STRATÉGÉ: Mapping the ePortfolio Skill Areas of Engineers – Use in Developing Engineering Student Mobility Internationally

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Faculty of Built Environment and Engineering
Reconciliation

In keeping with the spirit of Reconciliation, I acknowledge the traditional owners of the land on which we are meeting today, and acknowledge the important role Indigenous people continue to play within the QUT community.

www.reconciliation.qut.edu.au
Students of the future face:

**Challenges**

- Increasing workforce diversity and globalisation of business – new employees required in particular in multinationals
- Organisations need people open to diversity and adaptable to change
- Need to encourage global thinking and receptiveness to diverse values and beliefs
- Develop a capacity to adapt to living abroad and an open and flexible attitude to the world at large
- Study abroad should form fundamental part of a persons course

**Problems**

- Transnational employment of professionals
- Motivation of students to go internationally
International student flow

![Diagram showing international student flow with data points for different regions: N/America, 91,668 (3.1%); N/America, 493,483 (16.7%); S/America, 55,264 (1.9%); S/America, 12,678 (0.4%); Europe, 409,425 (14%); Europe, 766,049 (26%); Asia, 687,959 (23.3%); Asia, 153,162 (5.2%); Australia Oceania, 48,298 (1.6%); Australia Oceania, 15,898 (0.5%).](image)

Bode – DAAD 2006
Eurodata students – Where they go to?

- Germany: 115,000
- United Kingdom: 104,000
- USA: 77,000
- France: 45,000
- Spain: 35,000
- Austria: 25,000
- Switzerland: 21,000
- Belgium: 18,000
- Australia: 13,000
- Sweden: 11,000
- Italy: 10,000
- Greece: 7,000
- Czech Republic: 6,000
- Hungary: 5,000
- Denmark: 4,000
- Norway: 3,000
- Ireland: 2,000

Other Non-European Countries: 4%
USA: 13%
Eurodata Countries: 83%
Eurodata 2006
European student enrolments in Australia

Source: Australia Education International

Total enrolment EU students 26,700

- Germany
- United Kingdom
- France
- Czech Republic
- Sweden
- Poland
- Italy
- Spain
- Netherlands
- Other EU
Australia students - Where they go

- USA: 15.3%
- China: 10.1%
- UK: 8.1%
- Canada: 6.7%
- Germany: 4.9%
- France: 4.8%
- Japan: 4.7%
- Italy: 4.5%
- Sweden: 3.3%
- Malaysia: 3.1%

Number of Experiences
The EU – DEEWR Study - STRATÉGÉ

- Identify barriers to study abroad
- Propose strategies to overcome these barriers
- Discuss ways to achieve a better fit between study abroad and existing curricula
- Identify fields in engineering that had most to gain from study abroad
- Identify employer expectations of international experience
- Identify the potential for international professional accreditation of engineers
- Develop an e-Portfolio for transparency of student qualifications for mobility abroad
- Provide input into policy and recommendations on how to improve student mobility from Australia
The Australian/EU partners

- ATN Group of Universities
  - Queensland University of Technology
  - RMIT
  - University of Technology Sydney
  - University of South Australia
  - Curtin University

- Europe (CLUSTER Group)
  - Politecnico di Torino, Italy
  - The Royal Institute of Technology (KTH), Sweden
  - Universität Karlsruhe (KIT – Karlsruhe Institute of Technology), Germany

Model of the Student Decision Making Process
Student respondents by university

- KTH: 18.4%
- Uni Karlsruhe: 2.6%
- Poli di Torino: 5.7%
- QUT: 13.1%
- UTS: 18.5%
- RMIT: 22.3%
- UniSA: 1.9%
- Curtin: 15.0%
- Other: 2.5%

