

March 2015. Please bring this handout with you to the session

Engaging undergraduate students in research and inquiry: From first year to final year

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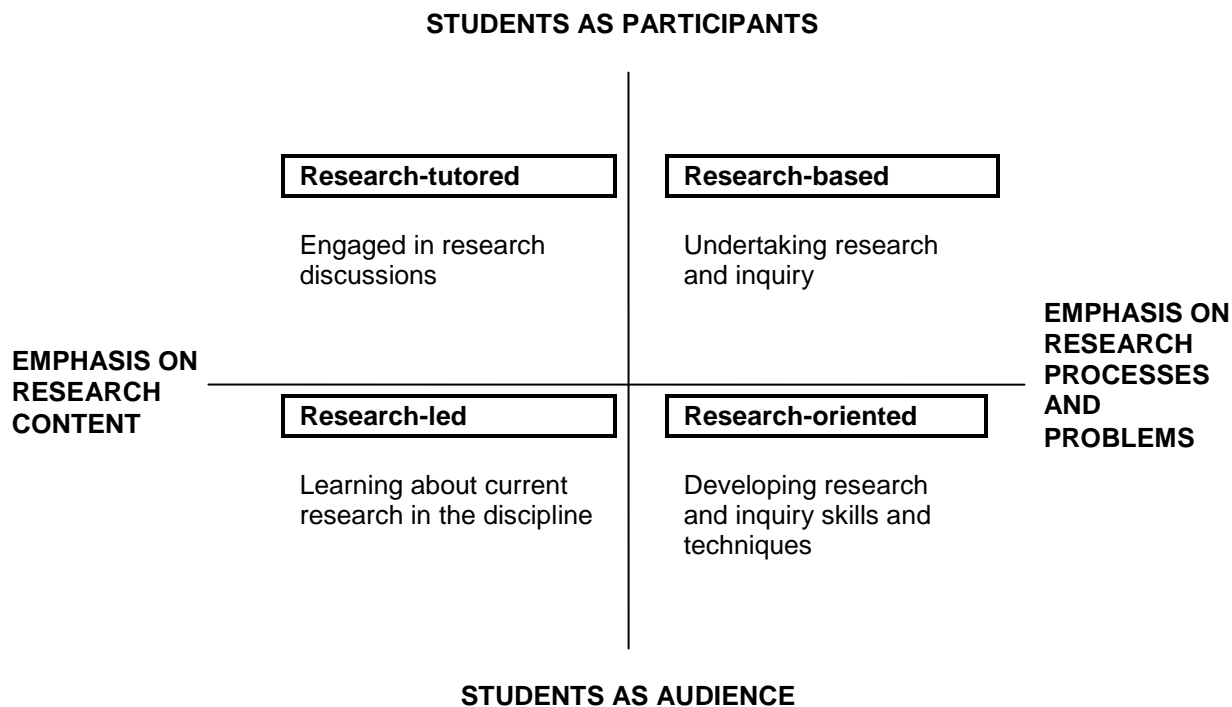
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The material in this handout has been developed over several years with Alan Jenkins, Professor Emeritus, Oxford Brookes University, UK; alanjenkins@brookes.ac.uk. Further and more detailed case studies, including institutional and national examples, references and a list of useful web sites may be found at: www.mickhealey.co.uk/resources. Several of the following case studies are taken from Healey and Jenkins (2009) and Healey *et al.* (2013).

We have found the framework developed by **Griffiths (2004)** effective in supporting staff/faculty to examine both their current courses and institutional policies and practices and in adapting innovations from elsewhere. According to Griffiths teaching can be:

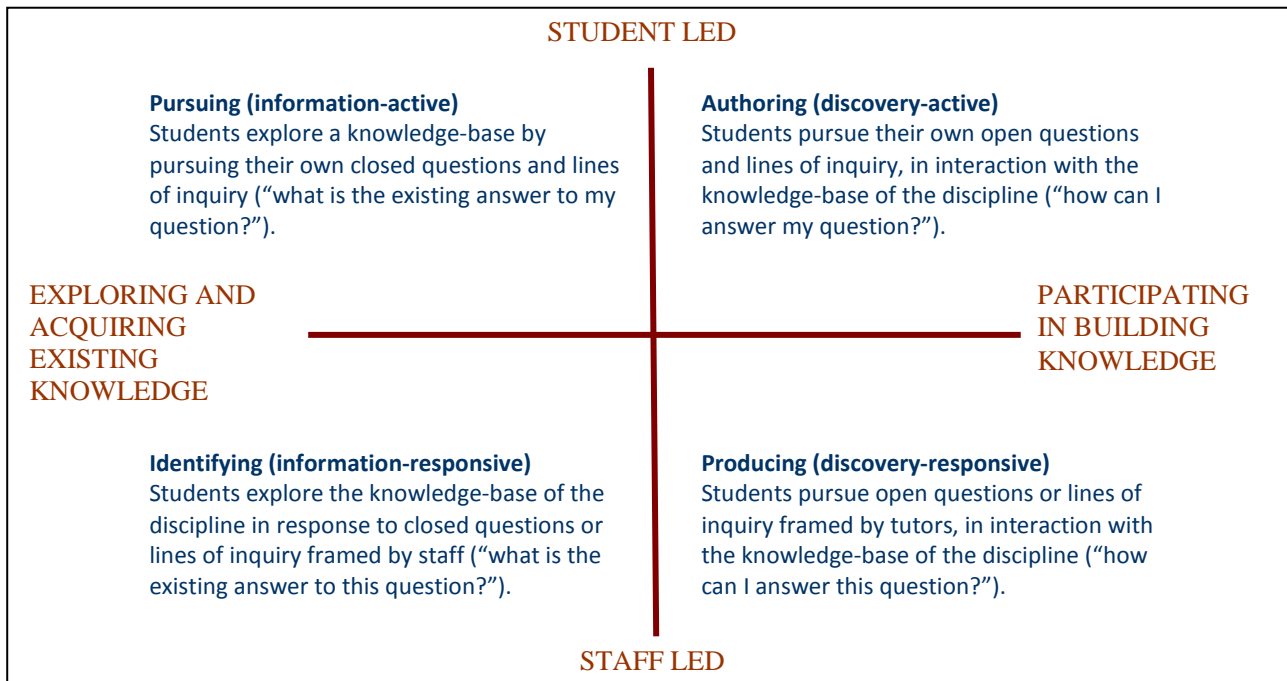
- **Research-led:** where students learn about research findings, the curriculum content is dominated by faculty research interests, and information transmission is the main teaching mode;
- **Research-oriented:** where students learn about research processes, the curriculum emphasises as much the processes by which knowledge is produced as learning knowledge that has been achieved, and faculty try to engender a research ethos through their teaching; or
- **Research-based:** where students learn as researchers, the curriculum is largely designed around inquiry-based activities, and the division of roles between teacher and student is minimised.

