Engaging Students in research and inquiry in the first year and introductory courses

Undergraduate research at the University of Gloucestershire, UK begins at induction

In 2007, over 650 students in the Faculty of Education, Humanities and Science undertook discipline-based inquiry projects during induction week. This involved them working in small groups to collect information from the library and in the field, analyse it, present it to tutors in novel ways and receive formative feedback. For example, the human geographers and the sociologists researched the experience of Gloucester residents of ‘the Great Flood of 2007’. The biologists and the psychologists investigated primate behaviour at Bristol Zoo. Other faculties in the University are developing their own versions of undergraduate research as part of induction. It has also proved a significant staff development activity both for the many academic tutors involved in designing inquiry-led activities and for the library staff who changed their approach to library induction to support the specific student research projects.

Further information: www.resources.glos.ac.uk/ceal/pre-induction/index.cfm

Inquiry-based learning introductory course for Social Sciences had a significant impact on students’ subsequent performance at McMaster University, Canada

McMaster University has been running a first-year course for Social Sciences based on inquiry since the late 1990s. It is typically taught in groups of no more than 25 students assigned to an instructor, who are subdivided into groups of four or five students. All of the groups have the same curriculum, reading material, process of assessment and goals that are outlined in a detailed compendium. The classes meet for 12 three-hour concurrent sessions. Class time consists of a combination of exercises and tasks for building the students’ critical abilities and time for students to share ideas about their individual inquiries with other students. Students investigate aspects of a broad social science theme, such as ‘self-identity’, and address a common inquiry question, such as: ‘Why do images of ethnicity, race, gender, sexuality, age, class, or abilities help to create aspects of personal and community identity?’ Students have to propose their own inquiry question, such as: ‘Why do some children apparently become violent after watching violent cartoons while others seem to be unaffected?’ They have to justify why the question was important in relation to existing literature. They then investigate the question through a process that involves developing and testing hypotheses using secondary sources. As detailed in section 8, there is strong research evidence of the positive impact of this inquiry course on the subsequent performances of students at McMaster University.

Further information: Justice et al. (2002, 2007a, 2007b, 2009); socserv2.mcmaster.ca/Inquiry/CourseOutline.htm
Introduction to writing research and contemporary cultures at Miami University, Ohio, US

Students in the first-year core course in ‘Writing and Cultures’ investigate how the forms of writing, and the methodologies for researching writing and culture, are being transformed through web-based communication. Through this reading and writing intensive seminar, students investigate how digitised technologies are transforming the forms of writing and communication. The course culminates in a group assignment where students, using secondary and primary sources, investigate an aspect of contemporary culture (e.g. dating, shopping) and how the forms of communication are being reshaped by the internet. They produce a multimodal website that includes text, digital images, audio and video. The course fulfils institutional requirements for the liberal education goal of critical thinking.

Further information: www.users.muohio.edu/mckeeha/h101-09; www.users.muohio.edu/mckeeha/h101-09/final_project.html; www.units.muohio.edu/led/principles.htm

Psychology students research students’ quality of life at York St John University, UK

First-year Psychology students undertook an eight-week project in which they collected data from themselves and three other students using four short inventories and a biographical questionnaire in order to research topics related to students’ quality of life. This project provided students with the opportunity to collect ‘live’ data, contribute to a developing database, select data for analysis and write up findings. The topics available for selection by students were linked to the research interests of the lecturer, making the project mutually beneficial. A departmental technician provided assistance with questionnaire design, the development and maintenance of a database, data entry and tutoring on some portions of the project.

Further information: www.psychology.heacademy.ac.uk/html/teach_land.asp?id=596

Inquiry-based learning in first-year Information Management at the University of Sheffield, UK

‘Inquiry in Information Management’ is a first-year, second-semester core module with an enrolment of about 30. The course aims to induct students into learning as a community of researchers in a professional applied discipline. Students work in groups on research projects from generating their own valid, practical and worthwhile research questions (e.g. student awareness of the environmental impact of mobile phones) through to presenting findings at a research ‘mini-conference’. Work on these projects starts in the fourth week, following a series of preparatory workshops, which include exploring their conceptions of ‘research’ and how to pose and investigate research questions in Information Management. In the final week, guests at the mini-conference include PhD students, lecturers and researchers, and the Head of Department. All guests contribute to assessment of research
posters, using criteria that the first-year students on the module have established previously in collaboration with module tutors.

Further information: [www.shef.ac.uk/cilass/cases/informationmanagement.html](http://www.shef.ac.uk/cilass/cases/informationmanagement.html); Cox et al. (2008)

**All first-year biologists have research experiences at Cornell University, US**

The ‘Explorations Program’, which has been running since 1991, introduces Biology first-year undergraduates to research by Cornell faculty in the context of a course of 700 to 900 students. Large-scale funding has created 100 to 120 ‘experiences’, each of approximately three to four hours, for groups of six to eight students. Most are designed to introduce students to the kinds of research problems on which the faculty member works. Programmes take place both in research labs on campus and at field sites near campus. The programme is structured so that each student is required to participate in one ‘Exploration’ per semester. For example, recent explorations have varied from ‘how do you tell if animals have color vision?’ to ‘why do sperm whales swim in circles?’

