The Higher Education Academy Physical Sciences Centre

πCETL Physics Innovations
Centre for Excellence in Teaching & Learning

# Physics Higher Education Conference 2007

# PROCEEDINGS

## Dublin Institute of Technology
## 6th-7th September 2007

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‘Students' Investigative Skills and the Physics Laboratory - Research and Good Practice Seen from 'Down Under''.

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## Keynote Lectures

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**The Value of Collaborative Working in Educational Physics**

*Bob Lambourne, The Open University*

**2 HEA Physical Sciences Lecture 2007**
**Students Investigative Skills and the Physics Laboratory - Research and Good Practice Seen from Down Under**

*David Mills, Monash University, Australia*

# Keynote 1

## National Teaching Fellow, 2006

## The Value of Collaborative Working in Educational Physics

*Bob Lambourne*
*Department of Physics and Astronomy, The Open University*
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Collaboration is more than just working together. At its best it is a creative process, involving two or more partners, benefiting from mutual learning as they use their individual abilities to work towards a common goal. It is not always an easy process, but it should be educative for all concerned.

Research physicists are accustomed to working in collaborations. One of CERN's very large particle physics collaboration has 2500 members, and groups of a few hundred are common. Should such collaborations be more common amongst physics teachers? Are there similar benefits to be gained, similar challenges to face and similar lessons to learn? Would there be benefits for students, for teachers, for departments, for institutions? My answer to all these questions is yes.

At my own university, the Open University (www.open.ac.uk) teaching is founded on collaboration and team work. Study materials are produced collaboratively by large course teams. Course/module presentation strategy is generally determined by the same team. Tutorial support is provided by regionally-based part-time Associate Lecturers (ALs), managed by regionally-based full-time Staff Tutors (STs). Most course teams include one or more STs, but collaborative working with ALs is also common and highly valued. Such work certainly requires good will and a collaborative spirit, but it also needs careful planning and good management in addition to all the usual individual academic virtues. In particular, teams must:

- be clear about the goal.
- be clear about the division of responsibilities.
- be realistic. (Mishaps will occur. a team should have a plan to deal with them.)
- try to avoid forcing people to do jobs they don't want to do.
- try not to let enthusiastic team members become overcommitted.
- be as open as possible: share experiences and aspirations.

Recent years have provided several opportunities to obtain external funds for large collaborative teaching and learning projects. Those in which I have had a personal involvement include: The Flexible Learning Approach to Physics (FLAP), Promoting Physics Learning and Teaching Opportunities (PPLATO), the Physics Innovations Centre for Excellence in Teaching and Learning (piCETL) and E-Learning in Physical Science Through Sport (ELPSS). These projects had different aims and different working methods, but in all cases, and whatever my personal role, I have tried to ensure that the general principles listed above are implemented. At a practical level, forming self-checking sub-teams or cross-checking pairs helps to ensure and monitor progress. Compiling glossaries is a good way to ensure precision in the use of terminology, and having a clear focus on assessment can help all those involved to be clear about what they are doing and why they are doing it.

My main current project involves directing the Physics Innovations CETL (piCETL). This is part of a £315 million ($630 million) initiative, by the Higher Education Funding Council for England that has established 74 Centres for Excellence in Teaching and Learning (CETLs). The CETLs are distributed across subjects and modes of teaching, but their common aim is to recognize and reward excellence, and to further develop and disseminate excellent practice. You will not be surprised to learn that piCETL is a collaborative CETL. By working together the partners involved are trying to:

- provide a national and international centre for the creation, documentation and dissemination of new ideas in the teaching and learning of physics and astronomy.

- promote a reflective attitude to physics teaching, based on pedagogic research and the evaluation of innovative learning developments.

- have a direct and significant impact on the learning experience of a substantial number of physics students, within the partnership and beyond.

To achieve these goals the partners are concentrating on their existing strengths in areas such as curriculum innovation, the use of modern technology in teaching, problem-based learning, laboratory-based teaching, the development of personal and professional skills, the positioning of physics in a broader scientific context and the widening access to physics studies.

As you can see at the piCETL website (www.open.ac.uk/picetl/), much has already been achieved and more is planned for the years ahead but key to the whole process has been and will be the spirit of collaboration that brought piCETL into existence and continues to sustain it.

