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# The Teaching-Research Nexus

**How research informs and enhances learning  
and teaching in the University of Melbourne**

Gabrielle Baldwin



The *Teaching-Research Nexus* was developed for the University of Melbourne by Associate Professor Gabrielle Baldwin of the Centre for the Study of Higher Education. The document was adopted by the Academic Board in 2005.

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Centre for the Study of Higher Education  
The University of Melbourne.

Telephone: 03 8344 4605  
<http://www.cshe.unimelb.edu.au>



# The Teaching-Research Nexus

## How research informs and enhances learning and teaching in the University of Melbourne

The University of Melbourne strives to achieve an enriching nexus between research, learning and teaching. This includes a commitment to introducing undergraduate students to research insights, methods and values as one of the distinguishing features of the 'Melbourne Experience'. As a pre-eminent international research university, the University's vision involves drawing on its research strength in the design and delivery of educational programs of equally outstanding quality.

In the *Nine Principles Guiding Teaching and Learning in the University of Melbourne*, the second principle is 'an intensive research culture permeating all teaching and learning activities'. The existence of such a fruitful nexus between teaching and research tends to be an article of faith with many academics – that, at higher education level, you cannot be a good teacher unless you are also a good researcher. But the benefits of the research-teaching nexus from the point of view of undergraduate students should not be taken for granted. A comprehensive review of the extensive research relating to the effects of college education in the United States, Pascarella and Terenzini (2005)<sup>1</sup> concluded that most studies actually suggest an *inverse* relationship between research productivity and teaching quality — as least as this is measured by student satisfaction surveys. A likely explanation for this pattern is that students tend to regard the availability of academic staff as very important, and that availability is likely to be restricted in research-intensive institutions. If this is the case, academics with strong research interests and extensive research programs may have to consciously work to compensate for the constraints on the time they have available for individual students.

The University of Melbourne recognises that the research-teaching nexus has both explicit and subtle qualities and is achieved in many ways — and that there is value in deliberate efforts to nurture it. The purpose of this document is to encourage consideration of the ways in which the research-teaching nexus can be continually broadened and enhanced.

*The suggestions to follow have been written for departments and academic staff wishing to explore and enhance the relationship between research and teaching. They are not prescriptive — some of the suggestions require intensive teaching and need levels of resources and staff-student ratios that are not always possible. Rather, the intention is simply to offer practical ideas based on the range of meanings that are attached to the concept of a 'teaching-research nexus' or 'research-led teaching'.*

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<sup>1</sup> Pascarella, E.T. and Terenzini, P.T. (2005) *How College Affects Students: A Third Decade of Research, Volume 2*. San Francisco: Jossey-Bass.

## **The various linkages between research, learning and teaching**

There are many ways in which the University of Melbourne's research activity and research culture permeate teaching and learning. According to particular contexts, academic staff build the teaching-research nexus through approaches that include:

- drawing on personal research in designing and teaching courses;
- placing the latest research in the field within its historical context in classroom teaching;
- designing learning activities around contemporary research issues;
- teaching research methods, techniques and skills explicitly within subjects;
- building small-scale research activities into undergraduate assignments;
- involving students in departmental research projects;
- encouraging students to feel part of the research culture of departments;
- infusing teaching with the values of researchers; and
- conducting and drawing on research into student learning to make evidence-based decisions about teaching.

Each of these approaches is discussed in some detail on the following pages. In the main part, the discussion examines how research informs teaching and does not consider how teaching might inform research — which it can in many disciplines. For example, academics have been known to report that being asked to teach a subject in a new area has opened up unexpected lines of inquiry that have led to fruitful new research agendas.

An ideal way to achieve many of the dimensions of the teaching-research nexus is to draw on the knowledge, skills and experience of the visiting researchers who pass through the University of Melbourne each year — through presentations or lectures to undergraduates, or through their leadership of class discussions.

