



# **Enhancing Industry Engagement in Engineering Degrees: our recent project and future plans**

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**ACDICT Meeting**  
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# Context, Purpose and Themes

The 2000's Mining & Construction boom highlighted skills shortages (all levels), and led to formation of the National Resources Sector Workforce Strategy Taskforce

They recommended that ACED should improve engagement with industry to increase **retention rates** and **employability** by:

*“providing all 1<sup>st</sup> and 2<sup>nd</sup> year engineering students with an industry mentor”*

***Since this was impractical, ACED negotiated a project (2012-14) funded by the Dept of Industry with 12 engineering faculties, to produce:***

- 1. Guidelines and Resources for (more) effective industry engagement – for ALL students (in EA accredited programs)**
- 2. Trial “Industry-inspired” projects in course units**

## Starting Point – EA Accreditation requirements

- ALL accredited programs have to demonstrate “exposure to engineering practice”
- faculties/schools with accredited programs have to demonstrate advice from industry in program design and development

## Exposure to Engineering Practice (EA advice)

- mandatory exposure to lectures on professional ethics/conduct
- **practical experience in an engineering environment outside the teaching establishment**
- use of staff with industry experience
- use of guest presenters,
- industry visits and inspections,
- an industry-based final year project,
- industry research for feasibility studies,
- study of industry policies, processes, practices and benchmarks,
- interviewing engineering professionals,
- Industry-based investigatory assignments,
- direct industry input of data and advice to problem solving, projects and evaluation tasks,
- electronic links with practising professionals
- case studies

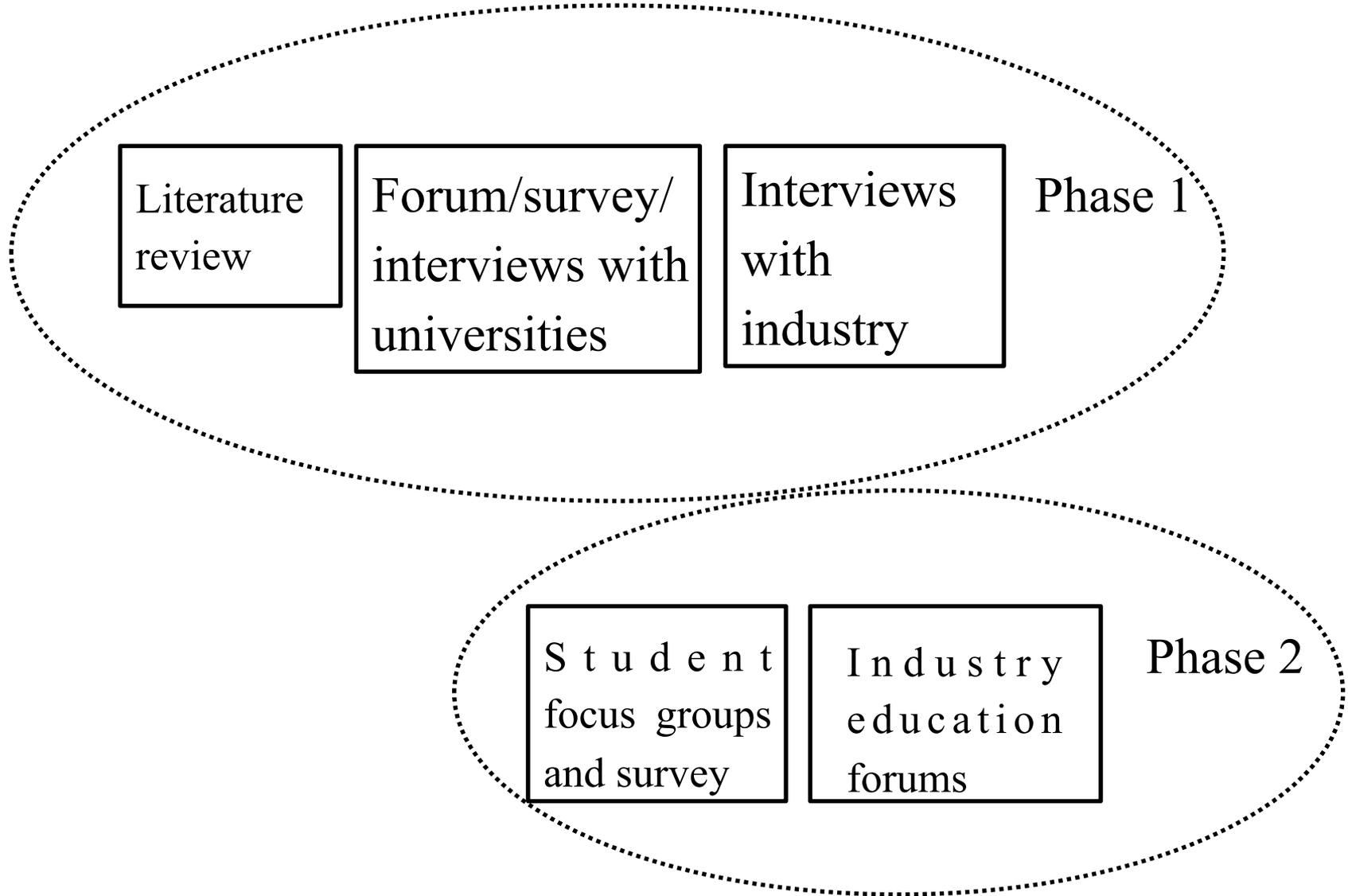
## now ...