Fig 1 Curriculum design and the research-teaching nexus



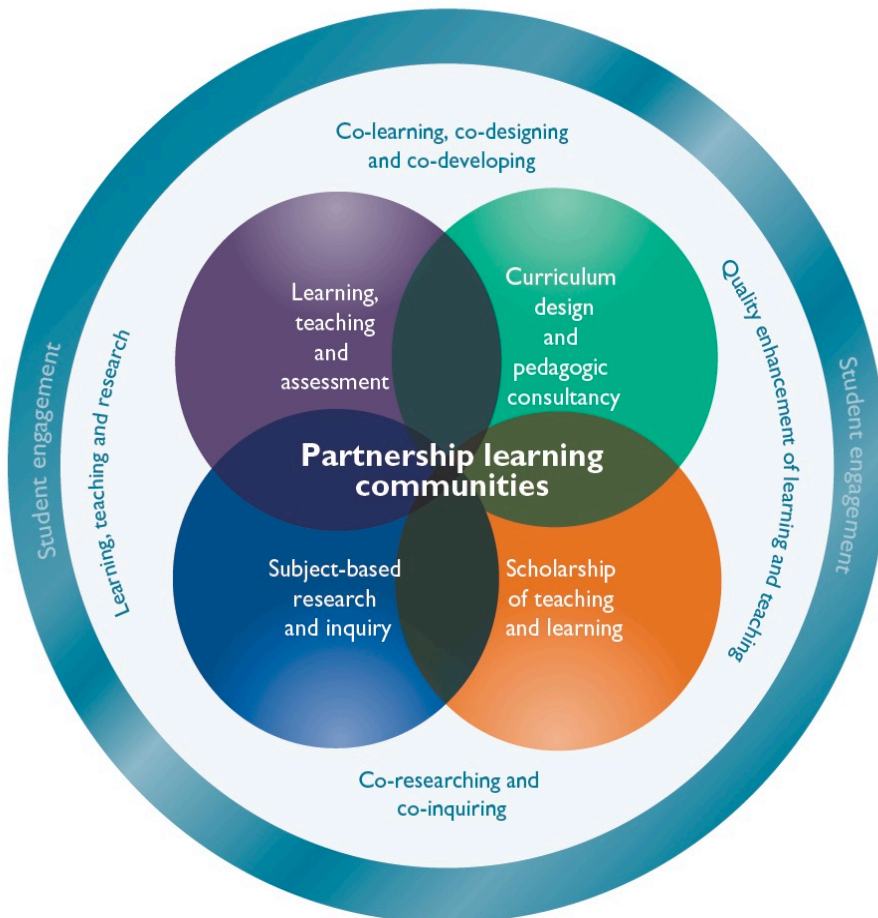
Source: Healey and Jenkins (2009, 7), based on Healey (2005, 70)

Fig. 2 Inquiry-based learning: a conceptual framework



Source: Based on Levy (2009)

Fig. 3: Students as partners in learning and teaching in higher education - an overview model



Source: Healey, M., Flint, A. and Harrington, K. (2014, 25); © 2014 The Higher Education Academy All Rights Reserved

1: Engaging students in research and inquiry at the beginning of their academic studies

1.1 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 <http://insight.glos.ac.uk/tli/resources/toolkit/wal/sustainable/Documents/Induction.pdf>

1.2 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. 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; For more recent versions of the course see: http://www.youtube.com/watch?v=i9idE_uClpc; http://cte.uwaterloo.ca/research_on_teaching_and_learning/TBRG/OND/2011/Presentations/Vine.pdf

1.3 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;

1.4 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

<http://www.heacademy.ac.uk/resources/detail/subjects/psychology/Akhurst-case-study>

1.5 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; Cox *et al.* (2008)

1.6 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; biog-101-104.bio.cornell.edu/BioG101_104/explorations/explorations.html

1.7 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.

Further information

Farrand and Myatt (2009); www.science.uq.edu.au/usser

1.8 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/lrc/altc/ug_research/research_curriculum.htm

1.9 Introducing students to academic staff research: Department of Geography, University College London (UCL)

All year one students in Geography at UCL do an assignment in term one, in which students interview a member of academic staff about their research.

- Each first year tutorial group is allocated a member of academic staff who is not their tutor.
- Tutorial groups are given three representative pieces of writing by the member of staff along with a copy of their CV, and a date is arranged for the interview.
- Before the interview, students read these materials and develop an interview schedule.
- On the basis of their reading and the interview, each student individually writes a 1,500 word report on: a) the objectives of the interviewee's research; b) how that research relates to their earlier studies; and c) how the interviewee's research relates to his or her teaching, other interests and geography as a whole.

