Using Student-Generated Content and Peer Support to Enhance Student Engagement and Learning
University of Manchester, 16th May 2012

This meeting shared practice with regard to ways in which students can take ownership of their learning and learn by working with their peers. The meeting was organised by Marion Birch (University of Manchester) for the Higher Education Group of the Institute of Physics, as a Higher Education Academy (HEA) sponsored workshop. Paul Yates (HEA) started things off with a reminder to the 40 or so people present that the HEA not only supports meetings such as this one, but also can provide grants for relevant education developments. The discipline and activity themes within the HEA provide a range of events and resources.

Peer Assisted Study Sessions

Maggy Fostier (Manchester Life Sciences) reported on Manchester University’s approach to PASS (Peer Assisted Study Sessions) The UK National PASS Centre is based at Manchester and run by Marcia Ody. It was established in 2009 and has so far provided training and advice about PASS to 30 HE institutions in the UK and Ireland. PASS originally started in the USA. PASS has senior undergraduate students (leaders) facilitating non-compulsory group sessions where entrant students (participants) can discuss their work in a safe and collaborative environment. These timetabled sessions are 50 minutes long and address what the participants decide to address, which may include reviewing content, discussing understanding of material, critical questioning of each other, and discussing aspects of the transition to university life. One aim is to increase the confidence of the students and help them become more independent learners with less of a focus on just doing what they think is needed to pass exams. The senior students are told specifically not to “teach” the junior students, but to encourage discussion amongst the participants, always striving for active learning. The aims are to assist the transition to study at university, to improve the academic performance of participants, to be another mechanism for student-staff communication, and to provide development for the PASS leaders. The leaders are volunteers from second and third year. They receive ten hours of training in facilitation, mentoring, and basic education theory. Each PASS session has two leaders so that they can support and mentor each other. Fifteen students are invited to a particular session. The sessions should be fun, and are aimed to be of benefit to all participants, including the most able ones.

Maggy explained that in the first year of operation of her scheme it was not possible to offer PASS to all students all year, so some were able to take part in first semester and some in second. This gave a control group to see what effect the scheme was having. In first semester of those (158) who were not permitted to take part in PASS 47% failed the challenging module supported by the scheme, and the mean mark was 42%. Of those who were offered the opportunity to take part but did not do so 44% failed. Of those who attended only 1-3 sessions 41% failed, but of those who attended 4 or more sessions only 22% failed. The mean marks of those three sections were 45%, 45%, and 53% respectively. In future years when all the students were able to attend the sessions there was still a strong correlation between those who attended numerous sessions and higher achievement.

In Manchester the leaders do not get payment or credit for their work leading the sessions, but they are able to use this as part of their PDP.

http://www.tlso.manchester.ac.uk/students-as-partners/peersupport/pass/
**Student generated content and peer review in the laboratory setting**

Chris Dewdney (Portsmouth Applied Physics) is developing a new programme in applied physics with strong interactions with local physics-based industry. As part of this development four students were employed for two weeks in the summer to develop interactive and open-ended laboratory work. They identified problem areas, suggested how these could be presented to students, searched for resources online and elsewhere, created instructional videos, and wrote lab scripts. In first year the students get some prelab work to prime them, then each investigation session lasts for three hours. Chris set up peer review sessions where constructive criticism of the labs was encouraged. An example of a session was on LC circuits. The students were taught how to use LabView for data acquisition, and were then given freedom on how they wish to investigate the topic in the lab.

**What happens when you let students write their own MCQ assessments: a case study using Peerwise**

Simon Bates (Edinburgh Physics) told the meeting about Edinburgh’s use of Peerwise in first year physics. Peerwise is a free online tool through which students can create multiple choice assessments and answer those created by their peers. By getting students to create their own good quality questions and explanations their educational experience moves up Bloom’s taxonomy and encourages a more student-driven learning experience. The social-media aspects of the experience also seem to be attractive.

Peerwise was created by Paul Denny (University of Auckland) and is now used in hundreds of institutions worldwide, though any student sees just their course’s part of it. There is an easy-to-use interface, which includes a maths editor and the ability to include diagrams. At Edinburgh, students were given a substantial introduction to the writing of quality questions and answers, including group work, with the tool, and were guided to write questions that would take participants into their zone of proximal development. They were required as part of their summative assessment to create one question, answer five, and comment on three more. The students did not find writing questions easy, and they reported spending two to three hours on each question.

Simon showed the example of one question where the student author had set up a nice scenario, but had got the answer wrong. The teaching team had decided earlier not to intervene, but were monitoring activity. In a fairly short time another student had discovered the problem and suggested a solution. This student then collaborated with the original author to create a corrected version. Looking at the responses of students showed that many students selected the same “wrong” answer, meaning that the original author had usefully found a strong misconception that this question could now test for.

