Innovative pedagogies series: Research-based learning, taking it a step further

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Abstract

Like many Psychology departments, we engaged in research-led teaching activity (where students learn about research findings), research-orientated activity (teaching students about research process) and research-tutored activity (where students learn in small group discussions with a teacher about research findings), see Griffiths (2004) and Healey (2005) for full definitions. Students also engaged in practical research where they learned by doing research, that some might refer to as research-based learning, (see Griffiths (2004) and Healey (2005). However, our early iterations of research-based learning were not optimal since students would practice a type of research method or analysis using well-known, and perhaps over-used research replications with little intrinsic value for staff or students. We argue that research-based learning is optimal only when students learn as researchers in inquiry-based activities, and where the division of roles between teacher and student is minimised. In this context research becomes an authentic and complex task, and a vehicle for transformational learning. Here we share our experience of creating a research-based learning module which ultimately evolved to transform departmental culture to one in which our students work alongside us as co-creators of knowledge.

Introduction

There are many excellent approaches to aligning teaching and research in UK universities. The most commonly discussed, that we have experienced and reflect on here, are research-led teaching, research-orientated teaching, research-tutoring and research-based learning. These will be explored in detail later alongside our reflections on moving from delivering a module in research-based learning to a whole department approach in which students and staff are co-constructors of knowledge. This approach has led to mutually respectful and beneficial relationships between staff and students. We are now six years into our department journey of culture change and already there are tangible outcomes: our proportion of research active staff and research income has grown; National Student Survey satisfaction figures have improved; and the Destinations of Leavers from Higher Education data indicates that the proportion of graduates in paid employment and in graduate occupations has increased to levels above the national mean. Moreover, our department is a vibrant learning community in which students and staff are partners.

Innovating in research-based learning

There is much debate about whether teaching and research are necessary partners, a ‘marriage of convenience’, or create conflicting goals for an academic (see discussion in Ramsden and Moses; 1992). Empirical research indicates that no relationship or a negative relationship exists between individual and departmental level teaching effectiveness and research indexes (Ramsden and Moses; 1992). In our experience (spanning three UK universities, pre and post-1992 institutions) there is a clash between research and teaching, characterised in dialogues such as “if we adopt that tutorial system my research time will decrease” and “we can’t reach that level of research output and maintain student contact time”. More often than not, academic staff were identified as teachers or researchers, rather than both. Our experiences lead us to believe that this differentiated identity is an inherent risk in any department simultaneously striving for teaching and research excellence. Avoiding the conflict between research and teaching requires proactive and strategic planning.

Griffiths (2004) categorises possible links between research and teaching into three areas: research-led, where students are taught research findings, with content predominantly consisting of staff research interests; research-orientated, where students learn the processes and methodology of conducting research; and research-based, where students learn as researchers, with minimisation of typical ‘student’ and ‘teacher’
roles, instead focusing on collaborative input into research. Healey (2005) adds another category: research-tutored activity, where tutorial systems between student and staff are implemented to discuss research collectively, with the potential for future work to be produced based on these dialogues.

For many years the Department of Psychology had engaged in research-led, research-oriented and research-tutored activity (see Griffiths (2004) and Healey (2005)). Research-led was achieved by all department module lecturers teaching the theoretical and research underpinnings of psychology, often in their own area of expertise teaching the research findings they had published. Research-orientated teaching was delivered via two modules in each of Level 4 and 5 in which students were taught quantitative and qualitative research methods and analysis. Research-tutored activity was achieved in Level 4 weekly and Level 5 fortnightly small group tutorials (with no more than seven students), and in one-to-one dissertation supervision.

As we learned from our experience, integrating research into teaching does not automatically lead to a more effective, engaging and student-centred learning experience. There is as much risk with research-aligned teaching as with any other teaching that it is conceived and managed as information transmission. Trigwell, Prosser and Waterton (1997) identified an “information transmission focus” that results in communicating information through lectures. Even when this is research-informed information, it will not achieve the “conceptual change student focused” approach that they identified as engaging students into performing the research.

Complex tasks for complex learning: building teamwork

Soon after joining the department I became the lead for an undergraduate module in Transferable Skills for Psychologists. In this undergraduate module one of my aims was to develop teamwork skills. While for the first iteration of this module student feedback was excellent, I wasn't convinced that the students were team working; choosing instead to work independently to achieve a shared goal. My reflections led me to the literature on developing meta-cognitive skills and I became convinced that the work of Jeroen van Merrienboer (see for example Merrienboer and Kirschner, 2007) exploring ‘complex tasks’ for ‘complex learning’ could help to develop the module. Complex learning integrates knowledge, skills and attitudes like that developed at work (more akin to transformational learning). Transformational learning is defined as learning that creates significant change in the learner, which affects the learner’s beliefs and perception of experiences thereafter (Clark 1993). I realised how inadequate my initial module had been. In my second attempt at the module I took students into the university TV studios. Their brief was to work in groups over ten weeks to develop, record, edit and feature in their own TV programme about university life (the complex tasks). Students were anxious and stressed. This experience felt very real and they experienced all the joys and woes of team work.

