Learning Outcomes and Curriculum Development in Physics

Notes of Steering Committee Meeting 01/03

held at 12:00 pm Wednesday 1 October, 2003
in the Science Foundation Council Room, University of Sydney.

Reconvened: 1:15 pm Friday 3 October, 2003
Stephen Roberts Foyer, University of Sydney

Present: Les Kirkup (University of Technology, Sydney), Michelle Livett (University of Melbourne), Davis Mills (Monash University) (Chair), Judith Pollard (University of Adelaide), Manju Sharma (University of Sydney), Marjan Zadnik (Curtin University) and, for main meeting, Richard Newbury (University of New South Wales), Maria Hunt (University of New South Wales).

Apologies: Brian James (University of Sydney), Mike Prosser (University of Sydney)

1 Team Dynamics

The following people will take responsibility for leading working parties and the project overall : Les Kirkup, Michelle Livett, David Mills, Richard Newbury, Judith Pollard, Manju Sharma and Marjan Zadnik. (Note: Brian James wishes to be contribute and will be able to offer an important viewpoint as a school Head. Mike Prosser may likewise have special roles).

2 Project Officer

The advertisement is expected to appear in *The Australian* Higher Education Supplement on Wednesday 8 October. The position is being advertised as 0.8 so that available funds will permit an appointment at the top of Level A with the option to appoint at 0.9 or full-time.

Recommendations regarding selection include:

An interview, including a 15 minute presentation on how the applicant sees the position and what s/he can bring to it. (MZ offered to forego reimbursement of his expenses to ensure funds are available.)

Subject to relevant privacy legislation, the Selection Criteria and all information about applicants for the position will be circulated to Team Leaders.

ACTION: David to circulate information.

Selection Committee: the project leaders and working party leaders, with a subgroup comprising Michelle Livett, David Mills and Manju Sharma to conduct interviews. (Note: the head of School at Monash is also on the Selection Committee.)

Selection criteria should include an awareness of and interest in ‘outcomes-based education’.

Duties and responsibilities of the Project Officer include:

- an initial internet search to identify details of all physics teaching at Australian Universities, to be circulated to each School/Department for verification;
- maintenance of a web site for communication between team leaders and team members;
- collation of data, preferably using a database with web interface.

Skills development: short courses on project management and working with databases were recommended if required.

3 Contract and funding details

The deadline for Stage 1 is 1 December 2004, with a possible extension to 23 December 2004.

Funding for Stage 1 has been transferred to Monash University.

All participants will keep records of project expenses, including those funded from other sources, so that reimbursement can be made if project funds are available.

Funds may be required for independent experts to lead focus groups.

4 Resources

Relevant resources to which we have or need access include:

From Australia:

Other AUTC projects, e.g.

Review of Biotechnology in Australia: http://www.autc.gov.au/pr/documents/biotech.pdf

The ICT-Ed Project: http://www.autc.gov.au/pr/ict/split_ict.htm

Graduate Destinations Surveys: http://gradlink.edu.au/

Institute of Engineers, Australia: course accreditation questions.

Australian Institute of Physics: course accreditation information: http://www.aip.org.au/uni_accreditation/procedureNov01.pdf

Reflections on cross faculty teaching, University of Technology, Sydney.

The Physicist surveys of undergraduate physics educations.

Learning and Teaching Development Units (or equivalent) as a source of good practice, not only in physics.

From Europe

QAA of Higher Education in UK: Physics, Astronomy and Astrophysics Benchmark Statement; http://www.qaa.ac.uk/crntwork/benchmark/phase2/physics_textonly.htm

EUPEN : Partial studies of curricula studies of Physics in Europe: http://inwfnu07.rug.ac.be/eupen/eol/eol43.html

Physics: Building a flourishing future: *Report of the Inquiry into Undergraduate Physics*, Institute of Physics: http://policy.iop.org/UPI/index.html

European survey of physics PhD programs: http://www.bme.hu/ptee2000/papers/konsta2.pdf.

From USA

Preparing Physicists for life's work, (possibly a good article for WP 3): http://www.aip.org/pt/vol-54/iss-4/p43.html

American Association of Physics Teachers: suggestions for course evaluation: http://www.psrc-online.org/curriculum/baccal2.html

Review of Astronomy Ph.D. in USA: http://www.aas.org/publications/baas/v29n5/edrpt.html

American Institute of Physics report on professional masters degrees (contains a survey on p. 44. of possible interest to Service teaching and multidisciplinary WPs.): http://www.aip.org/professionalmasters/mstphys.pdf

5 Brainstorming

A wide-ranging discussion raised the following issues for consideration.

Scope: the project should evaluate the main features of undergraduate physics education in Australia, and be aware of the range of other offerings including astronomy, astrophysics, biophysics, physics taught within engineering and applied maths; there may not be time/resources for more than an overview of some of these areas; it should include Honours, but exclude postgraduate education.

