Valuing and Challenging Selective Undergraduate Research Programs

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"... universities should treat learning as not yet wholly solved problems and hence always in research mode" (Humboldt, 1810, cited by Elton, 2005).

"The research universities have often failed, and continue to fail, their undergraduate populations, thousands of students graduate without seeing the world-famous professors or tasting genuine research" (Boyer Commission, 1998, p. 3).

"We argue that ... all undergraduate students in all higher education institutions should experience learning through and about research and inquiry" (Healey & Jenkins, 2009, p. 3).

Our Argument

The United States undergraduate research movement has offered internationally a powerful model of what the undergraduate curriculum should be — but we argue that *the* challenge now is to ensure that its insights and practices can be made available to all or many students.

Our perspective in part reflects our experience of largely working in United Kingdom higher education where recent central government policies have radically altered higher education from an elite to a mass higher education system in some ways similar to the U.S. system, and also where high-level research is increasingly concentrated in a few "research elite" institutions. Relatedly in the U.K. there is talk of "teaching only" or "teaching intensive" institutions far removed from the long European cultural ideal of the Humboldtian vision of universities being institutions where teaching and research were closely interconnected. In that context much of our research and writing has focussed on investigating how national systems, institutions, and individual faculty can reinvent the potential interconnections between discipline-based research and student learning, while also recognising that governments and other funders will want to concentrate high-level research in certain institutions, departments and individuals. Selected web publications at the end of this article detail these arguments.

In that context we have become fascinated by U.S. undergraduate research programs and initiatives and have been involved in a number of national and institutional initiatives in the U.K. and internationally to develop U.S.-style undergraduate research. But while valuing what such programs have to offer for selected students, we want here to challenge them to

extend their visions, achievements, and resources to all students.

Valuing Undergraduate Research

To us a central value of the U.S. undergraduate research movement is in (re)shaping our sense of what is potentially distinctive about *higher* education. While valuing the crucial role of school education, we would argue, as do others, that what distinguishes higher education is explicitly opening up the student to the complexities and uncertainties of knowledge and helping them to see how to analyse and, indeed, cope with those complexities. The higher education curriculum might do other things, such as help student employability, but if that is its central or sole aim we would question whether that is *higher* education. To achieve that aim, then, we need to reshape and/or reaffirm the central role of students understanding about such complexity through themselves, learning as closely as possible how research is conducted in the disciplines or interdisciplines that they are studying.
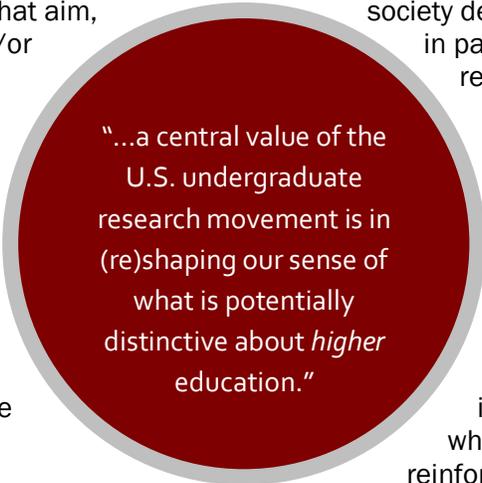
Undergraduate research also potentially offers a critique of the research roles of universities, their leaders, and individual academics for so often devaluing teaching, and for in effect hiding research from most undergraduates and the wider society. While some might question whether undergraduate research is "real" research, the term and its practices potentially challenge the research roles of universities to ensure that their role and resources in part benefit undergraduates. Those of us outside the U.S. look with respect at how the National Science Foundation in the mid-1990s reviewed its grant procedures to give explicit emphasis to research dissemination and undergraduate and postgraduate involvement in many of their grant programs (Haggett, 2006; NSF, 2005).

Undergraduate research has other benefits for both faculty and institutions. For faculty, particularly in research-intensive institutions, it may help them to manage what often feels like two separate jobs: that of being a teacher and a researcher. For faculty in teaching-focussed institutions, it helps more of them to maintain their sense of being an academic through being involved in research. For institutions, it helps them to articulate their particular mission and strategies. Clearly for those students who gain access to these selective research opportunities, there are significant intellectual and career benefits.

