How can institutions and departments support faculty teaching designed to bring undergraduate students into the worlds of disciplinary research and develop their understanding of the complexity of knowledge? While recognizing the strengths of undergraduate programs for selected students that are a feature at many U.S. institutions, our approach is to embed research and inquiry in all curricula for all students. We argue that this can be achieved “through structured interventions at course team, departmental, institutional and national levels” (Healey and Jenkins 2009, 3). Such interventions need to include specific support enabling faculty to teach in ways that develop students as researchers. Departments, and, in particular, institutions, can play central roles in this agenda for they have the resources and the “political” power to intervene structurally to help faculty teach “emphasizing the construction of knowledge by students” (Hattie and Marsh 1996, 534).

Our focus here is to provide an international perspective by presenting a wide range of initiatives, from a range of national systems, that we think can be easily adapted by U.S. institutions committed to embedding undergraduate research in the mainstream curriculum. This article draws in part on arguments and material in our previous publications (Healey and Jenkins 2009; Healey, Jenkins and Lea 2014; Jenkins and Healey 2012). Table 1 sets out selected strategies that can be adapted by institutions and departments.

### Table 1. Strategies for Institutions and Departments to Support Faculty Who Teach Through Student Research and Inquiry

| 1. Develop courses that engage students in research and inquiry from the beginning of their first year. |
| 2. Ensure that progression in research and inquiry is built into programs. |
| 3. Celebrate and share what is already in place. |
| 4. Create opportunities for faculty and students to experiment. |
| 5. Review and enhance what is in place. |
| 6. Ensure that initial training in teaching and subsequent continuing professional development emphasize student research and inquiry. |
| 7. Reshape academic timetables. |
| 8. Create alternative learning spaces. |

The course is typically taught to classes of no more than 25 students, and the instructor subdivides the class into groups of four or five students. The essence of the course is that students learn how to learn through investigating a researchable question that they have developed. All of the classes have the same curriculum, reading material, process of assessment, and goals, which 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 aimed at building students’ critical abilities, and time is allowed for students to share ideas about their individual inquiries related to the one “researchable question” that the group is pursuing. Students investigate aspects of a broad social-scientific theme, such as “self-identity,” and address a common 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 question, related to the common theme, 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 is 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 students’ subsequent performances at McMaster.

Sources: Justice et al. (2007, 2009)

### Case Study A: Inquiry-based course introducing first-year students to social sciences at McMaster University, Canada

For many years Canada’s McMaster University has had a series of faculty-based optional courses incorporating inquiry for first-year students. Case study A outlines one in the Faculty of Social Sciences began in the late 1990s.

Developing an expectation that students will be engaged in research and inquiry from the time they enter the institution is an effective way to encourage faculty to build this approach into their courses. For example, the president and provost at University College London recently stated that “our top strategic priority for the next 20 years is to close the divide between teaching and research. We want to integrate research into every stage of an undergraduate degree, moving from research-led to research-based teaching” (Arthur 2014).
to have thought through strategically what progression in research and inquiry looks like throughout their programs. Case study B, from Australia, provides an illustration of how this might be done. Making greater use of prerequisites for courses may help to build in such progression in programs in the United States.

**Case Study B: Coordinated interventions in zoology at University of Tasmania, Australia**

The zoology school has developed a set of linked strategies or interventions, including:

- **Year One**
  - A workshop on the use of animals in research: Students are put in the position of a researcher, considering experimental design and ethics in the use of animals to complete an application form for a research project using animals.
  - Throughout the year, students are encouraged to interact with a web portal with links to “Hot Topics” in zoology related to lecture material.

- **Year Two**
  - Over several weeks students are assessed on a task in which real, experimental data is given to the students, and they are guided through analysis of it and preparation of a manuscript for publication based upon it.

- **Year Three**
  - Courses include group research projects, critical reviews of current literature, writing of research-grant applications, lectures from scientists outside the institution, and training in scientific communication.
  - Zoology research unit: Individual students are matched with an academic supervisor to complete a semester-long research project.
  - Selected students work with staff to prepare a research paper for the institution’s Nexus Journal of Undergraduate Science, Engineering and Technology.

- **Years Two and Three**
  - All students are invited to participate in the Student Research Volunteers program. Volunteers are matched with mentors, usually postgraduate or honors students in the zoology department, for short-term, in-house research tasks that may offer either laboratory or field experiences.