## **Possibilities and suggestions for research-led teaching**

### **1. Draw on your own research in designing and teaching courses**

The most obvious, and perhaps ideal, situation is one in which your current research can be incorporated directly into the curriculum — as the focus of a module or even a single lecture. The great advantage of this is that students can be introduced to the nature of research, as well as to some of the new knowledge which has been created. They can be ‘let in’ on the process: the formulation of the research questions, the development of appropriate methodologies, the frustrations and uncertainties, and the analytical steps involved in reaching sound conclusions. Research becomes a real experience to them and is de-mystified. They are likely to be affected by your enthusiasm and commitment – research findings tell us that these qualities in teachers are powerful motivators for students. Their respect for your intellectual authority will also be greatly enhanced.

Unfortunately it is not always easy to use personal research this directly in teaching – large, mainstream undergraduate courses often seem to have no room for modules based on the specialised research interests of the academic staff. On the other hand, perhaps we need to be more creative in thinking about the curriculum. As we come to accept that, with the explosion of knowledge, full ‘coverage’ of major areas is not possible in undergraduate courses, emphasis in education is shifting from content to the processes of learning (to some extent — it need not, and cannot, be either/or). Students need to ‘learn how to learn’, how to go about finding out what they don’t know, and to be given the conceptual frameworks of their chosen disciplines, so they can effectively process, evaluate and use the information they acquire. A loosening of the constraints of ‘coverage’ should create opportunities for innovative curriculum design based on the objective of teaching students how to *think like a . . .* (physicist, historian, economist, etc.). Units of study which foreground the teacher’s own thinking as a researcher – and invite the students to participate in the process — represent an invaluable way of encouraging this kind of learning.

Apart from the formal curriculum segment, there are many opportunities for teachers to introduce their own research experiences into classes in the form of illustration. The literature on effective teaching clearly indicates that illustrative material is an essential part of helping students to understand ideas, concepts and theories. They need to make connections between the abstract and the concrete, and to trace the implications of theories in practice. The good teacher is constantly searching for relevant examples and anecdotes. It is often suggested to beginning teachers that they look for topical illustrations in the media, to contextualise their material in the recognisable, everyday experience of the students. Just as effective is reference to the teacher’s own experience of tackling ‘real world’ problems in his/her research.

Here is a simple illustration of one way in which this can be achieved. Some time ago, the History Department at the University of Melbourne required first year honours students to study a unit on the Spanish conquest of Mexico. This was in addition to the main first year course in either Modern or British history. The unit was taught by a staff member who was conducting extensive research on this topic and who gained an international reputation in the field. There was no thematic link between the main courses and the specialised unit – this was not seen as a problem. The students were given a most valuable opportunity to learn about historical method, working through one of the main primary sources with a researcher engaged in the same exploration.

## ***2. Place the latest research in the field in its historical context in your classroom teaching***

All academics understand the importance of keeping up to date with developments in their fields and basing their courses on the latest findings. Teaching clearly outmoded theories or practices is a cardinal academic sin. Recently a law suit against a university department alleged as a central aspect of negligence the use of outdated materials.

However, the educational value of introducing current research findings is greatly enhanced if it is contextualised. It is important to convey to the students a sense that the discipline is dynamic and evolving — and that there have been many mistakes and dead-ends along the way. Too many textbooks tend to give the impression that knowledge is clear-cut and unproblematic. One of the most valuable insights a teacher can offer students is an understanding of the ‘messiness’ of reality and the provisional nature of knowledge. Within a discipline, there is no better way to do this than to refer to some of the discredited theories of the past and the passionate debates of the present.

This has to be handled carefully – particularly with young students, who can react with panic if confronted with too much uncertainty. They need a confident guide through the labyrinth and assistance in developing the analytical tools which will allow them to make their own judgements. One wants to encourage scepticism, but not cynicism. Students have been known to lament: ‘if all of these experts disagree, how am I supposed to work anything out?’. They can learn to be comfortable with ambiguity, informed uncertainty and provisional acceptance of theories on the best available evidence. In this, they can be greatly assisted by teachers who model these approaches and stances.

Another benefit of frequent reference to contemporary research in one’s teaching relates to student motivation. Letting students in on the intellectual adventure that is research is a powerful means of engaging their interest, even if they are presently working at a more basic level.