Respondents (1,241)
Barriers to mobility – Engineering students

- Committed to partner/kids: 22% EU, 15% AUS
- Leaving flat/house: 40% EU, 21% AUS
- Leaving parents: 28% EU, 22% AUS
- Leaving boy/girlfriend: 50% EU, 31% AUS
- Nervous about culture: 33% EU, 24% AUS
- Study not recognised at home university: 43% EU, 40% AUS
- Prolong degree: 66% EU, 62% AUS
- Language: 67% EU, 32% AUS
- Lack of international study information: 79% EU, 51% AUS
- Financial means: 82% EU, 58% AUS
Drivers for international study

- Relevant to international career
- Enhance career prospects
- Language skills development
- Increase cultural understanding
- Culture immersion
- Enhance acad and prof knowledge
- Increase ability handle change
- Personal development

% of total number of students responding

<table>
<thead>
<tr>
<th>Category</th>
<th>EU</th>
<th>AUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant to international career</td>
<td>96%</td>
<td>86%</td>
</tr>
<tr>
<td>Enhance career prospects</td>
<td>90%</td>
<td>82%</td>
</tr>
<tr>
<td>Language skills development</td>
<td>66%</td>
<td>89%</td>
</tr>
<tr>
<td>Increase cultural understanding</td>
<td>71%</td>
<td>71%</td>
</tr>
<tr>
<td>Culture immersion</td>
<td>90%</td>
<td>86%</td>
</tr>
<tr>
<td>Enhance acad and prof knowledge</td>
<td>75%</td>
<td>79%</td>
</tr>
<tr>
<td>Increase ability handle change</td>
<td>86%</td>
<td>87%</td>
</tr>
<tr>
<td>Personal development</td>
<td>90%</td>
<td>87%</td>
</tr>
</tbody>
</table>
Mobility decisions – student motivators / barriers

DRIVERS OF MOBILITY
- Employer led interest
- Enhanced career prospects
- Improved language competence
- Relevance on degree subject
- Personal development
- Professional development

Availability of a range of relevant / attractive options
Good university promotional information
Committed and enthusiastic departmental staff

Desire to study/work abroad
Concerns about study/work abroad

DECISION

Student’s profile characteristics
- Gender
- Socio-economic background
- Previous mobility
- Age
- Ethnicity
- Personality traits

Mitigating factors
- Preparatory language teaching available
- Financial support system in place
- Credit transfer worries lack of recognition of Study abroad
- Good promotional information and support

BARRIERS TO MOBILITY
- Language proficiency
- Financial constraints
- Credit transfer worries lack of recognition of Study abroad
- Uncertainty about mobility opportunities
- Perceived prolongation of degree

From HEFCE Issues Paper 2004/30

Social Context
- Institutional national and international factors
  - University policies
  - National schemes
  - Government policy
  - International schemes and policies

Political Context

Cultural Context

Economic Context

Student barriers
Student motivators
University to address
### Comparison of ATN credits as ECTS

<table>
<thead>
<tr>
<th>University</th>
<th>Credit Unit Used</th>
<th>For 30 ECTS</th>
<th>For 1 University Credit Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtin</td>
<td>Curtin credit points</td>
<td>100</td>
<td>1 credit point = 0.3 ECTS</td>
</tr>
<tr>
<td>QUT</td>
<td>QUT credit points</td>
<td>48</td>
<td>1 credit point = 0.625 ECTS</td>
</tr>
<tr>
<td>RMIT</td>
<td>RMIT credits</td>
<td>48</td>
<td>1 credit = 0.625 ECTS</td>
</tr>
<tr>
<td>UniSA</td>
<td>UniSA units</td>
<td>18</td>
<td>1 unit = 1.667 ECTS</td>
</tr>
<tr>
<td>UTS</td>
<td>UTS credit point</td>
<td>24</td>
<td>1 credit point = 1.25 ECTS</td>
</tr>
</tbody>
</table>
Presently……

- Academic requirements for professional engineers met through 4 year undergraduate degrees
- Accredited by Engineers Australia with international recognition through Washington Accord
The Washington Accord