- **Years One, Two and Three**
  - “Reach into Research” seminars are held several times each semester. Speakers from industry, collaborating institutions, and PhD students present their research, and then everyone except the undergraduates in the audience and a facilitator leave the room so that undergraduate students’ comments are the focus of the ensuing discussion.

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

A few universities have developed institution-wide approaches, which effectively provide opportunities for all students to engage in undergraduate research and inquiry. Case study C, for example, at Roskilde University in Denmark, shows such an approach, since half of the curriculum for all students is based around project work.

**Case Study C: An institutional focus on project-based learning at Roskilde University, Denmark**

The Roskilde Model refers to three different aspects of project-based learning. The first one is problem-oriented interdisciplinary and participant-directed project work. At Roskilde University, half of all study activities in the assessed curriculum are organized in line with this particular pedagogical approach. The second aspect of the model is the organization of university education on the basis of four interdisciplinary bachelor’s-degree programs. These programs are part of the humanities, social sciences, natural sciences, and humanistic-technological sciences, and prepare bachelor’s students for admission to two-year master’s programs in a broad range of disciplines. The third aspect of the model is the interdisciplinary academic and educational profile of the university (Siig and Hellesen 2015).

The projects involve students working in groups guided by staff. “Problem-orientated project work ... [is] participant directed indicating that it is the group members that collectively ... take the responsibility for the project. ... The result is a body of knowledge owned for the most part by the students that produced it and not borrowed from the teachers who taught it” (Legge 1997, 5). In the first two years, students undertake group interdisciplinary projects; later projects tend to be within one discipline and sometimes may be undertaken individually.


### 3. Celebrate and share what is already in place.

Start by recognizing, valuing, and celebrating the reality that many faculty will already have developed good practices for implementing inquiry-based teaching. However, such practices may not have been shared, even with other members of the faculty member’s department, and almost certainly have not been shared across the institution. That was the experience of faculty and administrators working on the national enhancement project developed by the Quality Assurance Agency (QAA) Scotland (Land 2013). This project gathered
interesting practices used to bring teaching and research together in disciplinary communities and institutions, and also disseminated good practices through publications and workshops that further embedded the strategies. Institutions in many national systems now have web sites dedicated to research-based learning and often include examples of practices within the institution, for example, McGill University (2013); Queen Mary University London (nd); and University of Sydney (2014).

Such web dissemination is important, but more “active” methods may have greater impact and provide more case studies to present on institutional web sites. Case study D’s example of a “swap shop” at the University of Gloucestershire is one that can easily be adopted by departmental or curricular teams, perhaps at an off-site faculty seminar or conference.

Case Study D: Faculty celebrate student engagement in inquiry and research through a “swap shop” at the University of Gloucestershire, UK

Supported by the British government’s funding of Centres of Teaching Excellence, the University of Gloucestershire from 2005 through 2010, celebrated ways in which faculty involved students in research by running a “swap shop” in each university faculty and in some departments. Faculty were invited to attend a workshop armed with an interesting practice they would like to “swap” for an interesting practice used by another faculty member. After an introduction putting the nature of the practices to be exchanged into context, three or four colleagues sat at tables and each faculty member had five minutes to outline his or her practice and five minutes to answer questions about it. Participants then went to another table and repeated the process with different colleagues. This was followed by a plenary session discussing key ideas participants had learned and how the interesting practices could be publicized further.

Sources: Mick Healey (mhe@cy.ox.ac.uk); Healey and Roberts (2004)

4. Create opportunities for faculty and students to experiment.

One way to move practice forward is to create special events and structures that enable, and in some cases require, staff and students to experiment with teaching approaches that emphasize students constructing knowledge. Case study E from Oxford Polytechnic (now Oxford Brookes University) shows how this could be a limited experimental activity.

Case Study E: ‘Non-traditional teaching week’ at Oxford Polytechnic, UK

From 1986 to 1989 Oxford Polytechnic designated a week during term two (of a three-term year) as “non-traditional” teaching week. Faculty were assured that they could teach the same content as they normally would, but were told that they should not lecture or give the traditional teacher-led seminar or laboratory session. They were urged to use methods in which the emphasis was on student activity and involvement. The week was organized with the close involvement of leaders of the student union, who led certain key events—including a competition between faculty and student groups to give the most interesting lecture. The week inspired the IT Term in 1996—a term-long period of innovation and public events aimed at stimulating the use of information technology in courses. Other institutions adopting this case study could move the emphasis on student activity and involvement toward practices that require the activities to focus explicitly on undergraduate research. Sources: Jenkins (1999); Pepper and Jenkins (1988)

Such experimental periods could become permanent features of the institutional structure. The Massachusetts Institute of Technology (MIT) has a period each year between the two formal semesters called the “independent activities period” (IAP), lasting about three weeks. During this period, students are encouraged to set their own educational agendas, pursue independent projects, meet with faculty, or pursue many other inquiry-based options not possible during the semester. Faculty are free to introduce innovative educational experiments as IAP activities (MIT 2013).