Challenging and Supporting Undergraduate Research

A central challenge we would put to such programs concerns their selectivity. How society decides to spend its resources is in part a *political question*: what resources are allocated to whom and for what? From a left of centre political position, we ask who gets access to such programs, and how are such decisions shaped by social class, gender, ethnicity, and so on? Relatedly, to what extent do such programs seek to redress the inequalities in society; or to what extent do they in effect reinforce or indeed increase such injustices? Now we recognise that in the U.S. there are a number of initiatives that seek to use undergraduate research to widen access and success in higher education. For example, the University of Michigan Undergraduate Research Opportunity Program (UROP) in part offers particular opportunities to historically underrepresented students as well as young women in the sciences (Locks & Gregerman, 2008). But our impression is that such initiatives are not that deeply established in the U.S. Certainly it has proven difficult to get U.K. research-intensive universities to develop similar initiatives. They are much more concerned about focussing on high-level "discovery research" by selected faculty and moving up international university rankings.

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The related challenge we would put to universities with selective undergraduate programs is how to extend what they have learned and achieved about developing students as researchers to mainstreaming undergraduate research in the curriculum for all or many students. We have argued, supported by a wide range of international case studies, that this can be achieved through structured and linked interventions by institutions, departments, course teams, and national systems (Healey & Jenkins, 2009). Here we will sketch out four such ways that can be achieved:

- Widen what is seen as undergraduate research
- Structure it through the curriculum
- Make targeted interventions
- Challenge institutional research agendas and policies.

Widen What Is Seen as Undergraduate Research

Faculty often face the realisation that some types of research, scholarly, or professional activity are not valued by tenure and promotion committees. An article such as this one would not impress most institutions — for it is not real research, not published in a high-level journal, etc. There are evident parallels with the issue of what counts as undergraduate research. At one level one could argue that calling it "undergraduate research" and perhaps publishing it in an "undergraduate research journal" is effectively recognising that such work is not high-level, peer-refereed research. Yet many undergraduate research programs offer conceptions of undergraduate research close to that of faculty tenure committees. Indeed the Council on Undergraduate Research defines undergraduate research as "[a]n inquiry or investigation conducted by an undergraduate student that makes *an original intellectual or creative contribution to the discipline"* (emphasis added).

We think that's setting the bar pretty high, and one reaction would be to say if the work is that good then it should be submitted to high-level, peer-refereed journals. And some undergraduates do reach that level. We think

a more realistic view is again to look to CUR, which on its website describes its mission as promoting "learning through research." Relatedly Ron Barnett of the Institute of Education, London, has argued that what distinguishes *higher* education is the emphasis on helping students to live in a supercomplex world and that the curricula task is for "lecturers [to] adopt teaching approaches that are likely to foster student experiences that mirror the lecturers' experiences as researchers" (Barnett, 2000, p. 163).

We do think there are different levels and certainly types of research and development. But while recognising such, we think the way forward for undergraduate research in most, if not all, institutions is to focus more on curricula that support all undergraduate students to enter some way into that research complexity, and to do that, one needs to focus mainstream curricula on learning of and particularly through research and other related forms of inquiry. Through such mainstream interventions one opens up greater possibilities for all students to understand something of knowledge complexity and to help scaffold curricula and organisational structures to help more to reach high levels of research at some stage in their academic career.

Structure It Through the Curriculum

In our and others' work with institutions on this agenda, we often come across fascinating examples of innovative curricula which explicitly exemplify "research as learning." This, for example, was the experience of the Quality Assurance Agency of Higher Education (QAA) Scotland in working with all Scottish institutions and all disciplines in a national quality enhancement process to more effectively bring together teaching and discipline-based research. However, it was also clear that

> while there are wide-ranging innovative examples of practice and policy in all institutions, much of this is implicit and not systematically developed or supported. [Relatedly] while the evidence was strong of effective examples of

practice at final-year level (for example, some form of research project), institutions … need to ensure that these research attributes are developed systematically through programmes in a structured manner from year one. (Jenkins, 2009, p. 6).

The case study below shows how one department has sought to ensure undergraduate research is systematically structured through the three year mainstream undergraduate curriculum.

Co-ordinated Interventions in Zoology at University of Tasmania, Australia
The department has developed a set of linked strategies including

Year One c200 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 form
- Through 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
- Over several weeks an assessed task 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
- Zoology Research Unit (fcms.its.utas.edu.au/scieng/zoo/unitdetail.asp?lUnitId=3349): 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 *Nexus Journal of Undergraduate Science, Engineering and Technology* (http://www.utas.edu.au/scieng/nexus/)

Source: Edwards et al. (2007)

To achieve this requires strong departmental leadership and firm but supportive institutional quality assurance procedures. To express this perhaps harshly: while faculty should have some freedom in devising their curricula, they are responsible to ensure that their individual work meets the overall needs of students and the institution and department. It is also relevant here to say that librarians and other learning support staff have potentially key roles to play in the overall curricula design and delivery of undergraduate research.