Many students did a lot more than the minimum amount of work required, and created questions of good quality. In most cases they created genuine problems rather than single-step exercises or factual recall. There was a strong correlation between enhanced PeerWise activity and end-of-course attainment, for students of various abilities.

A summer-student was employed to evaluate the questions and to classify them in terms of levels in Bloom’s taxonomy. Most questions required higher order cognitive skills to answer them, and the explanations were generally very good. The scheme ran again this year, and preliminary results are encouraging. There has been a trial this year also at the University of Glasgow with promising looking results.


Stimulating authentic learning experiences through a Peer Learning programme: An analysis of Irish undergraduate physics students

Jennifer Johnston (Limerick, NCE-MSTL) noted that research shows that the greater the student’s involvement, the greater is the amount of student learning and personal development (Astin 1999; Bloom 1974; Whitman 1988). There is strong evidence from international research that Peer Learning, when implemented successfully, is effective. Peer Learning can be easily incorporated into the present structure of teaching sciences. It is cost effective and provides students with the opportunity to take responsibility for their own learning.

Jennifer’s presentation focused on a model of Peer Learning that was implemented in tutorials and support tutorials in Introductory Physics at the University of Limerick. The leaders were student teachers who volunteered for this role, and the participants were first year students. Both groups seem to benefit from the experience. The leaders, who were not always those with highest attainment, were trained by Jennifer, and met with her each week for ten weeks in order to discuss what was planned for each tutorial. As with the PASS scheme the leaders were meant to facilitate learning rather than re-lecture material.

To evaluate the programme leaders undertook a concept test, filled in questionnaires, and some were interviewed. Students in the discipline support tutorials did a pre- and post-survey, and also completed the Force Concept Inventory and related tests. Students attending the support tutorials, which had a significant fraction of mature students, also did pre- and post- tests. All the peer leaders showed improvements in their understanding of the material through taking part in this activity, though some conceptual misunderstandings were not changed. The students liked the relaxed atmosphere of the tutorials and the interactivity. One thought that they were “too messy” and wished to have instead a mini-lecture on how to solve a particular tutorial example – some still need to realise the aim of the tutorials. Overall the experience was positive for both students and leaders.


Three Case Studies in Student Generated Physics Learning Content

Sam Nolan (Durham Physics) commented that every educator learns from experience: teaching a subject deepens our understanding and appreciation of it. Therefore many see the creation of student generated learning-content as essential in enhancing the student’s learning experience. However there are risks associated with this approach: will the content be correct, will the content be accessible, and how will the student react if the materials are criticised?

This talk looked at three case studies in student generated content in physics at Durham University. The first involved those who had recently completed a laboratory module creating “Interactive Screen Experiments” (ISE) to help future students in pre-lab work. Within first year classes there is a range of previous experience in experimental physics, depending on the resources of the school that the students had attended. ISEs are made up of many photographs of real experiments, threaded together in (for example) Flash to allow students to explore the instrumentation or the physics involved. The student authors develop a range of useful skills, and are uniquely placed to understand the difficulties of current students. 70% of those using the ISEs responded positively to a question asking if the ISEs helped in their understanding of the experiment.

The second case study involved fourth year project students creating teaching materials for local schools to use with GCSE classes. Sam used his experience with the Cherenkov Telescope Array project to assist his students in developing lesson plans in this area. The students drove the project, increased their knowledge of pedagogy, and
developed a range of useful skills. The school teachers reported that the material produced was good, and liked the fact that the material had been quality controlled by the university.

The third case study involved the development of a glossary of technical vocabulary for foundation year students. A summer-student put together a Wiki and started populating it. The foundation students then expanded the glossary, including putting in links to online resources that they had found useful. When contribution to the glossary was part of a summatively assessed assignment all the students contributed, and about half continued to do so when it became purely formatively assessed. The resource is being heavily used now during exam time.

Peer to peer tutorials – broadening the skills of undergraduate physicists

Peter Sneddon (Glasgow, Physics and Astronomy) discussed Glasgow’s use of students in years three to five tutoring students in years one and two. This development was carried out with support from the HEA Physical Sciences Centre. Peter commented on different definitions used for peer tutoring (Topping 1996, Colvin 2007). The Glasgow scheme uses senior students to lead tutorials for junior students. Here the tutorials covered questions set by the course lecturers. Attendance by the junior students was voluntary, and the scheme was fairly “light touch” with four tutorials per class per year.

The aims included helping first and second year students revise material in preparation for assessments, integrating first and second year students more into the department, and helping tutors develop teaching skills and a better understanding of core physics. Colvin (2007) described goals of reducing hierarchical structures, motivating students and tutors, and empowering student tutors. Topping (1996) suggested that peer tutoring helps the tutor think at a high level and improves their knowledge. Benware and Deci (1984) did a controlled experiment with two groups, where one set had tutors learning to how to tutor the material (as well as learning it themselves) and the other set purely learning to pass exams. The former group had higher attainment in the exam. In the Glasgow study all the tutors felt that tutoring had improved their understanding, made them more confident in their abilities with the material, gave them satisfaction, and helped them feel more part of the School. These were desirable changes, and were achieved with little input from academic staff members.