# Keynote 2

## HEA Physical Sciences Lecture 2007

## Students Investigative Skills and the Physics Laboratory - Research and Good Practice seen from Down Under

*David Mills*
*Department of Physics, Monash University, Melbourne  Australia*
*Email: David.Mills@sci.monash.edu.au*

What are the ingredients for developing scientific enquiry skills? A recent higher education project which mapped physics learning and teaching in Australian universities found a strong commitment to laboratory in spite of staffing and budget challenges. Several lab programmes displayed resourcefulness, which is also seen in recent reports of undergraduate laboratory and projects in other countries.

Physics education research is now able to provide approaches to measuring and developing particular scientific abilities in the introductory lab. These approaches are useful in helping us evaluate our goals for laboratory and the types of activities we offer. A range of options such as mini-projects and design-experiments will be discussed.

As well as their efficacy in developing scientific abilities, appropriate activities which promote student initiative and creativity play a pivotal role in encouraging students to continue in physics, which is a key challenge in the Australian context.

## Oral Presentations

**Oral 1** **Focusing First Year Undergraduate Physics Labs on Constructing Knowledge and Understanding Science**

**Oral 2** **Enhancing the Conceptual Understanding of Physics Undergraduate Students using the Instructional Tool 'Concept Mapping'**

**Oral 3** **Development of a New First Year Physics Laboratory Teaching Methodology to Teach and Test Core Competencies and Fundamental Physics Concepts**

**Oral 4** **Presenting Newtonian Gravitation**

**Oral 5** **An Investigation of Student Peer Leaders in an Undergraduate Physics Course**

**Oral 6** **Peer to Peer Tutorials – If We Can't Teach Them Maybe We Can Get Them to Teach Each Other**

**Oral 7** **Learning to be SUPA**

**Oral 8** **A New Approach to Undergraduate Physics for Trainee School Physics Teachers**

**Oral 9** **A Study of Students' Problem Solving Approaches in Physics**

**Oral 10** **A Study of Students' View on learning Physics through Problem Based Learning.**

**Oral 11** **e-Submission, Marking and Return of Physics Assignments**

**Oral 12** **Assessment for Learning; Learning From Assessment?**

**Oral 13** **Supporting the Use of e-Portfolios for Physics Undergraduates**

**Oral 14** **Video Podcasting and *YouTube* Lecture Summaries for a 1st Year Physics Course**

## Abstracts of Oral Presentations

## Oral 1 - Focusing First Year Undergraduate Physics Labs on Constructing Knowledge and Understanding Science

*Thomas Wemyss, David Smith, Paul van Kampen.*
*CASTeL & School of Physical Sciences, Dublin City University, Glasnevin, Dublin 9, Ireland*
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The physics education group set about designing and refocusing the first year physics labs catering for over two hundred non-physics students. In order to make the labs relevant, it was decided to place emphasis on helping students develop transferable skills along with giving students an understanding of basic science concepts. Online pre-tests along with weekly surveys allowed us to learn about the students' attitudes, their experiences and their abilities.

We deemed it important that the labs meet a number of challenges:

- The labs should be an enjoyable experience for students
- Students should develop general scientific skills such as hypothesis testing, control of variables, along with interpreting and drawing conclusions from their own experimental data.
- Conceptual difficulties should be clarified based on their experience in the laboratory.
- Students should carry out quasi-independent investigations.

Overall feedback has shown that the labs were overwhelmingly a positive experience for students. This talk will present an overview of the labs, where it has been successful and aspects that need to be changed and developed.

## Oral 2 - Enhancing the Conceptual Understanding of Physics Undergraduate Students using the Instructional Tool 'Concept Mapping'

*Joanne Broggy and George McClelland*,
*Department of Physics, University of Limerick; Ireland*
*Email: Joanne.Broggy@ul.ie*, *George.McClelland@ul.ie*

In recent years there has being extensive research carried out to evaluate and highlight the declining number of graduates from science related courses. Following this several initiatives have being designed and implemented throughout the country to combat the problem of low retention rates in undergraduate science degrees. One of the main challenges of the first year university physics teaching is to capture students' interest on physics and get them engaged on the physics studies.

The search for new and ‘authentic’ methods to teach students is underway. One potential method is “Concept Mapping”. This method was utilised in this study which was carried out in the University of Limerick. Concept Mapping is a recent instructional tool introduced for the improvement of teaching and meaningful learning[1]. This tool involves students representing their understanding of scientific concepts in a graphical nature. The cohort involved within this study was a group of first year undergraduate students who were taking the Physics module; Sound and Light.