Further information

Dwyer (2001)

1.10 Involving first-year English students in the international research community at University of Gloucestershire, UK

At the University of Gloucestershire, Arran Stibbe allows students to take on the identity of a researcher from the start of their time at university. In the *EZ102 Language & Ecology* module the students have an opportunity to share their insights with the wider research community. The research community in turn has something to gain from student contributions because students can critically analyse aspects of their language and culture that others have yet to examine. The students are encouraged to take part in the international research community through working with the *Language & Ecology Research Forum* – the main international forum for research in ecolinguistics. The Forum

links together a network of scholars, has an online journal, a range of resources and a dedicated section for the *EZ102* module. The approach works best when students are becoming critically aware of texts that they are familiar with, rather than struggling to understand new genres understood better by the lecturer than by the students. In 2012 the process was simplified and applied to the successor first year module HM4202 *Sociolinguistics and Ecolinguistics*. Instead of a dedicated student section and a journal, the website now contains a mixed collection of articles, some of which are by students and some by researchers. These articles can be found at www.ecoling.net/articles.

Further information:

<http://www.english.heacademy.ac.uk/explore/publications/casestudies/sustain/ecolinguistics.php>

<http://resources.glos.ac.uk/ceal/resources/casestudiesactivelearning/activelearningcasestudies/index.cfm>

1.11 Scientific Communications 101: A student organised science conference at Curtin University, Australia

Students in an introductory year one course with a linked focus on physics and science communication were required to plan and present a one-day Physics conference. The context was an institutional requirement that employment focused communication skills be integrated into disciplinary programmes. The idea of a student-organised science conference, publication of the proceedings, and the reasons for the approach were explained to students in the first Physics class. For the following week, students were asked to decide on a Physics topic they were interested in presenting at the conference, the overall theme for the conference, and how all the students would contribute to the organisation of the conference and the publication. Later in the term the conference took place over a day and staff and students from the department and local high school students and their teachers attended. In the years that the course ran it succeeded in helping students develop more effective communication skills linked to their discipline, introduced them to research debates and helped them begin to think and communicate like physicists.

Further information: Zadnick and Radloff (1995)

1.12 Students in large first year science course learn about the research done in the department and university at University of Technology Sydney, Australia

As part of a first year physics course with an enrolment of c500 students watched video or listened to audio interviews with selected faculty and postgraduate students who described their current ongoing research and discussed its potential relevance to the students' current and future studies and careers. A required writing assignment had students analysing the interviews and relating it to their studies.

The assignment and linked web materials was created by a team of discipline researchers, media technology and communication specialists. Linked lecture presentations set the activity in the wider contexts of disciplinary research and science communication. Findings over three semesters showed that students consistently judged the activity to be a positive learning experience, and academics, whose research is highlighted, valued the opportunity to explain their work. Unfortunately when the innovator went on sabbatical the exercise was dropped.

Sources: Kirkup and Bonfiglioli (2011)

1.13 Grand Challenges 2013: a researcher led programme for first year undergraduates at University of Exeter, UK

This programme provides first year students with a researcher led 11 day educational experience at the end of the academic year. Students produce solutions and ideas to tackle some of the key dilemmas of the 21st Century, like climate change, ageing, ethical banking, child health and international security. The programme includes a cultural, social and sporting festival on campus during the middle weekend.

Central to the programme are twelve interdisciplinary 21st century dilemmas. Students work in cross-disciplinary groups to address significant cultural, social, economic and/or environmental issues. Divided into small groups facilitated by a postgraduate (PG) inquiry group facilitator, students research key questions and produce negotiated

outputs which are communicated to wider audiences. Examples include writing a policy paper, U-tube videos, debates, awareness campaigns, myth buster pamphlets, social media discussions and dramatic presentations.

Four key principles which relate to research informed education underpin the dilemmas:

Research led

Exeter has a tradition of introducing undergraduates to research skills and ideas and this is embedded in the [Strategy for research led education](#). The 21st century dilemmas provide a powerful focus for teaching and learning through research. Senior Academic Champions with a national or international research profile take the lead and recruit well known external champions to work with them. Together with other academics and PG students they ensure the rigour and research relevance of the work.

Interdisciplinarity

Each dilemma builds on interdisciplinary research being undertaken at the University. Students are given insights into this research and use concepts and approaches to develop skills which transcend disciplinary boundaries. They should be able to transfer some of their new research knowledge and skills into their University programme during subsequent years.

Inquiry based learning

Ensuring that students have an intrinsic motivation to engage is a challenge at the end of the summer term; consequently dilemmas are designed around active approaches used by researchers. With support, students:

- actively set their own goals;
- take part in research like activities to gain knowledge and skills; and
- are responsible for communicating high quality outputs at the end of the dilemma.

Education for employability

Employability related master classes and research-like employability related skills are embedded into the programme. Opportunities to reflect on these are integral. A significant link has been made with the [Exeter Award](#) and several employer led events take place. Students who show the greatest commitment and innovative thinking are awarded places at the [Battle of Ideas 2013](#) and, for a select few, a chance to attend the [One Young World Summit 2013](#). At both of these events they will have opportunities to work with internationally renowned thinkers and researchers.