However, while strong internal quality assurance and enhancement processes are important, these need to release the creativity of faculty and also be very open to alternative disciplinary conceptions of research. At Oxford Brookes University, while requiring all undergraduate and postgraduate courses to be revised to more effectively bring students into research, the institutional requirements "simply" stated that to obtain approval, programs had to "demonstrate through programme specifications how the linkages between research and teaching and learning are realised in the formal curriculum and the wider student experience" (Huggins et al, 2005, p. 1). This resulted in a wide range of innovative interventions which were then

publicised for consideration by programs in other disciplines and departments.

Make Targeted Interventions

Part of the rationale for selected undergraduate research programs is that these are costly in faculty time and other resources. Clearly in most institutions one cannot take this approach into the whole of a university curriculum without a massive shift of public and private resources into higher education. Realistically many courses will have high enrolments, and while there are ways such can help students to some understanding of research, the level of research proficiency and activity will clearly be limited. However, departments and institutions can review the whole of a program and ensure that at various stages all or many students receive high-level research experiences. In the U.K. such interventions have traditionally focussed on a dissertation research experience that has long been a graduating requirement in many institutions. There are now a range of initiatives to rethink and reshape that final-year research experience while holding onto the ideal of all students doing some form of research capstone (Healey, 2011). There are strong arguments for ensuring such research interventions include introductory courses. Based on the U.S. research on "high impact activities," including undergraduate research and first-year seminars, Kuh (2008) argues that institutions and departments should

> make it possible for every student to participate in *at least two high-impact activities* during his or her undergraduate program, one in the first year, and one taken later in relation to the major field. ... Ideally, institutions would structure the curriculum and other learning opportunities so that *one high-impact activity is available to every student every year*. (pp. 19-20).

Miami University, Ohio, instituted a Top 25 project in which over a four-year period the largest recruiting courses mainly, at first-year level, are being supported to convert to inquiry-based learning (Hodge et al., 2008).

Challenge Institutional Research Agendas and Policies

There is now internationally a range of initiatives to hold onto the Humboldtian ideal of a university where teaching and discipline research are interconnected and explicitly bring selected undergraduates into disciplinary research. However, most of these initiatives are from the teaching side of the university and fail to be effectively supported through research strategies and resources. Undergraduate *research* just in its name starts to question these institutional firewalls. Indeed U.S. undergraduate research programs may well be explicitly led by institutional research offices. However, that could be another example of undergraduate research being behind closed walls and hidden from most students — or it could help provide the leadership, resources, and values to bring all or many more students into the worlds of research through the mainstream curriculum. For example the vice president for research at the University of Alberta led and resourced an institutional strategy to demonstrate that "Research Makes Sense for Students."

Conclusion

The Humboldtian ideal of a university where teaching and research were interconnected through all faculty being researchers, and this significantly shaping their teaching of selected students who themselves were involved in research, is clearly not possible, except in selected institutions in a mass higher education system. However, it is possible, and to us essential, that we reshape that ideal by arguing, and then delivering, that a university is an institution that supports student understanding of knowledge supercomplexity through ensuring a curriculum which focuses on research as learning.

The U.S. undergraduate research movement has provided a powerful stimulus to ensure that selected students in selected institutions can learn through research and inquiry. But in many institutions, the reality as revealed by a wide range of studies internationally is that many students experience being "at arms' length" from the

worlds of university research (Brew, 2006, p. 52). We need to bring all students somehow into the worlds of research, and to achieve this, the focus needs to be on the mainstream curriculum and ensuring structured co-ordinated interventions at institutional, department and national levels. To slightly misquote President Obama, "Yes, we can do that," and undergraduate research programs now need reshaping to ensure that their resources and expertise support that aim.

Selected Web Publications (all web links cited live as of 11 July 2011)

Healey, M., & Jenkins, A. (2009). *Developing undergraduate research and inquiry.* York: Higher Education Academy. http://www.heacademy.ac.uk/assets/York/documents/resources/publications/DevelopingUndergraduate_Final.pdf.

Jenkins, A., Healey, M., & Zetter, R. (2007). *Linking teaching and research in disciplines and departments.* York: Higher Education Academy. http://www.heacademy.ac.uk/assets/York/documents/LinkingTeachingAndResearch_April07.pdf.