Current Signatories
- Australia (1989)
- Canada (1989)
- Ireland (1989)
- New Zealand (1989)
- United Kingdom (1989)
- USA (1989)
- Hong Kong (1995)
- South Africa (1999)
- Japan (2005)
- Singapore (2006)
- Korea (2007)
- Taiwan (2007)

Provisional Status
- Germany
- India
- Malaysia
- Russia
- Sri Lanka

Other Accords / Agreements
- APEC Engineer Register
- The Engineers Mobility Forum Agreement
The EUR-ACE project (2004/2006)

has proposed an European accreditation system that will

- ensure consistency between existing national “engineering” accreditation systems;
- add an European “quality label” to accreditation;
- introduce “accreditation” in other countries;

and thus

- improve quality of education
- facilitate trans-national recognition
- facilitate (physical and virtual) mobility

EUR-ACE has been supported by the European Commission (DG EaC) within SOCRATES and TEMPUS programmes
Implementing the EUR-ACE system

EUR-ACE is:

- NOT an European Directive
- NOT an European Accreditation Board
- A bottom-up agreement towards a decentralized accreditation system in which:
  - Accreditation is awarded by National (or Regional) Agencies that satisfy the EUR-ACE Standards
  - The EUR-ACE label is “added” to the “national” accreditation, thus giving it an international value
  - The label is different for FIRST CYCLE (BACHELOR) and SECOND CYCLE (MASTER) in accord with the European Qualifications Framework (EQF)
Implementing the EUR-ACE system

- The initial EUR-ACE system includes six countries - France, Germany, Ireland, Portugal, Russia, UK with very different educational and professional systems from both within and outside the EU
- Contacts under way to include Turkey, The Netherlands and Flanders
## Mapping ePortfolio Skill Areas against EUR-ACE First Cycle

<table>
<thead>
<tr>
<th>Student ePortfolio Skill Areas</th>
<th>EUR-ACE First Cycle and Selected Second Cycle Competencies</th>
</tr>
</thead>
</table>
| Technical / Professional Research | • Knowledge and understanding of the scientific and mathematical principles underlying their branch of engineering.  
• Systematic understanding of the key aspects and concepts of their branch of engineering.  
• Coherent knowledge of their branch of engineering including some of the forefront of the branch.  
• Awareness of the wider multi-disciplinary context of engineering.  
• Workshop and laboratory skills  
• An understanding of applicable techniques and methods, and their limitations. |
| Problem Solving / Critical Thinking | • The ability to apply their knowledge and understanding to identify, formulate and solve engineering problems using established means.  
• The ability to apply their knowledge and understanding to analyse engineering products, processes and methods.  
• The ability to select and apply relevant analytic and modelling methods.  
• The ability to combine theory and practice to solve engineering problems. |
| Social / Ethical responsibility | • An awareness of the non-technical implications of engineering practice.  
• Demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice. |
| Creativity / Design | • The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements.  
• An understanding of design methodologies and an ability to use them.  
• The ability to design and conduct appropriate experiments, interpret the data and draw conclusions. |
| Managing / Organising | • The ability to conduct searches of literature, and to use data bases and other source of information.  
• The ability to select and use appropriate equipment, tools and methods. |
| Communication | • Use diverse methods to communicate effectively with the engineering community and society at large.  
• Work and communicate effectively in national and international contexts. (2nd cycle) |
| Teamwork | • Function effectively as an individual and as a member of a team. |
| Career Management / Lifelong learning | • Recognise the need for, and have the ability to engage in independent, life-long learning. |
| Leadership | • Function effectively as leader of a team that may be composed of different disciplines and levels (2nd cycle). |
| Initiative / Enterprise | • Demonstrate an awareness of project management and business practices, such as risk and change management, and understand their limitations. |
Diploma Supplement

- In parallel to ECTS, the Commission promotes the Diploma Supplement - a transcript of studies which all students in participating countries are eligible to receive.
- Development of EUROPASS incorporating Europass, European Portfolio and the European CV into a single European Framework that will include the Diploma Supplement.