Sources: Correspondence with Sue Burkill (Sue.Burkill@exeter.ac.uk); <http://www.exeter.ac.uk/grandchallenges/aboutgrandchallenges/>; Kay, J (2013)

1.14 A first-semester experience exploring the history of science through one-act plays at Concordia College, USA

All first-year students are required to enrol in a one-semester inquiry course that is discussion based and writing intensive. Topics for these courses are driven by faculty interest and expertise and are offered by departments across campus. All inquiry courses share common learning outcomes that include explaining the value of intellectual investigation and demonstrating the ability to conduct an intellectual investigation by gathering data for well-reasoned arguments and cogent conclusions. For example, in 'Unravelling the Mysteries: Sheldon Cooper and Other Great Scientists through the Ages', students read historical and contemporary texts, lead class discussions on course readings, write a traditional dissertation on an argument they have chosen and developed, and perform 30-minute one-act plays with scientific demonstrations.

The central text for the course is *The Scientists* by John Gribbin who takes the reader on a journey of science through the lives of the most influential Western scholars from the Renaissance through the turn of the millennium. Students are assigned into working groups of three or four students. In the first half of the semester, each group is responsible for leading the discussion on one chapter (time period) and is expected to include independent research that enriches the context and content for the scene beyond the 'who did what when' to include the influence of politics, health, religion, communication and culture, to name a few. Each group also performs a 30-minute one-act play around a

central character or characters from their assigned time period. Their plays must include a 10-minute demonstration of a key scientific principle, discovery or invention developed by their character(s). Students are shuffled into new groups for the second half of the semester, facilitate another discussion and perform a second one-act. Just before the mid-semester point, pairs of students interview a teacher-scholar in the division of science and mathematics at our institution. The course culminates with the students writing about the scientific journey of their interviewee with the intention of informing a lay audience about the research activities and interests of their faculty and students.

Sources: Correspondence with Krys Strand (strand@cord.edu); <http://www.concordiacollege.edu/about/concordia-at-a-glance/>; <http://www.concordiacollege.edu/student-life/first-year-experience/>; <http://www.concordiacollege.edu/student-life/first-year-experience/inquiry-seminars/>

1.15 Students hold a Green Week at Dun Laoghaire Institute of Art, Design & Technology, Ireland

First year students, initially in management and marketing but now working across faculties and disciplines investigate issues with respect to the question *How green/sustainable is our campus?*. They are supported by academic staff and the Estates department. Students start defining group topics in September, consider how to examine and analyse local data, and in March, for one week, examine the issue in depth and present their results and recommendations in a campus-wide event attended by senior management.

Source: Correspondence with Jenny Haughton (jenny.haughton@iadt.ie); <https://www.facebook.com/pages/IADT-Dun-Laoghaire-Green-Week-2013/329029953874904> <http://www.iadt.ie/en/>

2. Final year and capstone projects

See: 2013 *Developing and enhancing undergraduate final year projects and dissertations*. York: HE Academy. (Healey M, Lannin L, Stibbe A and Derounian J) 93pp http://www.heacademy.ac.uk/projects/detail/ntfs/ntfsproject_Gloucestershire10

2.1 Engaging students in applied research through a community sports development consultancy project at University of Central Lancashire, UK

The final year Community Sports Development module acts as a capstone module for Sports Coaching students. This module is an optional module which is taken in addition to the honours dissertation. Students work as a project team through a consultancy brief with a partner agency and recommend strategies that can be employed to support community development through community sport and coaching initiatives. There are normally 8-12 consultancy briefs divided up among the 40-50 students, with students creating their own consultancy teams. Examples of consultancy projects include: a) A “health check” of football refereeing in Blackburn; b) Community Sport and Crime Reduction; and c) Community Sport (“Street Dance”). The emphasis is upon the students creating professional working relationships with the client organisations in order to carry out primary research that is directed by the clients and supported by the Academic staff at the University. Students are expected to hold regular review meetings with the clients, carry out interviews with relevant stakeholders; use secondary research to help analyse their findings; and present their work and recommendations to the organisation through the staging of a mini-conference, where all the partner groups are invited. Representatives from agencies provide the feedback on students’ work, judging on the content, feasibility of solutions, and competency in conducting research.

Source: [//resources.glos.ac.uk/ceal/resources/casestudiesactivelearning/undergraduate/index.cfm](http://resources.glos.ac.uk/ceal/resources/casestudiesactivelearning/undergraduate/index.cfm)

2.2 Modelling the research experience: Tourism students' virtual conference at Universities of Lincoln and Wolverhampton, UK

In May every year, final-year Tourism students at the Universities of Lincoln and Wolverhampton participate together in a live virtual conference, as part of their final-level assessment. A conference is a useful vehicle for extending

insight into the process and practice of knowledge creation and dissemination and for students to participate as, in effect, research disseminators. Information technology has made it possible: during the specified time frame of one week, students across two campuses can come together at times of their choosing to participate in a joint effort to disseminate research findings and engage in dialogue about their research.

Feedback from them has been very positive and encouraging. Two qualified web designers built the site and have been on hand to deal with technical issues. Teaching staff have provided support for the conference throughout. Students submit a full conference paper, but it is only a summary discussion paper that appears on the conference website. Each student is also required to post a comment on another conference paper, in true conference dialogue tradition.

Sources: www.tsvc.lincoln.ac.uk;

2.3 Language students work in teams on international market research projects at Leeds Metropolitan University, UK

For almost 15 years all the final-year undergraduates on language degrees at Leeds Metropolitan University work in teams of four over a full year to undertake international market research projects on behalf of local businesses, following project briefs prepared for them by the managers in those businesses. The students practise the whole range of skills they have developed on their course (applied languages, team-working, time management, research, project management, data analysis, report-writing, presenting recommendations and so on) in a real-world environment based on genuine commercial needs and products. The students appreciate that they are not working on a case study but with actual products and professionals who teach them about expectations in a professional environment. Over the years, those products have included fashion jewellery, specialist woven fabrics, language services, bathroom equipment and even high-speed, crash-proof shutter doors. Students are particularly fascinated by the company or factory tours as, for many of them, it will be the first time they have ever seen behind the facade of a business. The employers also prize the experience as they get valuable research undertaken that can assist them with their strategic development of international markets.

