Mapping Local Trajectories of Engineering Education Research to Catalyze Cross-National Collaboration: Australia, the United Kingdom, and India

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EER’s expanding global profile

- SEFI’s Engineering Education Research Working Group (EER-WG) formed in 2008


Internationalizing EER

- *Journal of Engineering Education (JEE)* now distributed via professional societies in Australasia, the Caribbean, Europe, India, North America, Russia, and South America
- International Conference on Research in Engineering Education (ICREE) in Honolulu, HI in 2007; Research in Engineering Education Symposium (REES) in Switzerland in 2008 and Australia in 2009
- Advancing the Global Capacity for Engineering Education Research (AGCEER) in 2007-2008
About AGCEER


The goal is to significantly advance the global capacity for engineering education research through moderated interactive sessions offered in a series of international engineering education conferences between July 2007 and December 2008.

The sessions address fundamental questions facing the development of a global community of scholars and practitioners in engineering education research.”

Project goals

1) Describe the development and state of engineering education research in specific national contexts

2) Identify opportunities, strategies, and approaches for developing multi-national research collaborations

3) Promote further discussion and agenda-setting activities at all levels (institution, nation, region, globe)
Subjects and methods

Cases
- Australia, the United Kingdom, and India

Data Sources
- Database of 800+ empirical research papers published 2005-2008
- Brief interviews (in-person or e-mail) with actors/stakeholders from countries of interest
- Additional archival, database, and Internet research
### Table 2. Number of Qualifying Papers by Author Country of Origin

<table>
<thead>
<tr>
<th>Author Country 1</th>
<th>No. of Papers</th>
<th>Author Country 1</th>
<th>No. of Papers</th>
<th>Author Country 1</th>
<th>No. of Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>315</td>
<td>Israel</td>
<td>7</td>
<td>Korea</td>
<td>2</td>
</tr>
<tr>
<td>Total – EU</td>
<td>257</td>
<td>Hong Kong</td>
<td>5</td>
<td>Latvia</td>
<td>2</td>
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<tr>
<td>Australia</td>
<td>154</td>
<td>Japan</td>
<td>5</td>
<td>Palestine</td>
<td>2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>54</td>
<td>Malaysia</td>
<td>5</td>
<td>Poland</td>
<td>2</td>
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<tr>
<td>Spain</td>
<td>37</td>
<td>Brazil</td>
<td>4</td>
<td>Slovenia</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>28</td>
<td>Colombia</td>
<td>4</td>
<td>UAE</td>
<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>28</td>
<td>India</td>
<td>4</td>
<td>Czech Republic</td>
<td>1</td>
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<tr>
<td>Turkey</td>
<td>23</td>
<td>Greece</td>
<td>4</td>
<td>Iran</td>
<td>1</td>
</tr>
<tr>
<td>South Africa</td>
<td>22</td>
<td>Norway</td>
<td>4</td>
<td>Nigeria</td>
<td>1</td>
</tr>
<tr>
<td>Sweden</td>
<td>21</td>
<td>Romania</td>
<td>4</td>
<td>Oman</td>
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<tr>
<td>Denmark</td>
<td>20</td>
<td>Thailand</td>
<td>4</td>
<td>Pakistan</td>
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<tr>
<td>Finland</td>
<td>19</td>
<td>Chile</td>
<td>3</td>
<td>Puerto Rico</td>
<td>1</td>
</tr>
<tr>
<td>Canada</td>
<td>17</td>
<td>Italy</td>
<td>3</td>
<td>Qatar</td>
<td>1</td>
</tr>
<tr>
<td>Belgium</td>
<td>10</td>
<td>Kuwait</td>
<td>3</td>
<td>Saudi Arabia</td>
<td>1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>10</td>
<td>Lebanon</td>
<td>3</td>
<td>Sierra Leone</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>9</td>
<td>Russia</td>
<td>3</td>
<td>Trinidad &amp; Tobago</td>
<td>1</td>
</tr>
<tr>
<td>Mexico</td>
<td>8</td>
<td>Singapore</td>
<td>3</td>
<td>Ukraine</td>
<td>1</td>
</tr>
<tr>
<td>Portugal</td>
<td>8</td>
<td>Slovakia</td>
<td>3</td>
<td>Zimbabwe</td>
<td>1</td>
</tr>
<tr>
<td>Taiwan</td>
<td>8</td>
<td>Hungary</td>
<td>2</td>
<td>Total – All Data</td>
<td>888</td>
</tr>
</tbody>
</table>