Training was provided at the beginning of the module to enable to students to clearly understand the method of construction. Throughout the semester students were asked to construct three maps. The module was also delivered through Concept Maps where they were used as ‘advanced organisers’. This allowed students to identify the relationship between concepts and also provided a reference from the beginning. Within this research, particular attention was posed on the effectiveness of the tool on student learning. Among the results obtained the authors will mainly discuss the students’ attitudes to the tool and the effect it had on student conceptual understanding.


1. Novak, J.D. and Gowin, D.R. (1984). *Learning How to Learn*, New York: Cambridge Press.


## Oral 3 - Development of a New First Year Physics Laboratory Teaching Methodology to Teach and Test Core Competencies and Fundamental Physics Concepts


*Siobhan Daly & Cathal Flynn*
*School of Physics, Dublin Institute of Technology, Kevin St., Dublin 8*
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The principal role of the laboratory programme is to compliment the classroom teaching, reinforce fundamental physics concepts and increase the proficiency of students in measurement techniques, instrumentation, data analysis and critical thinking. At the end of the laboratory program all students should be able to demonstrate a minimum proficiency of core competencies. The comprehensive survey of the core competencies acquired by first year students after the first year of physics laboratories has been carried out and the results of this survey are presented. The findings of this survey informed the development of a new first year laboratory manual which is designed to test student understanding of key physics concepts and basic laboratory skills acquisition. The template and reasoning behind this new manual is presented. A training programme for all staff involved in the delivery of year one physics laboratories has also been developed and will be outlined. This new strand of learning and teaching will be implemented into the year one laboratory over the academic year 07/08 for all science students. Throughout the academic year, the progress, skills base and engagement of students will be monitored and compared to our current experience.

## Oral 4 - Presenting Newtonian Gravitation

*Martin Counihan*
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The basic principles of the Newtonian theory of gravitation are presented in a way which students may find more logically coherent, mathematically accessible, and physically interesting than other approaches. After giving relatively simple derivations of the circular hodograph and the elliptical orbit from the inverse-square law, the concept of gravitational energy is developed from vector calculus. It is argued that the energy density of a gravitational field may reasonably be regarded as $-g^2/8\pi G$, and that the inverse-square law may be replaced by a Schwarzschild-like force law without the need to invoke non-Euclidean geometry.

## Oral 5 - An Investigation of Student Peer Leaders in an Undergraduate Physics Course

*Jennifer Johnston and George McClelland*
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*E-mail: Jennifer.Johnston@ul.ie, George.McClelland@ul.ie*

This paper aims to investigate student Peer Leaders performance in a Peer Learning program in Physics at the University of Limerick. Peer Teaching offers potential benefits to Peer Leaders, including opportunities to develop skills in teaching, leadership and group management. Using mixed methods, both quantitative and qualitative data on students' conceptual understanding and attitudes towards physics were collected. The Peer Leaders selected for this program were third year undergraduate Science Teachers (N = 10) who had direct experience of the undergraduate Physics course. Their responsibilities included training in how to become an effective Peer Leader, preparing and planning weekly tutorials, creating a cooperative learning environment and facilitating learning during the tutorials. Introductory Physics students worked cooperatively through challenging exercises, which were specifically designed to enable students to share the problems by working in groups, pooling ideas and making collaborative decisions. Qualitative data reports the value of becoming a Peer Leader in relation to the development of their teaching skills and the change in conceptual physics knowledge. The Peer Leaders' response on the change in their conceptual understanding is reported. Effective Peer Learning worksheets, motivation to work, and good communication abilities were found to contribute to the positive performance of the Peer Leaders. Time constraints, pressure of their own course work, and a lack of confidence in their physics knowledge hampered the Peer Leaders success.

## Oral 6 - Peer to Peer Tutorials – If we Can't Teach Them Maybe We Can Get Them to Teach Each Other

*Peter Sneddon*
*Department of Physics & Astronomy, University of Glasgow, Glasgow*
*Email: p.sneddon@physics.gla.ac.uk*

Over the past eighteen months, the Department of Physics and Astronomy at the University of Glasgow has been running a series of "Peer to peer" tutorials for level 1 and level 2 undergraduate students. At these tutorials, honours level undergraduates – from levels 3 and 4 – act as tutors for the younger students. They provide assistance with set examples from the course work as well as providing general information and advice on other matters relating to life as a Physics undergraduate. These older students are better placed than academics to let the students know what *really* lies ahead for them.