Sources: Webb (2008; 2012)

2.4 Giving students first-hand experience of research-based consultancy in environmental management at University of Queensland, Australia

Team-based problem-based learning is used in the final year capstone course for the Environmental Management, Rural Management Environmental Tourism and Tropical Forestry degrees at the University of Queensland's Faculty of Natural Resources, Agriculture and Veterinary Science to give students experience of research-based consultancy. It is a year-long course, team taught by an interdisciplinary staff (in recent years, a social scientist and an ecologist for the internal students, a multi-skilled environmental manager taking the external students). The staff solicit suitable 'problems' and clients among their contacts, for instance from government agencies, non-governmental organisations, or land care groups, or the private sector. The staff may help the client mould the topic to achieve appropriate degrees of difficulty, and equity in workload and difficulty across the student groups. The students work like consultants to their client, coping if the client changes the brief during the year (as many do a couple of times). They work in groups of about six students. The clients come to campus at least three times, for an initial briefing to their students, and presentations at the ends of first and second semester. They liaise with the students all year, usually off campus at their offices, and by phone and email. The staff give a flexible program of lectures in first semester, to prepare the students with skills they need towards each forthcoming step of their tasks, and in group processes. At the end of the year their report is 'published' (printed and bound) for the clients. Peer and self-assessment are used to distribute group marks among the contributors.

Source: Correspondence with Helen Ross, 2006

2.5 Biology start up business final year project, University of Durham, UK

Biology Enterprise is a collaborative venture between Durham Business School and the School of Biological and Biomedical Sciences. This elective module for final year undergraduate students in the School of Biological and Biomedical Sciences aims to introduce science students to the key processes of business start-up and enhance their enterprising skills and behaviours. The module is project-orientated with self-selecting groups of students who generate an idea for a business opportunity that is based on a scientific discovery. Students use their knowledge and understanding of science to develop and research their idea into a technology that can be readily commercialised e.g. a diabetes breath tester, a biodegradable chewing gum. In parallel, the Business School teaches students the necessary skills and knowledge required to develop their idea into a successful business. This course offers science undergraduates an alternative to the traditional laboratory-based project and is useful for those seeking employment in business and commerce.

Sources: <http://www.bioscience.heacademy.ac.uk/events/dur05.aspx>
http://www.dur.ac.uk/biosciences/undergraduate/courses/content/level3/lab_project_enterprise_schools/;
<http://www.bioscience.heacademy.ac.uk/journal/vol11/beej-11-r2.aspx>
<http://www.bioscience.heacademy.ac.uk/ftp/events/york05/cowie.pdf>

2.6 Preparing and defending a consultancy report in environmental geology at Kingston University, UK

Each student in a final year module is given an environmental geophysics problem and is asked to role play being a consultant recruited to address this problem for a client, either a local authority or a private land owner. They are required to design a solution, interpret field data and present their findings in a technical report and verbal format. Students are required to prepare and deliver a solo presentation to an open public meeting (20 minute session, including 5 minutes for fielding questions) describing their problem outline, methodology, data interpretation and recommendations. The audience includes Councilors (soon up for re-election) and members of the lay public (staff members and other students) who have a vested interest in the environmental issues. A disruptive group of 'eco-warriors' (usually noisy postgraduate students) also make an appearance! During their presentations, students must show appropriate local and environmental considerations and effective handling of heckling from concerned local residents and the 'eco-warrior' group.

Source: Thomas (2003)

2.7 Senior Capstone at Portland State University, US

During the final year each undergraduate student is required to participate in a Senior Capstone, the culmination of the University Studies program. The Senior Capstone is a community-based learning experience that:

- Provides an opportunity for students to apply the expertise they have learned in their major to real issues and problems in the community;
- Enhances students ability to work in a team context necessitating collaboration with persons from different fields of specialization;
- Encourages students to become actively involved in this community.

Each student works with a team of students and faculty. Each Senior Capstone must result in some form of summation, closing project, or final product that puts closure to the students' experience. Senior Capstones vary in length ranging from one term to three terms, depending on the specific nature of the Capstone.

Sources: www.pdx.edu/unst/senior-capstone;
www.oirp.pdx.edu/portweb/published_pages/prototype/themes/cp/capstone/

2.8 Students participate in a research project on Criminal Justice linked to staff interests at Australian National University

Students at ANU have the opportunity to participate in a research project based on current research being conducted by members of the Faculty of Law, the Australian Institute of Criminology and Research School of Social Science. 'Criminal Justice' is an advanced law elective which critically examines the principal institutions, processes and legal

rules relating to the administration of criminal justice. The iLearning project is an assessable option that allows students to devise research projects which have both academic value and practical outcomes.

Source: <http://www.anu.edu.au/CEDAM/ilearn/research/crimjustice.html>

2.9 Unravelling complexity at Australian National University (ANU)

The final year synoptic capstone course involves students from each of the seven colleges/faculties examining different disciplinary ways to “unravel complexity”. It is the first of what the ANU hopes to be a suite of “Vice-Chancellor” courses where “ANU researchers from different disciplines sharing leading research ideas and discoveries with students.” The number of students taking the course increased from 70 (10 per College) in 2009 to 210 (30 per College) in 2010. They are selected on the basis of outstanding results and interest in and commitment to working in policy areas. The course has a weekly two hour panel of different high profile researchers speaking to the class on how different disciplines deal with complexity. Each panel typically consists of a range of speakers taking different perspectives on an issue, e.g. global financial crises, the collapse of empires, contemporary 'failing' states, pandemics, engineering and network failures and the moral and legal dimensions of these issues. Students in pairs then facilitate a tutorial discussion with about 16 of their classmates on this topic. As the course unfolds students are encouraged to apply methods and insights from different disciplines to each week’s case example. Reflective and interdisciplinary thinking is encouraged through a learning portfolio being the major assessment piece for the course. Students commented that the course structure modelled likely work scenarios they were soon to be in – i.e. working in interdisciplinary teams on complex problems that need a diverse range of tools and perspectives to address.