- ALL accredited programs have to demonstrate “exposure to engineering practice”
- faculties/schools with accredited programs have to demonstrate advice from industry in program design and development
- most (now ALL) engineering faculties include an industry placement in their accredited program/course regulations (increasingly for credit) – *but hard to source, with uneven experiences, and sub-optimum learning (overall)*

# A Research-based Model, Guidelines and Best Practice Resources

*“improved industry engagement in ALL  
accredited programs for ALL graduates”*

# Research Design for the Model



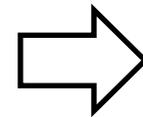
# The Model of Effective Exposure to Practice (supported by literature and stakeholders)



Participation in **socio-technical activities** using **authentic** tools and representations in an inclusive culture in which engineering practice is valued. **Each year is more like real engineering practice.**

The diagram consists of two concentric ovals. The inner oval contains the text about socio-technical activities. The outer oval contains the text about reflective practice. A large arrow points from the right side of the outer oval to the text on the right.

**Reflective practice** is supported by assessments linked to competency standards and including reflection on culture.



Students develop **identities** as student engineers, understanding the relevance of their programs and, prepared for transition to engineers.

# Guidelines - Curriculum Themes

1. Education centred on engineering practice (including research)
2. Curriculum design incorporating students' whole experience
3. Integration of socio-technical dimensions of practice
4. Reflective practice and development of students' identity as engineers

# **Best Practice Resources (on arneia.edu.au)**

**Best Practice Guidelines for Effective Industry Engagement in Australian Engineering Degrees**

**Tool for Reflecting on Effective Industry Engagement in an Engineering Program**

**Benchmark Responses to Tool for Reflecting on Effective Industry Engagement**

## **Employer Resources**

**Student Engineering Induction Guide**

**Vacation Student Buddy Training Presentation**

# Resources – University Exemplars

**AMC Employer Handbook**

**Curtin University Design Project**

**ECU Engagement Handbook**

**QUT Work Integrated Learning Unit**

**QUT Work Integrated Learning Unit background**

**RMIT Student Engineering Experience Guidebook**

**Swinburne IBL Responsibilities**

**UTS Engineering Practice Program Student Guide**

**UWA Career Mentor Link Guide**

# Final Report ... also outlines

- commentaries by 11 university partners on how they are improving their performance in industry engagement
- new collaborative activities by ACED and EA on e-portfolio design
- new activities by EA
  - EA Connect to support placements
  - EoL (engineers on\_line) to demonstrate 'real engineering'

# *industry-inspired projects*

*seven ACED members have worked with industry to “breathe engineering reality” into the curriculum, mostly in large classes and mostly in middle curriculum years*

*\$19,800 allocated to six universities, and \$9,900 to one, for project development (often by casual staff or PhD students), against an approved budget*

*more than 1,000 students and more than 30 companies involved*

# Industry-inspired Projects

University main contact	project/ program situation	companies
AMC/UTas David Harte, David Pointing	project engineering 93 student, 3 disciplines ( <a href="#">engineering interviews</a> )	16 contacts in 13 companies
Deakin Matthew Joordans	power systems design, Yr 2 100 students	SPNet
JCU Rabin Tadhulkar	Eng. project m'gement, Yr 3 80 – 90 students ++	Glencore-Xstrata Copper Rockfield Technologies
UniSA Brenton Dansie et al	power systems analysis, Yr 3 engineering dynamics, Yr 2 fluid dynamics, Yr 2 42, 160, + nn students	PSD Arrium & Materials / OneSteel
USQ Tony Ah Fock, et al.	Energy audit, Yr 3 110 students	Downey Engineering
UTS Rob Jarman, et al	Mechanics of solids, Yr 2 274 students	Atlantis, Sika Australia, SMEC, Geofabrics, Arup, Lend Lease
UWA Melinda Hodkeiwicz	Risk, reliability & safety Yr 4/5 186 students	Rio Tinto Iron Ore

# project successes

- nine industry-inspired projects were developed
  - Power systems (2); Engineering dynamics; Fluid dynamics
  - Mechanics of solids
  - Project engineering / project management
  - Energy audit / Risk, reliability and safety (an area indentified by industry as important and generally poorly covered)
- positive student and external evaluations
  - student comments:.
    - *“gave very useful information about engineering practices from real and actual world to learners;*
    - *helped student [be] aware of what they might want to do in their future career;*
    - *Industry’s proximity to engineer students gave me opportunity to get vacation job;*
    - *Learning how the forces and mechanics problems we’re taught in class relate back to the big picture”*

# project successes (continued)

Industry partners were very pleased to assist, and get involved:

Most of the projects have included guest lectures

Some have included site visits

One (small classes) had guided interviews / electronic interaction with engineers (not entirely unlike the mentoring idea at the start)

# challenges

- Sustaining projects when teaching staff change
- Two universities do not have permission for industry data to be shared, but the project framework to be shared
- Transferability of some projects may be limited by context and location

# Concluding Remarks

- ACED agreed that having a specific small project fund (\$19,800) was critical
- ACED will promote the project outcomes, Model, Tools, Guidelines, Best Practice and Industry–Inspired project concept (and materials) through workshops etc.
- ACED will work with ADTLs, AAEE and Engineers Australia and others on specific issues (eg e-portfolios that link to accreditation learning outcomes specification)
- ACED will use/develop this work in responding to recommendations by the AWPA study on Engineering Skills, June 2014, and other initiatives (OCS, UA) on work integrated learning

a summary paper is in [ATSE Focus #184, pp 3-5](#)

<http://www.atse.org.au/Documents/Publications/Focus/2014/focus-184-educating-the-future.pdf>