In this presentation I will summarise the successes, and problems, with these peer to peer tutorials, based on feedback received from both the tutors and tutees. Briefly, the successes are two-fold: from the tutors point of view the tutorials have proven to be an excellent opportunity to learn how to teach their subject. Indeed, they have gained a better understanding of their subject through that teaching. The level 1 and 2 students have also expressed positive views about the tutorials, liking the opportunities to speak to their predecessors, as well as getting away from the academics. On the down side, though, attendance at these events has proven low – these tutorials act as purely voluntary, formative assessment exercises. They could be an excellent way to help the less able students, but these may not be the students attending the sessions.

## Oral 7 - Learning to be SUPA

*David Crooks, Sean Farrell, Karon McBride, Avril Manners*
*SUPA, the Scottish Universities Physics Alliance.*
*The authors are resident in Glasgow University, Edinburgh University and Heriot-Watt University*
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The Graduate School of SUPA, the Scottish Universities Physics Alliance, runs a portfolio of lectures that includes level 5 undergraduate courses. Through this inclusion, the experience of the undergraduates is enriched and the transition to postgraduate studies enhanced.

SUPA was created to place Scotland at the forefront of research in Physics through an agreed national strategy, an inter-institutional management structure, and co-ordinated promotion and pursuit of excellence. The Graduate School is both a key integrating component of the Alliance and a major structural change in the provision of advanced and coordinated research training in Scotland.
The lecture courses of the SUPA Graduate School are delivered primarily using seven videoconference suites located in the Universities of Edinburgh, Glasgow, Heriot-

Watt, Strathclyde, Paisley, St. Andrews and Dundee. This allows students across these institutions to access high quality teaching covering a wide range of themes in physics. These themes are currently Astronomy and Space Physics, Condensed Matter and Material Physics, Nuclear and Plasma Physics, Particle Physics, Photonics and Physical and Life Sciences.

In addition to the videoconference facilities, the Graduate School uses a virtual learning environment called My.SUPA, based on Moodle, to enhance the learning experience of the students. This VLE is also used for many administrative tasks relating to the courses and for communications with the students.

We report on the experiences from our first full year of operation and the development of the project using an action research approach. This subject is particularly relevant for those involved with inter-university pooling initiatives, especially those at the planning stages who may benefit from our initial findings.

## Oral 8 - A New Approach to Undergraduate Physics for Trainee School Physics Teachers

*Sarah Symons and Derek Raine*
*PiCETL-Leicester (the Physics Innovations Centre for Excellence), Department of Physics and Astronomy, University of Leicester*
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As part of a Teacher Development Agency initiative, PiCETL-Leicester (the Physics Innovations Centre for Excellence in the Department of Physics and Astronomy at the University of Leicester), in collaboration with iTeach, is responsible for the development of e-learning materials for trainee specialist physics teachers to form a module in an online PGCE course. These problem-based distance learning materials are informed by our experience of using problem-based learning in undergraduate courses. Our aim is not only to refresh undergraduate physics knowledge, but also to provide real-world backgrounds to physics concepts which can be transferred to classroom use.

We shall describe some features of our approach, report on feedback from the first cohort of students, and reflect on the challenges of increasing "physics confidence" in teachers to help them make the subject attractive and relevant in the classroom.

## Oral 9 - A Study of Students' Problem Solving Approaches in Physics

*Laura N. Walsh, Robert G. Howard, and Brian Bowe*
*Physics Education Research Group, School of Physics, Dublin Institute of Technology, Dublin*
*Email: laura.walsh@dit.ie*

This presentation will describe the research findings from a study that investigated students' approaches to quantitative and qualitative problem solving in physics. This empirical study was conducted using a phenomenographic approach to analyse and interpret data from individual semi-structured problem solving interviews with 22 introductory physics students. The result was a hierarchical set of categories that describe the students' problem solving approaches in the context of introductory physics. The descriptions represent the qualitatively different ways in which students approach problem solving, which can be represented by four main categories; scientific, 'plug-and-chug', memory-based and no clear approach. The 'plug-and-chug' category was further split into two sub-categories, structured and unstructured. These categories will be clearly described within the presentation and examples provided. The researcher has presented the findings of a parallel research study, at previous Physics Higher Education Conferences, which examined different stages of conceptual knowledge. This presentation will discuss the outcomes of the two studies in order to examine relationship between a students' conceptual knowledge and their approach to problem-solving.