Source: <http://insight.glos.ac.uk/tli/activities/ntf/urproject/casestudies/Pages/default.aspx>

2.10 Involving Students in Interdisciplinary Interactive Media Consultancy Projects at Miami University, Ohio, US

Interactive Media Studies at Miami University is an interdisciplinary programme (including Computer Science, Engineering, MIS, English, Marketing, Graphic Design, Education, etc.) that brings together students and faculty to investigate how interactive media informs and transforms their disciplinary perspective. The programme has been running since 1996 and uses problem-based learning and team-oriented projects to help students to learn how to apply their theoretical knowledge to innovative digital solutions for a paying client. About 100 students a year take the programme. The students work in groups of up to 20. The students themselves decide how to divide up tasks; typically there are groups undertaking development, design and marketing. The programmes are team taught with the last two weeks spent on de-briefing and talking about what they’ve learnt. The students are typically in class four hours a week, but spend many more hours, for example visiting clients, undertaking research or doing user testing. They make a presentation to their client at the end of the project. Commercial companies are charged \$20,000 per project paid on delivery; non-profit organisations and charities are typically charged c\$5,000. They found the client did not take it as seriously when no charge was made. From the client’s perspective, they get out of the box thinking that they would never obtain from a consultant firm. The clients typically end up with something that far exceeds their expectations. The students find it surprising and challenging to manage the changes which commonly occur during the development stage of the project.

Sources: Interview with Glenn Platt 14 November 2007; <http://student.sba.muohio.edu/ims/>

2.11 Alternative Final Year projects in the Biosciences at the University of Leeds, UK

Final year students within the Biomedical Sciences group of programmes (Human Physiology, Medical Sciences, Neuroscience, Pharmacology) have the opportunity to undertake one of the seven types of research project. Each project is of 8 weeks duration, with students expected to commit 3.5 days per week to their project. Students are provided with a list of projects (with project descriptors) in March of the year preceding their final year and invited to choose, in rank order, 10 projects they would like to be considered for. Projects are then allocated based on student choice and ranking within the year group; with projects starting in the January of their Final Year. The assessments for all project types are similar. Students are required to write a 25-30 page dissertation and deliver an oral presentation. Students undertaking critical review projects also have to submit a 5 page grant proposal linked to their review. There is also a supervisor allocated “productivity” mark.

- i. *Individual laboratory projects*
Students undertake an individual programme of research in the laboratory of their project supervisor, often contributing to ongoing research within that laboratory.
- ii. *Group laboratory projects*
Students work collaboratively, a team of 3-4, to undertake a programme of research; based either in their supervisor's laboratory or in the teaching laboratories.
- iii. *Computer simulation project*
Students investigate the function of biological systems using established computer models (e.g. human cardiac myocytes).
- iv. *Critical review projects (with linked grant proposal)*
Students undertake a hypothesis driven critical review of the literature in a specific area/topic within the biosciences.
- v. *Survey projects*
Students undertake a public health survey under the general theme of "Healthy Lifestyles".
- vi. *Science and Society projects*
Students undertaking science and society projects create, deliver and evaluate an interactive, curriculum enhancing teaching in local primary (students aged 7-11) and secondary (students aged 13-18) schools.
- vii. *Educational development projects*
Students undertaking educational development projects develop and evaluate learning resources for use in undergraduate teaching. Working either individually or in small teams, students develop learning resources or new teaching methods (e.g. social media) to support ongoing teaching.

3. Course team strategies to mainstream undergraduate research and inquiry across programmes

3.1 Co-ordinated interventions in Zoology at University of Tasmania, Australia

The department has developed a set of linked strategies/interventions including:

Year one (approximately 200 students)

- Workshop on the use of animals in research: students put in the position of researcher, considering experimental design and animal ethics to complete an animal ethics application.
- Throughout the year, students encouraged to interact with a web portal (www.zoo.utas.edu.au/rir/rir.htm) with links to 'Hot Topics' in Zoology related to lecture material.

Year two

- An assessed task over several weeks, in which real, experimental data is given to the students for guided analysis and preparation as a manuscript for publication.

Year three

- Courses include group research projects, critical reviews of current literature, writing research grant applications, lectures from scientists outside the school and training in scientific communication.
- In the Zoology Research Unit individual students are matched with an academic supervisor to complete a semester-long research project.
- Selected students work with academic staff to prepare a research paper for *Nexus Journal of Undergraduate Science, Engineering and Technology* (www.utas.edu.au/scieng/nexus/).

Years two and three

- All invited to participate in Student Research Volunteers programme (www.zoo.utas.edu.au/volunteers/summvolunteer3.htm). Volunteers are matched with mentors, usually postgraduate or Honours students in the School, for short-term, in-house research placements that may offer either laboratory or field experiences.

Years one, two and three

- ‘Reach into Research’ seminars held several times each semester (www.zoo.utas.edu.au/rir/rir2&3.htm). Speakers from industry, collaborating institutions and School PhD students present their research, and then all non-undergraduate audience members, except the facilitator, leave the room.