The Australian Higher Education Graduate Statement

- A distinctively Australian document for presenting information regarding an award conferred on a graduate – the Australian equivalent to the Diploma Supplement.
Diploma Supplement / The Australian Higher Education Graduate Statement - Portability

- Mobile students seek recognition of their qualification
- Aids mobility, access and lifelong learning
- Promotes the employability of graduates at national and international level
- Fosters employability – increased employer interest in the information the Diploma Supplement provides
- Easier access to work or further studies abroad

‘In a time of globalised knowledge economies, his ability to have his qualifications and skills understood by his next employer is becoming increasingly crucial to him’

Jan Figel – Commissioner EU April 2007
Development of the e-Portfolio

The e-Portfolio will consider the potential of incorporating / addressing the following elements:

- The requirements of the Australian Higher Education Graduate Statement
- The requirements of the Diploma supplement
- Mapping the Engineering Australia Professional Engineer Units and Elements of competency to the Student e-Portfolio Skill areas
- Mapping the EURASE Cycle 1 and Cycle 2 competency outcomes to the Student e-Portfolio Skills area
- Employers ability to understand what the graduate as actually achieved
<table>
<thead>
<tr>
<th>Student Portfolio Skill Areas</th>
<th>PE1 Knowledge Base</th>
<th>PE2 Engineering Ability</th>
<th>PE3 Professional Attributes</th>
</tr>
</thead>
</table>
| Technical/Professional Research | 1.1 Science and engineering fundamentals  
1.2 In depth in one discipline  
1.3 Techniques and resources  
1.4 General knowledge | 2.3 design and operationalise performance | 3.7 Professional attributes |
| Problem solving/Critical thinking | 2.1 Problem identification, formulation and solution  
2.3 Systems approach to complex problems | 2.2 Social, cultural, global & environmental responsibilities principles of sustainable development | 3.4 Professional and ethical responsibilities |
| Social/Ethical Responsibility | 2.4 Engineering design | 2.5 Conduct an engineering project | 3.3 Creativity and innovation |
| Creativity/Design | 3.1 Communicate effectively/team/community | 3.2 Manage information and documentation | 3.5 Function effectively as an individual multidisciplinary, multicultural team |
| Managing/Organising | 3.5 Function effectively as an individual multidisciplinary, multicultural team | 3.6 Lifelong learning and professional development | |
| Communication | 2.6 Understand the business environment | 3.5 Team leader or manager | |
| Teamwork | 3.1 Communicate effectively/team/community | 3.5 Team leader or manager | |
| Career management/ Lifelong learning | 3.5 Team leader or manager | 3.5 Team leader or manager | |
| Leadership | 3.5 Team leader or manager | 3.5 Team leader or manager | |
| Initiative/Enterprise | | | |
Student Portfolio

Student Portfolio is an online tool that you can use to document and present your academic, professional and personal development in the format of an e-portfolio (electronic portfolio). You can access information about Student Portfolio by clicking on 'Help and Resources' below or by visiting the Student Portfolio support website.

Select one of the following areas by clicking on the title or accompanying icon:

- Build and Release your Portfolio
  Create, update and release your portfolio.
  More detail...

- Export your Portfolio
  Save a copy of your portfolio as an HTML file.
  More detail...

- Visitors Log
  See who has viewed your portfolio.
  More detail...

- Portfolios Released to You
  View portfolios released to you by others.
  More detail...

Help and Resources

- View tutorials, guides and example portfolios.
  More detail...

- Create and update your résumé.
  More detail...

- Identify your strengths and areas for improvement.
  More detail...

New to Student Portfolio?

Get started by:
- Viewing the sample portfolio
- Visiting the support website

When you are ready to create your own portfolio, click 'Build and Release your Portfolio' on the left.