Jenkins, A., & Healey, M. (2005). *Institutional strategies to link teaching and research*. York: Higher Education Academy. http://www.heacademy.ac.uk/assets/York/documents/ourwork/research/Institutional_strategies.pdf.

Jenkins, A. (2004). *A guide to the research evidence on teaching research relations*. York: Higher Education Academy. http://www.heacademy.ac.uk/assets/York/documents/ourwork/research/id383_guide_to_research_evidence_on_teaching_research_relations.pdf.

Works Cited

Barnett, R. (2000). *Realizing the university in an age of supercomplexity.* Buckingham, England: Open University Press.

Boyer Commission on Educating Undergraduates in the Research University. (1998). *Reinventing undergraduate education: A blueprint for America's research universities.* Stony Brook: State University of New York at Stony Brook. naples.cc.sunysb.edu/Pres/boyer.nsf/.

Brew, A. (2006). *Research and teaching: Beyond the divide*. London, England: Palgrave Macmillan.

Council on Undergraduate Research. (n.d.). http://www.cur.org/faq.html

Edwards, Ashley, Jones, Susan M., Wapstra, Erik & Richardson, Alastair M.M. (2007). Engaging students through authentic research experiences. *UniServe Science Teaching and Learning Research Proceedings* 168. science.uniserve.edu.au/pubs/procs/2007/33.pdf.

Elton, L. (2005). Scholarship and the research and teaching nexus. In Barnett, Ronald (Ed.), *Reshaping the university: New relationships between research, scholarship and teaching* (pp.108-118). Maidenhead, England: McGraw-Hill/Open University Press.

Haggett, R. (2006). The U.S. National Science Foundation: The undergraduate curriculum and undergraduate research. Paper presented to 'Bringing research and teaching together: adapting U.S. experience to the U.K.'. Higher Education Academy and the Research Councils' U.K. Executive Group, London, 25 November. www.heacademy.ac.uk/assets/York/documents/events/archive/research_and_teaching_conf_2006/Rosemary_Haggett.ppt.

Healey, M. (2011). Rethinking the undergraduate dissertation. http://www.guardian.co.uk/higher-education-network/blog/2011/jun/28/flexible-dissertations-for-undergraduates?INTCMP=.

Healey, M., & Jenkins, A. (2009). *Developing undergraduate research and inquiry.* York, England: Higher Education Academy http://www.heacademy.ac.uk/assets/York/documents/resources/publications/DevelopingUndergraduate_Final.pdf.

Hodge, D., Haynes, C., LePore, P., Pasquesi, K., & Hirsh, M. (2008). From inquiry to discovery: Developing the student as scholar in a networked world. Keynote address, *Learning through enquiry alliance inquiry in a networked world conference*, June 25-27, University of Sheffield. http://networked-inquiry.pbwiki.com/About+the+LTEA2008+keynote.

Huggins, R., & Jenkins, A. (with Colley, H., Price, M., & Scurry, D.). (2005). Realising teaching and research links in course redesign for delivery in semesters: Mission statement rhetoric, mission impossible, or mission accomplished? *Brookes eJournal of Learning and Teaching, 1*(2), 1-10. http://bejlt.brookes.ac.uk/vol1/volume1issue2/perspective/hugginsetal_05.html.

Jenkins, A. (2009). *Research-teaching linkages: Enhancing graduate attributes. Overview: The aims, achievements and challenges from the enhancement theme*. Glasgow, Scotland: Quality Assurance Agency. http://www.enhancementthemes.ac.uk/documents/ResearchTeaching/QAA292Overview260509.pdf.

Kuh, G.D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities. http://www.neasc.org/downloads/aacu_high_impact_2008_final.pdf.

Locks, A.M., & Gregerman, S.R. (2008). Undergraduate research as an institutional retention strategy. In Taraban, R. & Blanton, R.L. (Eds.), *Creating effective undergraduate research programs: The transformation from student to scientist* (pp. 11-32). New York City, NY: Teachers College Press.

National Science Foundation. (1995). *NSF in a changing world: The National Science Foundation's strategic plan.* Arlington, VA: National Science Foundation. http://www.nsf.gov/nsf/nsfpubs/straplan/contents.htm.

Scottish Higher Education Enhancement Committee .(n.d.). Enhancement Themes: Research-teaching linkages. http://www.enhancementthemes.ac.uk/themes/ResearchTeaching/default.asp.

University of Alberta. (n.d.). Research makes sense for students. http://www.uofaweb.ualberta.ca/researchandstudents/.