Further information

Edwards *et al.* (2007); <http://www.utas.edu.au/zoology/>

3.2 Junior Research Associate Bursaries in Social Sciences and Cultural Studies at the University of Sussex, UK

From 2008 the School of Social Sciences and Cultural Studies at the University of Sussex is offering competitive awards to selected first- and second-year students for Summer research bursaries at a rate of £200 (not taxed) per week for eight weeks for Summer research projects. Applications must be sponsored by a member of academic staff in the School, who must be willing to act as supervisor for the duration of the award. Bursaries are awarded to projects that clearly link to the research agenda of the supervisor and support their Department's research strategy. Bursaries are not awarded for projects that are part of assessed work for a degree (e.g. projects or dissertations), or for projects involving work away from the University of Sussex.

Further information

<http://www.sussex.ac.uk/lasi/teaching/bursaries>

3.4 Using undergraduates to evaluate student experiences of teaching and learning in the Sociology Department, University of Warwick, UK

In the Department of Sociology at the University of Warwick, selected second- and third-year Sociology students led an evaluation of their peers' experiences of teaching and learning. They used a variety of social research methods – including focus groups, interviews and participant observation – to explore the learning experiences of their peers. The results were widely discussed within the department, and at a department away-day, and have led to students being more involved in department academic debates. Clearly it is more transferable to those departments and disciplines such as Sociology, Education, Psychology and Management, where students developing research skills ‘match’ the research focus.

Further information

Hughes (2005)

3.6 A Curriculum Designed to Facilitate a Student's Journey toward Self-Authorship, Samford University, US

The geography department at Samford University recently redesigned their department's curriculum guided by goals of increasing student engagement with the discipline, improving their practical skills, and enhancing their ability to solve complex problems and engage in critical thinking. Core modules provide basic instruction, but these introductory modules incorporate case studies, problem-solving, and active engagement with the subject matter. Students then proceed through a series of elective courses and finally to a series of courses called “Geography in Practice”. Here students have the option of doing a supervised externship, acting as a teaching assistant for an introductory class, or doing an independent research project.

These experiences provide students with an opportunity to link their prior coursework with practical workforce skills. Finally all students complete a capstone experience where they may either undertake a client-based project, or may elect to do a traditional research paper. With the client-based projects, students work in teams with an outside client to define a problem, devise a work plan and create some distinct output. As examples, students have produced a series of maps for a local bicycle club, worked with the university's disability services on an accessibility map of campus, and collaborated with an environmental agency to study sedimentation in a river.

All capstone students are assessed on a range of skills, as well as informational and quantitative literacy. As students progress through the curriculum they are expected to take increased responsibility for their own learning and to develop the intellectual skills necessary to move beyond the campus and into society.

Sources and further information: Moore *et al.* (2011); <http://howard.samford.edu/geography/>

3.7 Auditing and developing student research skills at the University of Adelaide, Australia and the University of Reading, UK

Selected departments at the Universities of Adelaide and Reading have systematically audited department-based undergraduate and postgraduate programmes for the extent to which they develop student research 'skills'. The University of Adelaide has developed both a conceptual framework on student research development and based on this, a diagnostic tool to support interventions to strengthen student research skill development in courses. Thus two consecutive first-year courses in Medical Science have adapted their assessment tasks explicitly and systematically to develop student research skills in accordance with the Research Skill Development (RSD) framework. A broadened application of the framework is being trialled, including with laboratory-based and numeracy-rich research, as well as with other disciplines and departments, including Petroleum Engineering, Nursing and English.

The framework is publicly available for other institutions to adapt. Within departments methods to collect data on undergraduates' research skills teaching and learning can be time-consuming and ineffective. At the University of Reading a related electronic 'research skills audit tool' has been developed for academic staff to map systematically research skills teaching and assessment within their own modules.

Further information

Willison and O'Regan (2006, 2007); Fraser *et al.* (2007)

3.8 Students across all three years of an Environmental Studies degree course worked together on local sustainability projects at the University of Sunderland, UK

Students on an Environmental Studies degree at the University of Sunderland undertook local sustainability projects, which brought levels 1, 2 and 3 students together in small research groups to work in collaboration with Sunderland City Council's Local Agenda 21 personnel, and other local environment and development agencies.

Further information

Hughes *et al.* (2001)

3.9 Students run the *Journal of Non-Significant Differences* at Grand Canyon University, USA

The *Journal of Non-Significant Findings* is a student-run, peer-reviewed journal designed to provide learners with a comprehensive understanding of the research cycle and the publication process. It started as a university-wide initiative in the doctoral college, but now includes students at all levels (undergraduate, masters, doctoral) in both the process of managing the journal as well as in the paper submissions. In 2013 the journal was re-launched and submissions are open to students from any university or college. Central to the journal is an understanding that research does not have to be significant to provide valuable insight into scholarship. As such, articles are evaluated according to the soundness of the research process and the ability to contextualize the importance of non-significant findings.

Source: Correspondence with Jean Mandernach (jean.mandernach@gcu.edu); <http://cirt.gcu.edu/research/nonsignificant>

3.10 Giving students alternative assessment options for undertaking a Product Design project at Nottingham Trent University, UK

The module consists of several possible routes. Assessment is based on a learning contract negotiated and agreed between the tutors and student. This contract stipulates the content of work, enabling students' to complete one of the following options:

- Option 1: a 10,000 word dissertation and students produce a poster that summarises their work
- Option 2: a 5,000 word conference paper with a supporting presentation that is delivered to peers and tutors

- Option 3: a conceptual project with a 5,000 word critical justification. As well as a written outcome students are required to produce illustrations or simulations.