5. Review and enhance what is in place.

Most institutions and national systems have policies that require programs of study to be periodically reviewed and enhanced. Making support of student inquiry and research a feature of such reviews can ensure that curricular committees see that as a priority. Departments themselves can initiate such reviews. Institutions can also run structured events in advance of such reviews to encourage faculty leaders to enhance their practices, for example by publicizing particular features of programs within the institution seen as representing best practices and highlighting interesting practices from other institutions. Durham University has linked its course review explicitly to the development of research-led education.
6. Ensure that initial training in teaching and subsequent faculty professional development emphasize student research and inquiry.

Ernest Boyer's Scholarship Reconsidered (1990) stimulated reform among educators in the U.S. and abroad through conceptualizing “the scholarship of teaching.” In effect this was part of an international movement to professionalize university teaching. In the U.S. this has in part focused on ensuring that graduate students who teach are helped to learn how to teach and to take a scholarly approach to their teaching (Walker et al. 2008). In countries such as the UK, Australia, and New Zealand in contrast, the initial focus has been on offering courses to newly appointed faculty members on the practice and the research evidence regarding university teaching. In the UK, such courses may be required. Many such courses include explicit discussion of ways to engage students in research and inquiry. While such courses are largely run by institutions, in the UK they are accredited through a national professional standards framework (UKPSF) run by the Higher Education Academy (HEA). One of the requirements of the framework is that faculty “engage in continuing professional development in subjects/disciplines and their pedagogy, incorporating research, scholarship and the evaluation of professional practice” (HEA 2012, 3). To support such courses, publications now exist aimed specifically at helping new faculty members develop ways to engage their students in research and inquiry (Jenkins and Healey 2012). As Case Study G illustrates, many such courses include explicit discussion of ways of engaging students in research and inquiry.

7. Reshape academic timetables.

Institutions worldwide are reviewing the timetables of their curricular structures to respond to various online-learning initiatives; they are moving away from the once-dominant one-hour teaching slot. Moving to a teaching block of from two to four hours may be seen as a strategic priority, if it
has not already been undertaken. Such changes can also significantly support student inquiry, which generally requires more focused time than the one-hour block allows. Institutional policies often enable fieldwork disciplines such as the biosciences, geography, and geology to schedule extended periods—generally three to seven days—during which students can investigate issues in depth outside the classroom. It might be argued that this flexibility should be an institution-wide feature and that the curricula for all programs and students should allow such concentrated timeframes, if appropriate for the pedagogies of particular disciplines. Early in the career of Ernest Boyer, when he was dean at Upland College, he introduced a program that gave students a period in the mid-year term during which they would not attend class but rather take on individual projects, supported by faculty (Goldberg 1995). Case study H, describing block teaching at Canada’s Quest University clearly represents a major restructuring of the traditional university timetable.

**Case Study H: Block teaching and the final two-year research project at Quest University, Canada**

Quest University in British Columbia, which held its inaugural class in 2007, is Canada’s only private, secular non-profit university, with an enrollment of 425 students in 2012. The curricular emphasis is on student inquiry and research. Faculty-to-student ratios are high, and much teaching is seminar-based, with a maximum class size of 20. There are no lectures or lecture halls. Quest uses a block system in which students take one month-long course at a time. In their second year, students spend an entire block, with 15 peers and a tutor, formulating a central question. Students spend their last two years focused on that question. Each student typically answers the question in the form of a thesis, but alternative research products are supported, for example, an original play or a graphic novel. Faculty are not expected or required to undertake standard discipline-based research.

Sources: Millar (2012); Helfand (2013);
http://www.questu.ca/about_quest/a_quest_degree.php;
http://www.questu.ca/academics/the_block_plan.php;
http://www.questu.ca/academics/experiential_learning.php

Quest University was able to introduce this radical structure from its beginning. This would be more difficult for larger existing institutions to implement, but administrators might find it easier to initiate block teaching in summer programs or in January inter-terms, which several U.S. universities have adopted.