## ***3. Design learning activities around contemporary research issues***

In many disciplines it is possible to ask students to explore some of the cutting-edge research themselves based on their knowledge of fundamentals of the disciplines. They can be given the task of investigating the status of a current research question — to find out more about the nature of the question, the different approaches to answering it being taken around the world, and the conclusions of different researchers. In this, the Internet is an invaluable resource, making possible an investigation which would not have been feasible for students even a few years ago. This procedure also has the advantage of helping students to become acquainted with the main channels of communication within the research community of a discipline, or sub-discipline.

There are many variants of this kind of task —in some areas, students can be asked to identify the key research questions being pursued in the discipline. They can investigate the reporting of a study in the media and compare this with the official report. They can be given an article setting out recent research findings and asked to review it in terms of methodology and argument (if it is recent, they will not be able to rely on others’ judgements).

A small-scale literature review, leading to a conclusion about the current state of knowledge and further questions to be addressed, can be a very effective learning exercise for undergraduate students. It requires a range of skills integral to the research enterprise (even though the students are not conducting any empirical research) – skills of information-gathering, summary and synthesis,

comparison and evaluation, logical argument and creative thinking. And, again, it brings home the evolving nature of the field and the provisional nature of its understandings.

There are many simple ways in which this particular aspect of the teaching-research nexus can be achieved. For example, students in one course were asked to investigate the current state of research on the nature of consciousness. Working in teams, they were required to cover at least two different disciplines — since ‘consciousness’ is preoccupying researchers in a number of diverse areas — and to compare the range of approaches and conclusions across these fields.

#### ***4. Teach research methods, techniques and skills explicitly within subjects***

This too can be done in several different ways. In the sciences, of course, the development of students' understanding of research methodologies occurs extensively in laboratory classes. Another way is on an ‘as-needs-within-subject’ basis, with assessment tasks and other activities within subjects utilising new methods and skills at appropriate times to address key contemporary research issues. A further way is to offer one or more systematic research methods or skills subjects, which might include a critical analysis of the ways in which these methods contribute to advancement of knowledge in the discipline. In the latter case, linking experiences in a research methods subject to contemporary research questions in another more substantively focussed subject can enhance the impact of both subjects. In one department, for example, a sequence of research methods subjects are taught that cover research design, measurement approaches, data analysis and statistics, and a critical analysis of the role of these methods in the discipline. The department also offers a series of later year elective subjects in areas of staff expertise that utilise generic research skills in particular contemporary research settings. The joint aim is to enhance the understanding of research methods — by meaningful application — and to deepen knowledge in the particular area through a constructive analysis of the evidence base.

It is important to ensure that undergraduate students gain a thorough and increasingly deep understanding of research approaches (and their limitations) across a program of study. In many fields there are often different ways to address the same question and a constellation of experiences across a number of subjects may be most effective in instantiating the connection between knowledge and its discovery, as well as the strengths and limitations of particular methods of knowledge discovery. A mapping of these research skills across the subjects within a program of study is a sensible step in ensuring that graduates have an appropriately broad knowledge of research approaches, as well as a sufficiently rich experience in putting these methods into practice.

It should be stressed it is essential that the development of research skills builds on an appropriate level of discipline knowledge — it is necessary to make sure that when students are learning to exercise these skills themselves they have the underpinning discipline knowledge and skills for this learning to be effective. In other words, the development of research skills simply needs to occur at the right time in student development.

#### ***5. Build a small-scale research activity into undergraduate assignments***

Traditionally, research projects at undergraduate levels have been confined to honours students in their final year. But there is no reason why students at all levels cannot benefit from small-scale research activities — and in recent years such activities have been used extensively in some courses (most notably in Business programs). These days, students in secondary and even primary schools are engaged in investigations which can be referred to as ‘research’, even if the scope is

necessarily very limited (for example, students exploring their own family histories).

The main objective of research projects at undergraduate level is to give students experience and understanding of the processes of research, and these can be mirrored in a small, short-term investigation – framing of the research question, literature review, choice of methodology, data gathering, writing up, reaching conclusions and identification of further research needs. Since the first of these —framing of the research question — is often the most difficult, it may be advisable to give undergraduate students help with this, in terms of a starting point, but they should still have to ‘unpack’ any question they are given.

If a full research project is not possible within any given subject, some aspects of the experience can be offered through strategies such as giving students the chance to analyse ‘real world’ data from an existing research project.