This work revealed their strengths and weaknesses in all their glory. We had time for reflection stimulated by theory and research when we came back to the classroom for weeks 11 and 12 of the module. We focussed on action planning around each student’s self-perceived strengths and weaknesses as part of the assessment. The assessment comprised an evaluation of the television show (group mark), their action plan (individual mark) and a peer review (the combined rating of their contribution from their nine fellow team members). Module satisfaction was even higher on this second iteration of the module, but this time I felt that the students had moved out of their comfort zone and had begun to experience transformational learning. Not only was their teamwork skills developing but their focus on, and abilities in, reflection were also developing, as were their critical thinking skills. I continued to use this approach in subsequent years, developing the Transferable Skills module into a Professional Skills module for professionally accredited Masters’ students.

The complex tasks developed, we added running after-school clubs (craft club and British Sign Language club), and designing and decorating a special needs room for a school (including the research to underpin the design and the fund raising). This approach has evolved over time and can now be seen in our commitment
to ‘creating knowledge together’, where research forms the complex task – epitomised in the undergraduate Research Based Learning module that we subsequently developed.

**A research based learning module**

We created the Research Based Learning module in 2004 for the department of Psychology (later rolled out across the university) to create an opportunity for students to experience a complex task via research, that went beyond the research-led, oriented and tutored activity already offered. In this credit-bearing module, students created knowledge with staff; they worked and learned as researchers with us. This activity is referred to by Griffiths (2004) as research-based, where students learn as researchers, with staff and students making a collaborative input into research.

This module (an option) entailed being competitively selected for a role (we began with about 14 research roles) having a secondary option module ready in case a student was not selected. Generally we had as many roles as we had students, however, we tend to increase roles if more students apply than we initially have posts for. So we are not selecting but rather enacting a selection process in order to give the role value and ensure that students take a professional approach from the offset. In reality students self-select having been briefed about the importance of the research work that they will be engaged in and the hours of work required. The hours of work reflect the notional hours for all other credit bearing modules, for example 100 hours per ten credits. However, in this unit these hours are not independent learning in addition to lectures, but largely scheduled working hours.

Each role has a formal job description as a Research Assistant on an existing staff research project. The roles are equivalent in that they entail each student working as a research assistant for six hours a week for ten weeks (of a 12 week teaching block). The final two weeks are focused on module assessment for which there is a module tutor for support, in addition to the research supervisor (the principal investigator). The coursework assessment is a learning portfolio in which the student provides evidence that they have achieved the learning outcomes of the module. Some learning outcomes are generic and built into the module, for example to develop knowledge in the specific research area of their project (most students produce a critical literature review to demonstrate this) and show understanding of the organisational structure relevant to their role (most students use diagrams to show the research team hierarchy and critical processes, such as securing funding and output as part of the project). Other learning outcomes are decided by the research supervisor and the role holder in a meeting early on in the module. These might include demonstrating a working knowledge of a particular type of research method or analysis, or showing the development of soft skills such as research communication, team work etc. We evaluated the Research Based Learning module after its first year by collecting qualitative feedback from staff and students, beyond the normal module evaluation questionnaires. As Griffiths (2004) and Healey (2005) would have predicted this revealed the development of respectful and mutually beneficial relationships between staff and students. The division of roles between teacher and student was minimised, achieving research partnerships that supported transformational learning that often continued beyond completion of the module. Shared staff and student peer reviewed journal articles resulted from some projects too, demonstrating this to be an authentic research exercise. When I became Head of Psychology in 2009 my main goal was to develop this approach beyond the Research Based Learning module. At this stage we were uncertain; could this be achieved as a whole department culture?
How this practice evolved to a culture of creating knowledge together

We began by working strategically to build a learning community in which staff and students created knowledge together, as a department culture. Psychology is a discipline like most Science and Social Sciences in which we aim to teach students research skills. However, this does not necessarily mean that students’ learning is developing transferable skills, including critical thinking.

What was clear at this point was that a learning community in which we created knowledge together would not simply emerge, nor could it be created via a range of research-led, research-oriented and research-tutored activity with one research-based learning module. We decided that we needed to go beyond curriculum developments. We took a multi-pronged approach, with further development in our curricula and extra curricula development. We also changed our department strategy that influenced, among other things, our infrastructure and staff selection.

Firstly we needed to address the question: what is our research? We were extremely diverse in our interests at that point, making it hard to provide a clear focus for the alignment of teaching and research. We began with bottom up identification of our research strengths, followed by the redevelopments of our departmental strategies, to include in their headline goals the need to support the link between research and teaching. Each of the research strength areas goals were developed, which included:

> providing a focal point for student extra curricula activity;
> delivering specialised research-led, research-oriented and research-tutored curriculum.
> providing credit bearing research-based learning opportunities for students;
> providing volunteer or paid research opportunities for students.