## Oral 10 - A Study of Students' View on Learning Physics Through Problem Based Learning.

*Robert G. Howard and Brian Bowe*
*Physics Education Research Group, School of Physics, Dublin Institute of Technology, Dublin*
*Email: Robert.howard@dit.ie*

This presentation will describe the views of first year physics students on learning physics through a Problem Based Learning (PBL) approach. Their views of working in groups, the advantages and disadvantages of PBL, and their views on their learning process will be presented. This work will be presented by the first year physics students and as such will be a true reflection of the students views.

## Oral 11 - e-Submission, Marking and Return of Physics Assignments

*Craig McFarlane*
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Electronic submission and return of tutor-marked assignments (TMAs) offers many advantages for Open University students, not least of which is the possibility of more rapid feedback. It avoids the delays and expense associated with the postal system and with hand-entry of marks into a central database. For these reasons, eTMAs have become an established feature of OU courses in social science and humanities. However, physics students need to produce assignments containing not only text but also equations, graphs and diagrams. This can lead to problems in producing files suitable for electronic submission. Correspondingly, electronic marking of files poses problems for physics tutors, particularly if the time spent marking is not to rise significantly. With a view to resolving these difficulties and reaping the benefits of e-submission, the Open University πCETL has funded a pilot project, launched in March 2006, involving an introductory physics course, S207 *The Physical World.* Students on this course have the option of producing their TMA electronically and then uploading it to an OU website. Tutors, also known as Associate Lecturers (ALs), download the eTMA, and annotate and mark it using a tablet PC equipped with appropriate software. Finally, the eTMA and an associated file containing submission data, marks and tutor comments are zipped and uploaded to the website for collection by the student and for automatic recording of results in a database. Preliminary results of this pilot study will be presented, and some of the associated technology will be demonstrated. Although the study involves distance learning students, many of the advantages would transfer to physics teaching in conventional, face-to-face HE institutions.

## Oral 12 - Assessment for Learning; Learning from Assessment?

*Sally Jordan*
*The Open University*
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The Open University's interactive assessment system (now called OpenMark) was developed to enable us to give students rapid and targeted feedback on their work. OpenMark supports free text entry of numerical answers (including superscripts), letters and single words and we are now seeking to extend this by providing answer matching and appropriate feedback for free text answers of up to about 20 words. A bank of questions is being developed, using a commercial linguistically based system that is able to distinguish answers such as 'dog bites man' from 'man bites dog'. Student responses to developmental versions of the questions are being used to refine the answer matching.

Analysis of student responses to online assessment tasks can also lead to increased understanding of students' misunderstandings. In an attempt to find out more about the nature of adult science students' mathematical misconceptions, a systematic evaluation of student responses to assessment questions on the course *S151: Maths for Science* has been carried out. Responses to summative End of Course Assessment questions have been found to be more reliable than those to the course's purely formative 'Practice Assessment' and responses to free text questions have been more useful than those to multiple choice questions.

The analysis is enabling us to go beyond an understanding of the sort of mistakes that students commonly make to find the underlying reasons. For example, many errors in finding correct SI units can actually be attributed to difficulties with fractions and the rules of precedence, and students' difficulties with differential calculus can be linked to misunderstanding of proportionality and the interpretation of straight line graphs. Many of the difficulties described will be familiar to experienced physics educators, but the evidence from this systematic evaluation adds weight to the findings. Increased understanding of students' misconceptions is enabling changes to be made to both assessment material and the teaching of the concepts themselves.

## Oral 13 - Supporting the Use of e-Portfolios for Physics Undergraduates

*Tracey Madden*
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In the early 1990s the electronic portfolio, or e-portfolio, began to emerge as an evolution of the traditional, usually paper based, portfolio but taking advantage of the increasing availability of digital media. Interest continues to grow with students and professionals being encouraged (or required, within the health sciences and legal fields) to produce portfolios.
In North America, where e-portfolios first came to prominence, the contents of the e-portfolio tend to focus on evidence of achievement. In UK HE, e-portfolios tend to be used in the context of personal development planning (PDP) so a balance of material is encouraged. The actual contents of an e-portfolio will depend on the student, purpose of the e-portfolio and the intended audience.
At present, there is a perceived lack of discipline based e-portfolio provision with a discipline focus, especially in the sciences. Although there is a publication by the Institute of Physics called 'Designing Your Future' which aims to help students profile their skills and plan future skill development, it is at present only available in paper format.
The Physical Sciences Centre is developing a discipline specific e-portfolio 'framework' for the physical sciences, which will it is hoped also be widely applicable across the other sciences and engineering. This 'framework' is a discipline specific template that provides the appropriate recording mechanism for a student to:

- chart their development from their own discipline perspective.
- structure what the student records, how they evidence their progress and how they reflect on their development in a subject specific manner to which they can relate

A future aim is to develop a postgraduate extension to the framework which will be appropriate for CPD and professional accreditation. Thus the framework will be useful to users from university entry through to eventual accreditation as a chartered scientist.