News and Updates

Change to Portfolio View release options
Web-accessible storage is now available to all students
Links

Careers and Employment
TALSS - For Students
OJT

OUT Home | OUT Virtual Home | Logout
CRICOS Institution Code: 00213J

https://qutvirtual.qut.edu.au/portal/.../show_menu
Example ePortfolio - Mapped E1 Competency
Experiences - Communication

Community

C-EWB-PE3.1 - Talking with Indigenous People
Engineers Without Borders Australia
Sep08-Oct08

A key part of the volunteer Bentick Island Project, to build infrastructure for the local Kialalik people, was engagement with the local Indigenous people. On numerous occasions during the planning and construction trips, we sat around the fires or went spear fishing with the local elders and children. My specific role was to ensure that the Kialalik people understood our mission, that we were there as volunteers to help them, and to build a relationship that would enable effective communication for further teams.

Our community Liaison, Andre Grant, aided our task by providing key advice prior to leaving for the island. The most significant item for me was the simple notion at the beginning of "Don't speak unless spoken to." This was not meant to be threatening, but highlighted that silence and listener is a key part of indigenous communication and allowed the local people to ask questions when they were ready to speak. This is a key difference from Western style communication where you introduce yourself immediately and begin to ask questions of the other person to understand who they are.

I have since applied these principles tutoring a refugee family from Africa and in my professional life while planning projects in Papua New Guinea. I have observed that the other party really appreciates making the effort to communicate in their style rather than enforcing the communication style I am used to during discussions.
Competency - teamwork
Experiences - Teamwork

Academic:
A - QUT-PESC-OSK22 Team Project
Name of Project Management

My first Masters subject was OSK22: Communication, Negotiation and Leadership and involved an individual research project and a group project. Once the first semester, I worked closely with my team and was assigned team leader of the second part of the project, a large work schedule. I was also responsible for meeting deadlines and ensuring all team members were aware of the tasks and responsibilities.

The team had significant difficulties with team members not attending meetings or lectures, and a lack of communication. I found it challenging to manage this large population of 20 students. I did not consider cultural differences to be a large factor until I realized there were many different Indian subgroups.

I had worked with the team and assumed background similar to my other Indian friends had traveled alone and more used to working in teams. This led to the project running slowly, without actively looking to other members into the group. We expected them to make their own progress, and this lack of interaction led to a lack of teamwork and understanding of the project.

I tried to involve my personal culture, but it was not feasible without a lot of work. I was hoping to make the Indian team more proactive and active in the project.

Personal

P - API: PES2-Yellows - 12-10 Div One Final
AFL Football Premiership

In API, I had the privilege of playing as part of a team of eight players, and we worked together to win the championship. We had a great sense of teamwork.

My role was to keep the ball close to me and defend against any opposing players. We trained hard to be the best we could be, and we finally managed to win the championship.

Although we had the talent to win, we had to work hard to reach that level. I learned the value of teamwork.

That day we put on our best work. Each of us played the best we could, and we were lucky. The game was close throughout, and we managed to clinch the win in the dying minutes of the game. The joy and excitement were immense.

Competency - teamwork
Problem solving / critical thinking
Experiences - Problem Solving / Critical Thinking

Work

W-BH-PE2.2-Reinforcement Issues over Pool
Boulderstone Hornibrook
Oct06-Jan08

As a Site Engineer, I was responsible for managing subcontractors, contract administration and site supervision of building works for the ARCBS/QUT BloodBank at Kelvin Grove. While observing Senior Project Engineers on-site, I observed an issue of combining steel reinforcement and post-tension cables in large beams spanning 20m over an indoor pool area.

The design of the beam was very tight, with large volumes of reinforcement up to 28dia bars and six large pre-stressing ducts of 90dia. The pre-assembled ligatures to resist shear at each end of the beam were placed after the post-tension cables, at a junction where column reinforcement also entered the beam. The steel fixers were unable to insert two of the ligatures due to space requirements, and the other ligatures took over three hours for a team of four to place causing significant time and cost delays. The closeness also lead to difficulty in vibration during concrete pours.