Aspects for inclusion:

- Gender balance;
- Students who complete 2 years of physics but no more, e.g. in nanotechnology, photonics, biotechnology, bioinformatics, scientific visualization, quantum computing, security technology; multidisciplinary and service teaching;
- Industry input into course and lab development.
- Graduate outcomes/attributes.
- Impact of changes in secondary education.
- Physics service teaching: what has changed in recent years and why? e.g. changes to IEAust accreditation? student dissatisfaction? EFTSU hoarding?
- What are the effects of 'named' or specialist physics degrees on student numbers? on graduate outcomes?
- What is the worth of doing physics for only one year? what does physics bring to other disciplines?
- How are students informed about careers in physics? about research within the department?
- Teaching methods.

- Tension between laying a firm conceptual foundation and showing current applications of physics.
- How much physics is taught by non-physics departments? what determines retention by physics areas?
- How are academic staff supported in teaching improvements?
- Staff development: examples of good practice; management of the conflict between research profile and teaching quality; role of Certificate of Higher Education, Internships etc.

Information required:

- what are the outcomes after 1, 2 and 3 years of physics educations?
- extent and impact of loss of service teaching.
- teaching qualifications of physics academics.
- examples of good practice, with evaluations where available, provided by Universities; including ways of managing with reduced resources.

Methods of gathering information:

- surveys/questionnaires;
- focus groups led by independent facilitator.

6 Working Parties

The tasks of the working party are outlined in Appendix A of the Proposal. It was agree that Working Part 1 needs to be split in two, to deal with the very large task of gathering information about physics teaching.

1A Mainstream physics courses. Leader: Richard Newbury.

1B Service courses and multidisciplinary teaching. Leader: Les Kirkup.

2. Student satisfaction. Leader: Marjan Zadnik.

3. Employer satisfaction. Leader: Judith Pollard.

4. Academic staff. Leader: Michelle Livett.

7 Informing the Physics Community

David Mills will address the meeting of Heads of Physics, to be held in conjunction with Science Meets Parliament Day, seeking their support and co-operation for this opportunity to make a real difference to physics education, through documentation of examples of good practice, and cost-effective changes to improve teaching, learning and retention of students.

Articles could also be written for *The Physicist* and *The Australian HES*.

ACTION: Richard to identify a HES contact.

ACTION: David to investigate whether AUTC will announce the project.

8 Immediate Tasks

A Gantt Chart will be produced to keep track of key tasks and timelines.

An ‘organisational chart’ will be prepared, showing the function of people involved in the project.

ACTION: Manju to draft and circulate for comment.

Each working party leader will identify the aspects/issues from Item 5 and from the project proposal relevant to his/her working party, develop the Working Party proposal and forward it to expert advisers for their input..

ACTION: Working party leaders.

A contact person will be identified for each University. Initially, Heads who attend the October meeting will be asked for nominations.

ACTION: David to identify contact person in each University, with suggestions from other team members.

Communications with AUTC needs to be defined, since it is possible that Prof Alan Robson will not be able to attend Steering Committee meetings.

ACTION: David to negotiate this arrangement with AUTC.

Team members will be contacted, to advise them of progress and invite their participation in Working Parties.

ACTION: David to contact team members.

Invite additions to the Expert Advisors Panel, including John O'Connor, Kate Wilson.

ACTION: David to co-ordinate invitations.

9 Publications

Any publications arising from the project will require AUTC permission.

It was agreed that publications should follow AVCC authoring guidelines, with only active contributors listed as authors.

10 Anticipated Outcomes

Principal outcome: to transform teaching and learning in physics.

> Subsidiary questions: What is happening in the teaching and learning of physics? Does it need transforming? What needs to happen? Does it match?

Dissemination proposed for Stage 2 includes:

- Presentation at the AIP Congress, Jan-Feb 2005, contact person David Low, who is now on the congress Program Committee.
- Workshops at participating Universities, within physics and other disciplines.
- Web site to facilitate sharing of resources and strategies.
- A print version of the Stage 1 Final Report.

Recommendations may include:

- a recommendation for funding to support a clearing house for resources which have been developed.
- recommendations for funding to develop resources to fill identified gaps.

Recommendations are expected to influence:

- Federal and State Governments;
- AIP Executive;
- Federation of Australian Scientific and Technological Societies;
- Heads of Tertiary Physics Departments;
- Deans of Science, Academic Program/Course Committees and Learning and Teaching Committees;
- Deans of cognate areas.

11 Next meeting

Monday 16 February, in either Melbourne or Sydney. The location will depend partly on the availability and preference of Alan Robson. The agenda may include input from people involved in other AUTC projects, and may begin to draft the Stage 1 report.

The meeting was adjourned at 6 pm, and re-convened from 1:15 to 1:50 pm on Friday 3 October 2003.

Judith Pollard
22 October 2003