Further information: [www.reinventioncenter.miami.edu/Spotlights/spotlight.html](http://www.reinventioncenter.miami.edu/Spotlights/spotlight.html); [biog-101-104.bio.cornell.edu/BioG101_104/explorations/explorations.html](http://biog-101-104.bio.cornell.edu/BioG101_104/explorations/explorations.html);

**Improving interactions between first-year science students and researchers through an informal networking program at The University of Queensland, Australia**

The Undergraduate Science Students Experience in Research (USSER) Network is an extracurricular program welcoming first year undergraduate science students to the research culture of The University of Queensland (UQ) from their first semester. The primary aims are to increase the frequency and quality of interactions between undergraduate science students and UQ researchers, to help students understand what a career in research entails, and the specific research being conducted by scientists at UQ. Of the three components to the USSER Network (lunches, tours and placements), the main component is the “Meet the Researcher” lunches, during which researchers meet with groups of undergraduate students over informal lunches each semester. These lunches take a round robin a ‘speed dating’ format, where 3-5 students and a researcher have a 10-15 minute conversations about research and career paths. Once time is up, the researcher moves to the next table to meet with a second, and finally, a third group of students. At the end of these three rounds, each researcher provides a short biography for the entire group, and students are able to mingle with the researchers they have common interests with for the remainder of the lunch. The design has been shown to foster conversations amongst small groups, and thus provide numerous, personalised interactions between the researchers and over 100 new science students at each event. In addition, students are invited to undertake guided tours of research facilities on the campus, and are supported in gaining work experience with research groups through a placement program.

**1,000 biology students are involved in research at University of Sydney, Australia**

First year Biology students at the University of Sydney contribute to the understanding of the prevalence of asthma in Sydney. Each student learns to pour an agar plate which they take home and expose in their back yard over a 10 minute period, to collect a sample of airborne fungal spores in the atmosphere. There are 1000 students in the class and they live all over the Sydney metropolitan area. Once the fungi collected have grown into colonies, students learn to use a key to identify the fungi, and the class results are converted into maps showing the distribution of the different species. This generates new knowledge, which they discuss online with an international expert, and which is fed into research programs on allergens. The students involved reported a better awareness of research, and their involvement in it, than students involved in a practical course which had a traditional textbook demonstration practical exercise. Dr Charlotte Taylor describes a thousand students as an 'ideal' size of research team for carrying out research of this nature.

Further information: Taylor and Green (2007); [http://www.mq.edu.au/ltc/altc/ug_research/research_curriculum.htm](http://www.mq.edu.au/ltc/altc/ug_research/research_curriculum.htm)

**Embedding enquiry-based learning in a skills module concerned with sustainability at Gloucestershire, UK**

‘Skills 4 Sustainability’ is a first year course in which enquiry-based learning is embedded in a personal learning and skills module concerned with sustainability. The module is delivered from weeks 1-12 of the first semester by a team of 8 tutors to c150 students with no formal lectures. Students are organised into tutor groups according to their subject specialism with a tutor with relevant specialist skills. The format varies from week to week including tutorials (commonly consisting of time in the classroom followed by independent time for students to explore topics raised), an organised debate for the whole cohort, and presentations.

The aim is to encourage students to take charge of their own learning and develop a community of enquiry within the group as a whole and in smaller groups within which students work on the main enquiry-based component of the course. This is a project where students enquire into and develop a proposal improving the sustainability of the University which they must research and present as a group. The students are prepared for their enquiry-based project by different activities in the preceding weeks, which encourage students to engage with sustainability through discussion, research into sustainability topics and formulating questions for a Sustainability Question Time debate. Tutors encourage exploration of the skills needed for research and collaborative working and introduce the use of an e-portfolio package to promote reflection and group communication between students and tutors which contributes to the enquiry-based learning (EBL) approach. A module blog is run through the e-portfolio package which further facilitates engagement.
with issues around sustainability and elicits contributions from both tutors and staff, further strengthening the community of enquiry.

There are 3 points of assessment. The first is concerned with researching, retrieving and presenting information on sustainability in a short essay with full references in the Harvard style. The second is the main enquiry-based project with groups enquiring and putting together the proposal for improving the sustainability of the University and presenting it to the group for tutor and peer assessment. Following this, the best proposal from each tutor group goes forward to the Green Dragons’ Den for consideration by an expert panel comprising the University Vice Chancellor, Director of Institute for Sustainability and a local business manager. The EBL activity is designed to engage students with a real-world problem and entrepreneurship. The third assessment, carrying 50% of module marks is the creation of an individual e-portfolio which is built up throughout the module and carried on until near the end of the second semester when it is submitted. The construction of the e-portfolio aids the enquiry process by encouraging students to reflect on sustainability issues, their own position and action they might take to improve their own sustainability, both environmentally and as a learner. Initial research into the first two years of module delivery is favourable with students enjoying the active learning approach and the promotion of independent enquiry.

Further information: Swansborough et al. (2007)

Case studies taken from resource developed for Linking Discipline-based Research and Teaching through Mainstreaming Undergraduate Research and Inquiry, Mick Healey, Higher Education Consultant and Researcher, Emeritus Professor University of Gloucestershire mhealey@glos.ac.uk and Alan Jenkins, Reinvention Fellow for the Reinvention Centre for Undergraduate Research at Oxford Brookes University and University of Warwick; and Consultant for the Higher Education Academy and QAA Scotland, UK alanjenkins@brookes.ac.uk

http://insight.glos.ac.uk/tli/resources/toolkit/resources/reference/Pages/default.aspx;
http://resources.glos.ac.uk/ceal/resources/casestudiesactivelearning/undergraduate/index.cfm