1. Shaded cells indicate European Union (EU) member countries.
2. Total is larger than total papers (n= 815) due to double counting of multi-authored papers.

Interview questions

1. What led you into this type of work?

2. What are the most active areas or topics for engineering education researchers in your country?

3. What criteria is used to assess if the research is good?

4. What individuals, centers, and/or institutions in your country are active in engineering education research?

5. Where is engineering education research from your country being published and/or presented? (e.g. books, journals, conferences, etc.)

6. Do you have any other relevant insights about the historical development and/or current state of engineering education research in your country?
Typical case themes

- Relative global visibility of each country
- Historical development and context
- Support mechanisms
  - Professional societies and conferences
  - Centers, departments, degree programs
  - Journals and other publication outlets
  - Funding sources
- Cross-national collaborative patterns
- Current areas/topics of research interest
- Horizon opportunities (research areas, etc.)
Areas of research interest in Australia

1. Online/Distance/E-Learning

2. Long history of distance education to remote interior

3. Strategy to make higher education an export industry

4. Focus on equity, access, and continuing education
Areas of research interest in Australia

1. Problem/Project-Based Learning (PBL)
2. Leadership of influential faculty
3. Shift to outcomes-based accreditation
Areas of research interest in the UK

- Recruitment, retention, and gender
- Continuing education, professional development, and industry cooperation
- Design education
- E-learning and educational technology (including through Open University)
Areas of interest in India

Systematically evaluating *quality* of technical education, including development and performance of students, faculty, and institutions

Aligning engineering education with industry needs and expectations

Autonomy of institutions, including as way to enable quality reforms and alignment
Support mechanisms
Professional societies and conferences

- Australasian Association for Engineering Education (AAEE) and Annual Conference (both est. 1989)

- From LTSN (est. 1998) and BEES (2000) to HEA, CETL, and Subject Centres

- Indian Society for Technical Education (ISTE, est. 1941/1968) and Annual Conventions (since 1972)
Support mechanisms

Journals

Australasian Journal of Engineering Education (AJEE, est. 1991), also JEE


Indian Journal of Technical Education (1978), also JEE
Support mechanisms

Funding

Australian Teaching and Learning Council (ALTC, formerly Carrick Institute) – primarily for teaching/curriculum innovation; also some funding from internal university grants, professional societies, industry

Engineering Subject Center; Center for Materials Education; Royal Academy of Engineering; other UK technical societies and university-based centers; EU funding

Appears wholly lacking
Challenges and opportunities

- **Shared**
  - Improve recognition and legitimacy of educational research in the context of engineering education
  - Respond to globalization trends and pressures
  - Connect research with outcomes-based accreditation

- **Local**
  - UK: Use and grow networks, scale up research projects, secure larger grants, interface w/EU
  - Australia: Leverage existing networks, interface with regional and global partners
  - India: Connect research with reform movements, coordinate among many semi-autonomous schools
Challenges and opportunities
Moving to outcomes-based accreditation

Institution of Engineers, Australia (now Engineers Australia) establishes outcomes-driven accreditation in 1996

Outcomes-based UK-SPEC standard implemented beginning in 2004

Provisional signatory of Washington Accord (2007), AICTE now moving toward outcomes-based criteria
Current and future work

- Additional case studies: Canada, Portugal, Hong Kong, Mexico, Spain (and others?)

- Cross-national workshops
  - PBL at Loughborough (UK), June 2009
  - Gender/Diversity at Delft, June-July 2009
  - e-Learning in Australia, December 2009
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