Topping, K., (1996), Higher Education, 32, 321

Using Peer-Assisted Learning in Maths and Physics in HE in Sweden and Russia

Elena Luchinskaya (Lancaster and Leeds) told us about her studies of two peer-tutoring systems in mathematics and physics education in two contrasting settings. The first setting was a traditional classroom environment in a Moscow secondary school with a teacher-centred educational process and the second one was in University West, Sweden, where a range of student-centred teaching and learning methods had already been introduced.

After a series of peer-assisted learning (PAL) sessions a questionnaire was distributed and in-depth interviews with the peer tutors were conducted. The analysis of the impact of PAL on the students’ learning experience showed that the majority of students positively evaluated their PAL experience. The students felt that they were more actively engaged with, and more in control of, the PAL process compared with traditional tutorials. The study demonstrated that the size of the groups, and the timing and the number of PAL sessions were crucial for successful PAL implementation.
Students asking for more work? Surely not! - Radio survey of the Milky Way

Samuel Richards and Glen Rees are undergraduate students at the University of Hertfordshire. In the second year of their studies they considerably extended their work in radio-astronomy on a self-directed project.

As part of their astronomy programme they used the facilities at the Bayfordbury Observatory, which has six optical telescopes, a 115m baseline radio interferometer and a 4.5m radio dish. One study looked at the 21 cm emission from atomic hydrogen. With consent from academic staff they decided to extend this work to do a complete map of the intensity of this emission across the Milky Way disc that is observable in the northern hemisphere, and also created velocity-longitude plots. This involved a 26 hour stint at the observatory, but they felt that they got much more learning out of this than just following a scripted experiment. They had to plan the observations from start to finish, and take responsibility for some expensive apparatus. The department allowed them to use this project as part of the assessment on their course. The experience they felt had also helped them gain year-long placements in Australian research institutions. They recommended encouraging this exploration with appropriate support, perhaps by requiring more mini-projects during the course of the degree. They suggested that it would be useful for departments to organise more in the way of visits to research and industry and visits by staff from potential future employers, helping remind students why they were studying on a given degree programme. Their project furthered their understanding of the galaxy in which we live and is one that can be used by future students as either a template for observations or as archival data.


Noah Finkelstein (University of Colorado) gave a fascinating presentation via video-conference. Noah is part of a large programme of physics education research (PER). He noted that education in STEM subjects is very important for nations, but that in the USA two thirds of those teaching physics in schools do not have a major or minor degree in physics. There is a real need to get more and better qualified physics students into the teaching profession, in the hope that this will improve the population’s skills and knowledge of this important area. While some institutions may teach their first year classes to encourage entry into PhD physics, it must also be important to prepare the next generation entering the general workforce, including teaching. PER gives evidence of better ways in which to get students to learn. Enthusiasm for reformed teaching methods has increased since work on the Force Concept Inventory showed the small gains obtained through traditional lectures and the much greater gains that can be achieved through more interactive techniques. The Colorado Learning Attitudes in Science Survey (CLASS) has looked at student viewpoints, and found that they frequently get less like those of experts during the first year of conventional teaching.

More interactive teaching such as that of SCALEUP (MIT) and Tutorials in Physics (Washington) can have significant benefits. As part of this programme Colorado uses undergraduate learning assistants (LA) in small-group interactive tutorial sessions. Rather than having one instructor and one teaching assistant deliver material to a large class, much learning is undertaken by students in groups of four supported by LAs and the instructor. The LAs meet weekly to discuss the content of the interactive sessions and the pedagogy used. Their practice of these techniques with students gives them useful experience, supports the other students in their learning, and provides feedback to the course organisers as to where the students are experiencing difficulties. This seems to be a positive experience, with students, LAs, and instructors showing improvements. Student demonstrate dramatically increased learning gains – two to three times the national average of traditional courses as measured by the Force Concept Inventory and similar tests. In the CLASS attitude survey there was no significant drop during first year instruction, and for the LAs there were significant gains. There is also the highly desirable side effect of more students going on to become teachers, and evidence that the future teaching by these students is more student-centred than would otherwise be the case.
The department has many applicants to be LAs, and so can recruit just the best and brightest for this activity. LAs can get paid or get credit in different versions of this programme, which has now been rolled out to other subjects. Many of the LAs go to graduate school, where they do better at helping undergraduate students learn.

Since its inception in 2003, the team has supported roughly 1,000 undergraduate Learning Assistants, has increased the pool of well-qualified STEM teachers in schools by a factor of approximately three, engaged scientists significantly in the recruiting and preparation of future teachers, and improved the introductory college courses so that students' learning gains are typically double the traditional average.

per.colorado.edu
laprogram.colorado.edu