The Project Engineer met with the Structural Engineer to address the problem together. Their solution was to increase the depth of the beam, but this was resisted by the Architect. Overall, the cost impact led to the design remaining the same.

The role of a Project Engineer is not just to build off the drawings, they are there to challenge the design and communicate professionally with the design team. However, the fundamentals of an engineering solution must always be compared with the most economic solution in a commercial situation.
Competency - leadership
Competency – creativity / design
Areas needing to be examined

- Lack of coherence and coordination of the ePortfolio in Australia and internationally
- Interoperability challenges between systems nationally and internationally
- What should drive the content of the ePortfolio in engineering? Academic or professional related matters e.g. employment etc.
- Development of the ePortfolio for transportability between disciplines e.g. between an engineering discipline and the law discipline
- Where does the ePortfolio fit into the EUROPASS the template and how to bring the following documents together: EUROPASS consists of five documents:
  - two documents (Europass curriculum vitae (CV) and Europass Language Passport) students/graduates can fill in themselves; and
  - three other documents (Europass Certificate Supplement, Europass Diploma Supplement and Europass Mobility) filled in and issued by competent organisations.
- What format would meet Australian and European accreditation agencies competency and recognition needs. How would the ePortfolio be used for this purpose?
Improving mobility Australia - EU

- Improving transportability of qualifications
- Joint / complimentary degrees
- Industry experiences
- Student exchange / study abroad
Wider scope: inclusion of external policy objectives - future reference programme in the field of HE cooperation with third countries

Collaborative partnerships with 3C HEIs (Action 2)

Action 1:
- Joint doctoral programmes + scholarships
- Possible inclusion of 3C HEIs in joint programmes
- Priority for joint degrees
- Better scholarships for EU students
- Stronger focus on continuous quality monitoring

Action 3: information grants for National Structures
Factors assisting double degrees

- Bologna Accord
  - 1st cycle: typically 180–240 ECTS credits, usually awarding a Bachelor's degree (3 - 4 years)
  - 2nd cycle: typically 90–120 ECTS credits (a min of 60 on 2nd-cycle level). Usually awarding a Master's degree (1.5 - 2 years)
  - 3rd cycle: Doctoral degree. No ECTS range given

- Erasmus Mundus Developments:
  - Funding for EU students to go abroad and AUS students to the EU
  - The Danish voucher scheme (2 years second cycle funding)
  - Desire for degrees with third country universities
  - Funding for joint PhDs and double PhDs
  - Potential of double accreditation
Types of award related mobility

- Germany
  - 3
  - 2 PHD
  - 1 Master
  - 3 Bachelor
  - 2 Bachelor

- Abroad
  - 3
  - 2 PHD
  - 1 Master
  - 3 Bachelor
  - 2 Bachelor
Joint EU – Australia Declaration of Cooperation

- promoting and **facilitating student and faculty mobility** between recognised higher education (HE) institutions in the EU and Australia;
- promoting and facilitating learner/trainee and trainer mobility between vocational education and training (VET) institutions in the EU and Australia;
- promoting and encouraging cooperation and joint/shared curriculum development including recognition of credits between HE institutions and VET institutions in the EU and Australia;
- promoting the development of joint activities leading to the exploitation of information technology, especially the Internet, in the field of education and training;
- facilitating the quality of student/learner and professional mobility by promoting transparent, mutual recognition of qualifications and periods of study and training, and where appropriate, portability of credits.
Opportunities for the improvement of student mobility

- Mobile students are seeking recognition of their qualification internationally
- Portability aids mobility, access and lifelong learning
- The need to promote the employability of graduates at national and international level
- By fostering employability as employers can use the ePortfolio for ease of understanding what the graduate has
- Promote easier access to work or further studies abroad
- Potential cross professional accreditation