Another educational advantage of undergraduate research projects is that they lend themselves very readily to a group approach. It is one way of making it possible to conduct a project within a semester — to divide the different tasks among members of the group. This also mirrors the research model which is becoming dominant in most fields, group rather than individual research.

A student research project is, of course, the ideal form for independent, active learning – learning by doing, rather than just watching and listening. All of these ways of learning have their place, but it is surely a goal to which we should aspire — to give every student in the university the experience of conducting her/his own research and enjoying the unique kind of learning that comes with it.

#### **6. *Involve students in departmental research projects***

Over time, universities have become very aware of how much postgraduate students contribute to the research activities – and output – of the nation. Undergraduate students also represent a great intellectual resource which is under-utilised. Many undergraduate students are very bright people – and quick learners. They have the qualities to make an excellent contribution to research projects while they are still studying. Of course, their role in research cannot be the same as that of postgraduate students – they need to build up the foundational knowledge and skills of the discipline and this is achieved largely through coursework. However, there is some potential for undergraduate students to participate in research teams – to their benefit and that of their departments.

Some universities in the United States have developed this potential to a significant extent – they make provision for students to work as junior members of research teams. In some cases, this opportunity is open to a select few, in others, it is an option offered generally to all students at a particular level of their course. Arrangements for remuneration vary – at some institutions, students receive credit towards their degrees, at others they are paid as research assistants, and in some cases they receive both.

Such schemes are not common in Australian universities and would require careful planning and monitoring. Staff would need to be confident that students had the required skills and that they could be given adequate supervision. But the benefits would more than compensate for this investment of time and energy. Students would have the immensely valuable experience of learning ‘on the job’, with experienced colleagues, and the projects would be able to draw on a pool of outstanding talent and, one would hope, enthusiasm.

Science students are able to complete a 300-level ‘Research project’ subject. These subjects are

available to students with an appropriate preparation, so that staff can be sure that students have the knowledge, skills and independence required to embark on such a project in third rather than fourth year (where this initial experience would more commonly occur). The nature of the project may be self-contained, with the student conducting a research project under the guidance of a supervisor — much like a mini-Honours project, but with closer supervision. Alternatively, at least one department in the Faculty of Science encourages students to be involved in a larger research program, becoming part of a research team and having individual responsibility for data collection and reporting on a component of the program. In this way, students become part of the research group and develop an understanding of the ongoing nature of a research program.

### ***7. Encourage students to feel part of the research culture of the department***

Most departments recognise the need to involve postgraduate research students in their research culture and have some strategies to achieve this – principally the departmental research seminar, to which postgraduate students are invited. From anecdotal evidence, the success of these attempts is mixed – too often attendance is poor, from both students and staff. It seems there is often little interest in others' research topics.

How can a vibrant research community be established, embracing postgraduate students? And can it be extended to undergraduate students? One possibility, especially in large departments, is to establish 'special interest groups' to meet from time to time and discuss topics of interest. These could be advertised to undergraduate students – the extra numbers would help to make them viable. The success of such groups seems to be dependent upon the enthusiasm and planning of the convener – and the quality of the refreshments provided!

Another effective procedure is to make students aware of the research activities of your colleagues, by referring to their areas of interest and achievements and, where appropriate, inviting them to speak to students formally or informally about their work. Most undergraduates would not have any idea of the research interests and strengths of the staff in the departments in which they are studying. Departments can also contribute to this awareness by displaying books and reports and by referring to important research work in newsletters and other communications.

Of course, some researchers simply meet regularly with postgraduate students, and in some cases senior undergraduates, to discuss issues of interest emerging from their research. These need not be formal occasions – students can be asked to raise problems and/or pose solutions, not to give papers.