## Oral 14 - Video Podcasting and *YouTube* Lecture Summaries for a 1$^{st}$ Year Physics Course

*Tom Brown*
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The use of technology is rapidly increasing as a component in the delivery of Physics teaching in UK universities. It seems that almost every day brings a new way of offering content to students which that should enhance the learning experience.

In the work described here, I will demonstrate the rolling out of video lecture summaries for students studying on the 18 Lecture Properties of Matter course at our 1$^{st}$ Year level. The clear aim of this work was to deliver to the students that was complementary to their lectures and that should, in no way, be seen as a replacement to lectures. To strike this balance is a reasonably difficult task and I addressed this by recording video lecture summaries for the students.

A key goal was to ensure that the preparation burden for the lecturer was minimised. In order to do this, full use was made of the *iLife* software package available on Mac OS X. This allowed seamless production of video, compression to appropriate size for web delivery and posting to a web site. I estimate that the total production time for each delivery from first filming to web publication was less than 20 minutes.

A major task was to ensure that students could use the videos as best suited them. In order to achieve this, two major distribution routes were taken, a video podcast site through which students could automatically subscribe through *iTunes* or similar software and delivery through *YouTube*. A third stream also came on line later in the course when a mechanism to deliver video simply through *WebCT* was also obtained.

I will also discuss student reactions to the material obtained through a survey at the end of the course and suggests updates and improvements to the work that can be taken when the course is delivered again next year.

## Workshops

**Workshop 1** **Combining Assessment and Learning: Creating Useful Questions with Feedback for Computer-based Assessment.**

**Workshop 2** **Enterprising Physicists**

## Workshop 1 - Combining Assessment and Learning: Creating Useful Questions with Feedback for Computer-based Assessment.

*Dick Bacon[1], Antje Kohnle[2], Bruce Sinclair[3]*
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*Email: r.bacon@surrey.ac.uk,*
*2 School of Physics and Astronomy, University of St Andrews.*
*Email: ak81@st-andrews.ac.uk*
*3 School of Physics and Astronomy, University of St Andrews.*
*Email: b.d.sinclair@st-andrews.ac.uk*

Solving problems is an important and substantial part of the educational experience of physics undergraduate students, and increasing use is being made of electronic systems to set questions and mark student answers. Designing useful questions and feedback that will contribute to the student's learning experience is however not straightforward. This workshop will address this problem, providing a structured approach to the process as well as giving participants a chance to design their own questions.

The workshop will introduce Bloom's taxonomy of learning objectives and give examples of questions testing a range of cognitive skills. We will explore what makes a useful question and feedback by giving examples of "good" and "bad" features in questions and illustrating common design errors. Questions based upon different types of user interaction will be illustrated and discussed, and the ways in which a question can change its purpose when presented in different ways will be explored.

A semi-formal method for designing questions will be introduced which participants can then try out to create their own questions. Following group discussion of these, participants will be given the opportunity to refine their questions if time permits, possibly using more advanced question types.

## Workshop 2 - Enterprising Physicists

*Kevin Byron*
*Physical Sciences Centre, Chemistry Department, University of Hull, Hull HU6 7RX*

*Email: kevin.byron@ntlworld.com*

The workshop introduced a learning resource that has been designed to help academics teach entrepreneurship and enterprise to undergraduate and postgraduate students. The participants took part in an activity 'The Journey of an Idea' which required creativity and imagination to develop a new product from material with novel properties.

The learning resource is available on a CD. It comprises a number of interactive activities that can be delivered via a one day workshop or over a semester long module and foster a creative approach to developing ideas.

The areas covered in the resource are:
1. Finding the Idea: Identifying Discontinuities and Gaps, Idea-finding (Creativity)
2. Shaping the Idea: Solution-Finding, Idea risk assessment
3. Protecting the Idea: Patents, Copyright, Registered Design, Trade-marks
4. Selling the Idea: Types of Business, Writing a Business Plan
5. Funding the Idea: Funding Sources, Cash Flow, second year Forecast
6. Presenting the Idea: Influencing skills, Presentation skills
7. Launching the Idea: Problem solving processes

All handouts and tutor notes are provided with sufficient detail and supporting materials to enable a non-expert to deliver an effective course.