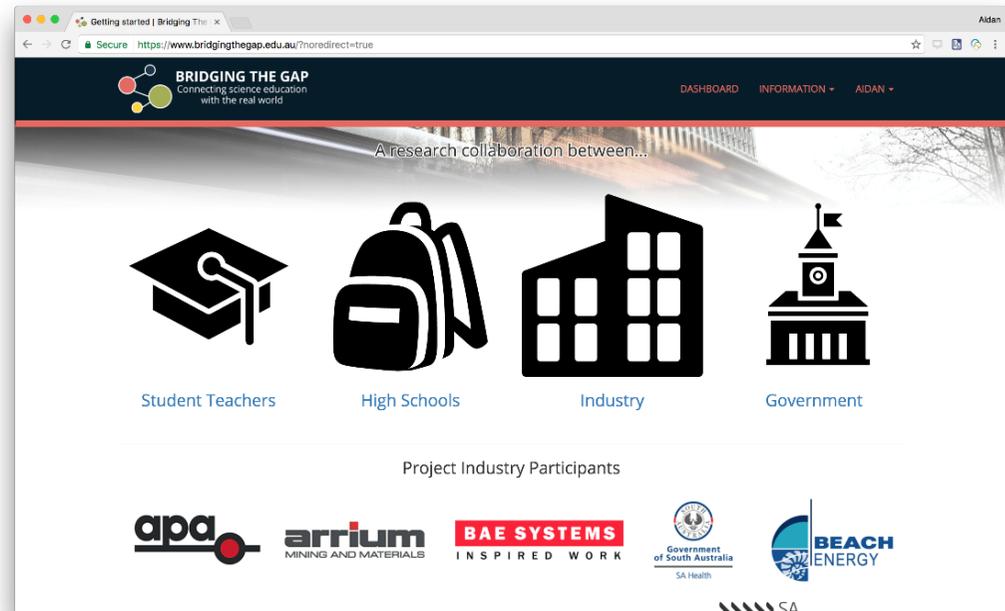
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Project Plan: Connecting Communities of Practice

❖ Stages

Stage 1 : Creating a Web based Platform & Resources

- digital space that captures current best practice
- space where project participants business and industry can interact
- Student Access
- Industry Access
- ‘Automated’ Research
- Project Updates
- Analytics & Tracking
- Student Tracking
- Complete Communication
- Document Management
- Strong Branding



Aidan Cornelius Bell: [bridgingthegap.edu.au](https://www.bridgingthegap.edu.au)

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Project Plan

❖ Stages

Stage 2: Industry Engagement and ongoing Communication between Communities of Practice

- student teachers placed with industry partners 3 weeks@ 4 hrs per week
- develop units of work based on industry experience and grounded in science as a human endeavour



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Project Plan

❖ Stages

Stage 3: Placement of Preservice Teachers in STEM Industry Focused Schools

Students undergo final practicum in STEM industry partnership school

Mentor teachers support student teachers with the management and implementation of their unit of work – or part of their unit of work

Session after morning tea



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Novel Practices used to forge connections

- ❖ Connecting Flinders research scientists through the commercialisation arm of the University (FP, NVI) with pre-service student teachers
- ❖ Encouraging pre-service teachers to hold conversations with various stakeholders eg STEM business personnel and then to blog about their industry visit (making so called real world science front and centre)
- ❖ Inviting guest speakers from business and industry to provide advice about entering industry environment and give training in real world application of scientific inquiry and design thinking.
- ❖ Co-ordinating the assistance of industry outreach entities with the university (eg FP, NVI) to assist student teachers translate identified industry issues into some possible solutions or ways to approach a solution. This includes involving Flinders research scientists



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Strategies used to forge connections

- ❖ Forging ongoing connections between student teacher and research scientist so this relationship will follow them into practicum in 2017 affording the student teacher to create some kind of science event

Creating Border Crossings highlights importance

- ❖ of developing a thorough understanding of the differences arising between different communities of practices - their incentives and motivations in order that effective strategies can be found



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Any Questions?

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