Prior to students undertaking their chosen assignment, there is a three week intensive period when students' are required to complete their learning contract. The contract identifies what option the student will complete, what they hope to learn and how that learning will be demonstrated. The module involves students using a wide range of primary and secondary research skills. Throughout the year, the direct contact students have with tutors is mainly limited to group or sometimes individual tutorials, where the tutor acts as a 'consultant', advising on their proposals, work in progress, what knowledge or skills should be developed, how to tackle certain issues and who students' should approach for further information. Occasionally there will be content common to all students and this will be delivered through lectures, for example, covering approaches to research. There are also opportunities for students' to present their work in progress to a panel of tutors and peers, to obtain feedback.

Source:

<http://insight.glos.ac.uk/tli/activities/ntf/creativehops/examples/Pages/Arts,MediaandHumanitiesExamples.aspx>

3.11 Preparation for the dissertation begins in year 1 of the Childhood Studies degree at Nottingham Trent University, UK

In year 1 of the Childhood Studies degree course, students are introduced to inquiry based learning approaches in a module called 'Becoming an Active Learner', where they reflect on their own learning through a number of individual and collaborative reflective tasks. During the summer break, before the students enter year 2, the students are required to do directed readings to support their knowledge and understanding of research. In year 2 they take a 'Becoming an Active Researcher' module. For the first few weeks of the year 2 module they take dedicated seminars relating to research methods and ethics. All student groups are required to complete a research proposal and an ethics form before they embark on an inquiry in small research groups.

Working with academics in a range of disciplines, the groups of students follow a rigorous ten-week schedule where they undertake the research inquiry, write a research report and present their findings at a student-led conference. Students complete the module with a reflective account of the research process and what they have learned about becoming a researcher. Some students go on to present at conferences and to managers in relevant organisations.

As a result of the modules the students are prepared well for their final year independent dissertations through improving their confidence and ability to undertake collaborative and independent research. Engaging students in research inquiry, both strengthens communities of practice in higher education and the transference of skills and knowledge to professional working environments.

Sources: Ovens *et al.* (2011); [http://www.ntu.ac.uk/apps/pss/course_finder/113014-1/7/ba_\(hons\)_childhood_studies.aspx](http://www.ntu.ac.uk/apps/pss/course_finder/113014-1/7/ba_(hons)_childhood_studies.aspx); Cyndy.hawkins@ntu.ac.uk

3.12 Assessing the learning experience of undergraduate research through structured reflective logbooks: An Office for Learning and Teaching (OLT) project, ANU, Australia

Undergraduate research experiences are commonly used to meet the aims of research-led education. Although staff value these because they are effective in introducing students to the nature and practice of their discipline, assessment often focuses on the outcomes or results achieved in the form of a formal report. The student may therefore see their learning largely in terms of discipline-specific skills and content, with success or failure being measured by the project results rather than their learning about the process of research. Our view is that much of the valuable learning occurs as the student struggles to come to terms with the reality of research and its inherent uncertainty and that it is appropriate to recognise this in the assessment of a research experience. We developed this in an OLT funded project entitled Teaching Research—Evaluation and Assessment Strategies for Undergraduate Research Experiences (TREASURE).

We introduced structured reflective logbooks as a small stakes assessment item to scaffold student learning and re-focus attention on the nature and practice of research. Students regularly responded to a set of prompt questions in a private blog. The prompt questions were developed in consultation with research project supervisors and ask about what students are doing, *why* they are doing it; what they are learning (particularly from the problems they encounter and the way they go about solving them); the nature of the research environment and how what they are learning links to their learning in other contexts. Their responses are helping both students and supervisors recognise and value broader learning outcomes such as enquiry, critical thinking and the development of confidence.

Sources: Howitt et al. (2014a, b); www.treasure.edu.au/project/

3.13 Engaging students in research into teaching and learning at the University of Western Australia and University of Exeter

The Undergraduate Learning and Teaching Research Internship Scheme (ULTRIS) was conceived at The University of Western Australia (UWA) to introduce undergraduate students to authentic research outside their chosen discipline. By focusing their research on a teaching and learning issue of identified priority for the University, students are able to make significant contributions to the understanding of the problem and provide insights to inform future changes in policy and practice. Beyond the benefits to the institution and the individual students, this model of undergraduate research heralds an opportunity for research into teaching and learning to gain acceptance and interest amongst a new and previously uninvolved cohort of investigators.

At the **University of Exeter** students are engaged as partners in shaping and leading their own educational experiences through their '**students as change agents**' initiative. The key concept is that students themselves take responsibility for bringing about change, based on their own research on aspects of learning and teaching. The approach enables students to be actively engaged with the processes of change, often taking on a leadership role. They are engaged deeply with the institution and their subject areas, and the focus and direction is, to a greater extent, decided by students. The most important aspect is the focus on research, and building change on evidence-based foundations.

Students from across the university have contributed to this initiative, carrying out a series of research projects on their learning and teaching environment, selecting concerns raised through student-staff liaison committees (SSLCs), and providing recommendations and solutions to improve their experience. A small amount of funding was made available from the University's learning and teaching budget to support this initiative. Students worked as apprentice researchers; their research methods included focus groups, informal interviews and questionnaire surveys. Outcomes were presented at a student-staff conference, which resulted in institutional engagement with key research findings. Each small project has also been captured through a case study. Student research has driven organisational change, contributed to student engagement in shifts of policy and practice within the University, and supported students' graduate skills in the areas of research, project management and presentation of outcomes, leadership and understanding organisational development.

Further information: Partridge and Sandover (2010); Kay *et al.* (2010); Dunne and Zandstra (2011)

For many more case studies of students as change agents see: www.mickhealey.co.uk/resources