The Grand Challenges program at Exeter University incorporates some aspects of the Quest curriculum, but its small scale makes it more adaptable for other institutions. Case study I shows that there are similarities between the Exeter program, the “independent activities period” at MIT, and the inter-term programs offered elsewhere in the U.S.

**Case Study I: Grand Challenges—a researcher-led program for first-year undergraduates at the University of Exeter, UK**

This program provides first-year students with a researcher-led, 11-day educational experience at the end of the academic year. Students produce solutions and ideas for tackling some of the key dilemmas of the 21st century, such as climate change, aging populations, ethical banking practices, child health, and international security. The program includes a cultural, social, and sporting festival on campus during the weekend of the 11-day program. Hence students work in cross-disciplinary groups to address significant cultural, social, economic, and/or environmental issues. Divided into small groups facilitated by a postgraduate student, the first-year students research key questions and collaborate to produce such items as policy papers, YouTube videos, debates, awareness campaigns, and dramatic presentations that are communicated to wider audiences.

Source: Correspondence with Sue Burkill (Sue.Burkill@exeter.ac.uk); Burkill (2015); http://www.exeter.ac.uk/grandchallenges/

8. Create alternative learning spaces.

Although many research studies have shown that lectures have limited impact on students’ understanding of the production and complexity of knowledge (Bligh 2000), many course teams and institutions nevertheless want to have such lecture halls as part of the institutional structures. Prompted by the move to various forms of online learning, however, many institutions around the world are significantly reshaping or creating new learning spaces to better support student inquiry (Narum 2004).

These efforts often involve close cooperation between curricular leaders and the heads of library and information-technology resources. One example is the redesigned “learning commons” at Hong Kong University, which was created to support large-scale reform of institutional curricula (Exploring Learning Spaces and Libraries in Asia 2012).

Case study J, at Australia’s Swinburne University of Technology, an institution with a strong applied focus and
links with external partners, represents general principles of classroom redesign that are relevant for many other institutions.

Case Study J: The “Project Hub” at Swinburne University of Technology, Australia

Swinburne University’s Hawthorn Project Hub was designed as a learning space offering 24-hour, seven-day-a-week access to approximately 2,000 students who are undertaking capstone projects in the final year of their undergraduate degree. This developed out of the institution’s decree in 2009 that all final-year students would undertake a major capstone project, with an emphasis on interdisciplinary group work, industry/professional relevance, and links with external organizations. The hub contains meeting rooms, state-of-the-art technology, and social, open working spaces. It was built as a result of undergraduates stating that the most important thing Swinburne could do to improve the capstone learning experience would be to provide facilities dedicated to undergraduate projects and group work.


Conclusion

Bringing students into the disciplinary worlds of research requires a series of structured interventions from the level of the individual academic to that of national systems. In that context, institutions and departments can play central roles by supporting and changing how faculty teach in order to support student inquiry. Drawing on a range of international case studies we have demonstrated seven examples of possible strategic interventions; which of those a campus might give priority to will clearly depend on particular institutional contexts. Some campuses might focus on other interventions—such as requiring faculty to grade students in ways that encourage student inquiry or ensuring that all students undertake an inquiry-based capstone course in their final undergraduate year (Healey 2014).

Institutions and departments could also adapt the creative approach to enhancing practice and policy pioneered by the Scottish Quality Assurance Agency (QAA 2014) in which specific enhancement themes were identified for the sector to work on for one or two years. In the context of developing student inquiry and research, an institution might develop a rolling program of structured and linked interventions in the curriculum, including how faculty teach. A theme, such as using information technology to support inquiry or changing the assessment of first-year students to focus on some aspect of disciplinary research, could be a theme for, say, one to two years. This could then be followed and linked with other themes that help faculty teach in ways that encourage and enhance student inquiry and research. Such structured interventions must be appropriately targeted and linked to a coherent institutional vision.

We believe that the strategies we have set out here are particularly appropriate for those institutions seeking to “mainstream” undergraduate research for all students, but they are also relevant for faculty and administrators at institutions that offer undergraduate research programs to smaller numbers of students. All the approaches are part of the wider agenda of engaging students as partners in their own learning (Healey, Flint and Harrington 2014)—offering a broad array of initiatives that institutions can act upon.

References


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