### ***8. Infuse teaching with the values of researchers***

This may be the most important dimension of the 'teaching-research nexus'. It can be argued that the quality which makes higher education 'higher' and quite different from training is that it is grounded in a deep understanding of the provisional nature of knowledge. This encompasses not just an awareness that knowledge is always changing and growing, but that it is constantly challenged and revised and that its evolution involves many dead ends. From this understanding flow values that should characterise any learning activities at this level (research, after all, is a form of learning). Some of the most significant of these are:

- openness to the new, the unlikely, the unpredictable, even the unwelcome;
- 'objectivity', which may never be fully attainable, but is a goal to aspire to;
- scepticism about received theories - and new fashionable ones;

- honesty with oneself as well as others, in facing the implications of what is discovered;
- respect for evidence, no matter how 'messy' or inconvenient;
- respect for others' views, and a civility in disagreement, based on the awareness that knowledge advances through debate;
- tolerance of ambiguity, which is the safeguard against fundamentalism of all kinds;
- respect for the subjects of study;
- persistence, in the face of difficulty and confusion;
- analytical rigour, which will not allow for facile solutions;
- accuracy, which requires the self-discipline to attend fully;
- humility – the awareness that one may always be wrong, as many others have been before;
- willingness to admit error or uncertainty;
- the courage to be creative, to think 'outside the square'.

This is an ideal, of course – some might say more honoured in the breach than in the observance. But these are strong, enduring values which continue to underlie research activities in our universities. It is not always the case that they underlie teaching activities – sometimes the assumption is that undergraduate education is about conveying the certainties of the discipline and that any questioning or creativity comes later – for a select few. But surely it is possible in all disciplines to establish the firm knowledge base in a context of change, challenge and uncertainty – and to give undergraduates plenty of experience in confronting messy, ambiguous and contested areas. There are two main ways of addressing these values in undergraduate courses: teachers can model them in classroom interactions, and can structure learning experiences which require students to develop them.

A powerful pedagogical strategy is to admit uncertainty. It has to be handled carefully – students need confidence in their teachers. But to illuminate the terms of that uncertainty in a structured way and to suggest possible ways of tackling the issue can reinforce the concept of teacher as fellow learner and guide, who has enough experience and knowledge to suggest ways of tackling problems, not necessarily solutions.

Another effective procedure is to canvass opposing views on an issue, in a measured, judicious way. To lightly pour scorn on scholars from different camps is to encourage an intolerant, doctrinaire approach that runs counter to the values outlined above. Or, ask students to review different arguments and encourage them to adopt these values of openness, fairness, respect – and scepticism – in doing so.

### ***9. Conduct and draw on research into student learning to make evidence-based decisions about teaching***

This is a different aspect of the 'research-teaching nexus' from those presented above. The research referred to here is research in the field of Education, on student learning and the student experience. But the connection between teaching and research in this context is just as important. A somewhat anomalous feature of all universities is that academics who are deeply engaged with research findings in their own disciplines have little knowledge of the considerable body of research on how, and in what contexts, students learn most effectively.

They cannot be expected, of course, to become experts in the field, but there are many ways of

learning quickly about broad findings which can be extremely useful in planning and conducting courses. Almost all universities now have academic professional development centres. Part of their function is to distil the research literature into accessible forms for busy academics. The Centre for the Study of Higher Education produces publications which aim to do this and workshop programs based on research in the area. The Internet makes available a wide range of resources which draw on educational research in suggesting ways of developing teaching practices based on the findings.

Some academics may also wish to conduct research into teaching and learning themselves in order to make evidence-based decisions. Staff within particular disciplines may on their own, or in collaboration with educational research experts, carry out research into the impact and effectiveness of particular educational practices within subjects, programs of study, or courses. Experimental approaches are often not feasible but systematic local collection and analysis of data that can inform understanding of the relationship between educational practices and learning can be exceptionally helpful.

It is important to acknowledge that much educational research is complex and inconclusive in relation to effective learning. If we could find 'the answer' to how people learn, it would make teaching a lot easier, but of course there is no one way. People learn in a wide variety of contexts, in unpropitious circumstances, sometimes outside or even despite the teaching environment. It is virtually impossible to reach absolute conclusions with educational research, because it does not lend itself to controlled experimental conditions and the outcome measures will always be complex and problematic (if they are to truly reflect the nature of higher education, say, rather than the learning of very simple tasks). However, there is much research which is very useful and provides clear pointers to practices which are likely to enhance learning. Such research is a valuable supplement to the confirmation of teaching effectiveness which has always guided good teachers – evidence of student response and understanding.