AUTC Physics Project: Learning outcomes and curriculum development

Aims of the project

• To evaluate the teaching and learning of undergraduate physics in Australian universities
• Understand how the teaching and learning of undergrad physics is evolving
• To identify future directions in undergraduate physics
• To identify good - successful practices

The project brief was provided by AUTC

As tangible outcomes which will benefit all stakeholders, we aim to
* identify, evaluate and communicate good practices in Australian undergraduate physics education
* build a community and facilitate sharing of resources.

Data collection methods

- Questionnaire (All 34 institutions)
- DEST and CEQ data
- Head of Department interviews (9 inst.)
- Teaching programs interview
- Focus group with first year students (2)
- Focus group with third year students
- Focus group with postgrad students
- Interviews with recent graduates
- Interviews with employers

KEY AREAS

1. Overview of Teaching and Learning in the context of each department’s environment
2. Teaching and Learning practices for physics majors, service and multidisciplinary teaching.
3. Student satisfaction, expectations and attitudes.
4. Relations with industry and employers, and graduate employability.
5. Staff development and successful Teaching and Learning practices.
6. Trends in student numbers and strategies for staffing in the face of declining budgets
7. School teacher education and in-service.

Structure

- Changes in human resources
- Infrastructure and resources
- Teaching profile
  - Changes in student numbers
  - Changes in offerings of subjects, courses or degree programs
  - Changes in teaching quality
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Results-challenges

- What challenges has your department faced in physics teaching and learning in the last 3-5 yrs?
  - declining staff numbers and downsizing departments (18: human resources)
  - laboratory and IT facilities and staff downgraded (12: infrastructure and resources)
  - attracting students, drop in student numbers (11: teaching profile: changes in student numbers)
  - loss of (or conflicts with) service teaching (11: teaching profile: changes in offerings)

Results-response

- How has your department responded to the challenges mentioned above?
  - restructuring of curricula and/or labs (11: teaching profile: changes in teaching quality)
  - introduction of new technology e.g. WebCT (10: teaching profile: changes in teaching quality)
  - introduction of new majors or degrees e.g. photonics, nanotechnology (9: teaching profile: changes in offerings)

Results- future directions

- What directions will the teaching and learning in your department take in the near future?
  - more new majors or courses (15: teaching profile: changes in offerings)
  - more on-line delivery of subjects (12: teaching profile: changes in teaching quality)
  - more service and/or multidisciplinary teaching (8: teaching profile: changes in offerings)

Results - strengths

- What are the strengths of the teaching and learning in your department?
  - dedicated experienced staff (13: human resources),
  - high quality research area specialisation (12: teaching profile: changes in teaching quality)
  - staff-student interactions (11: teaching profile: changes in teaching quality)

Structure

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<tr>
<th>Past</th>
<th>Present</th>
<th>Future</th>
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<td>Changes in human resources (reduction range)</td>
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<td>Infrastructure and resources (reduction range)</td>
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<td>Teaching profile</td>
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<td>- Changes in student numbers (reduction range)</td>
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<td>- Changes in teaching quality (N/A increase)</td>
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Recurrent features

- Use of undergraduate research/project work either in teaching labs or with research groups
- The importance of laboratory work
- Use of Information Technology and web based teaching and learning resources
- Changes in assessment practices
Broader Context for Teaching and Learning

- Students’ preparation is a concern
- Industry and employer partners are participating in a variety of ways
- Service teaching continues as a major factor in teaching effort and funding
- Specialist and double degree programs are increasingly popular
- Support for teaching and learning development
- Mechanisms for training new staff

Summary

- Physics departments are exploring new areas for service teaching and new degree programs.
- New alliances to introduce new subjects and degrees,
- Improving teaching quality, e.g. by introducing research projects and online delivery
- This is happening in parallel with, or as a result of declining staff numbers and reduced teaching in tradition areas
- There is a recognition by departments that shared resources should be beneficial, yet...

Acknowledgements

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