The course management teams worked to enhance the research-led, research-oriented and research-tutored activity. For example, Level 6, which had consisted of optional modules, was redeveloped to offer modules reflecting our newly identified research strengths. We also increased the capacity of our existing Level 5 Research-Based Learning module and added a similar module to Level 6. More hands-on research activity was added to our research-oriented Research Methods modules. These modules had always replicated ‘real life’ research with students engaging in their own ethical review submissions, but we added risk assessment and moved from well-worn practical exercises, with no potential for knowledge creation, to mini research projects designed by students (with our support). Here students chose areas in which they were intrinsically motivated to create knowledge (starting in teams and moving to individual work later in the modules). We increased coverage of qualitative research methods to create a broad range of methodology options for students but also to reflect the breadth of expertise in the department.

Allowing students to co-create their Level 6 dissertation research with us (rather than providing set projects) allows teaching and research to once again align, as well as ensuring that third year dissertations are intrinsically motivating to our students and their supervisors. This, and the fact that students will have experienced hands-on research from the first days of their degree for credit, pay or voluntary work, means that our students’ dissertations are consistently praised by our Externals Examiners.

In terms of extra-curricular opportunities, we developed a myriad of volunteer work with staff, creating a researcher database where students express interest in working with staff, then attend interview to gain placements. Approximately 20 students each year work as volunteer researchers. For example, two Level 5 undergraduates worked on a Portsmouth City Council-funded project exploring aspirations in Portsmouth's school children, with a member of Psychology staff and the Deputy Director of the Marketing and Communications Department. They worked on the initial phases of the project, collaborating with paid Research Fellows, and undertaking a review of existing research about primary school children's aspirations.
and the impact these have on academic outcomes. They also explored archive data from the local council regarding school children's academic outcomes. One of the volunteers referred to this opportunity as:

thought-provoking and an all-round good experience.

the other described the work as:

both interesting and challenging... it's been great fun working in a team and getting to know members of staff... it leaves you wanting to know more about the topic. By having meetings with the Council, it has shown me how applied work is carried out and the complications that have to be dealt with. These few weeks have demonstrated to me what doing research is all about and it has been a fantastic experience!

We also promoted summer bursary schemes (externally funded) and created internally funded schemes for students to work with staff on research projects. Our main routes to Undergraduate Summer Research Bursaries are the British Psychological Society (BPS) and the Nuffield Foundation. We have had excellent levels of success securing funding, for on average three undergraduates each year. One such project, funded by the BPS under the Undergraduate Research Assistantship scheme enabled one of our Level 5 students to work with a member of staff exploring how to make automated telephone systems more user-friendly for older adults.

Two colleagues created the paid Project Support Assistant (PSA) job role (with HERA analysis). This allows us to provide paid research assistant posts to our undergraduate students. Two students that worked as PSAs examined the cultural transmission of story-like information (such as urban myths and rumours). Existing studies are limited because participants are often asked to write down what they can remember of the stories, with these written versions being passed to the next person in the serial reproduction chain. As such, the method fails to capture the way in which stories are typically passed between people by word of mouth. In this project our undergraduates PSAs compare the content of stories that have been transmitted in writing to those that have been transmitted verbally, examining whether changes and distortions in the stories might simply be an artefact of the experimental procedure used to model their transmission. Our PSAs have been involved in literature reviews, research design, running experimental trials and applied interventions, data analysis and administering and scoring psychological measures, to name a few activities. They are not limited to the repetitive tasks that we will all experience from time to time in research, for example data entry and coding.

So as well as attending taught modules in the core cognate areas of Psychology, research methods and statistics, our students also carryout cutting-edge research with us as volunteers, for degree credit (Level 4 Research Based Learning and Level 6 Dissertation), on externally funded summer bursaries and as paid Project Support Assistants (PSAs). Given the extent to which students work with us in paid posts, for credit and as volunteers, it is not surprising then that so many publish with us, on average about ten every year. The article that you are reading now is co-written with a Level 6 undergraduate working as a PSA (her second PSA role). Here are a few other student staff partnerships that have resulted in publication (student names in blue):

Stafford, L. and Whittle, A. (2015) Obese individuals have higher preference and sensitivity to odour of chocolate. Chemical Senses, 40(4) 279-84.


In terms of developing infrastructure, we formalised an equitable approach to managing laboratories, equipment and technical support in line with our ‘creating knowledge together’ agenda. Our students use department facilities and are trained to do so from the early stages of Level 4. Since students design their own research, with support, from an early stage, they decide which resources they need and book these and the necessary training. We are explicit that there is no priority access for staff. This is clearly evidenced in testimonial from students:

From my first year, due to early involvement with departmental research, easy access to labs and competent technical support proved to be indispensable.

We have always had access to all areas of the department including technical support... it's brilliant to know it is available from day one... I think I speak for the group when I say it aided our interest and engagement being able to use such technology.

Being part of a learning community requires having a space to work together. We have 12 research cubicles for staff and students to book. We also created a social learning space - the Psychology Practical room. This is a space that, for very little investment, gives our students a sense of belonging, a place to go between lectures where they are known and where discussion and learning takes place. Staff are not permitted to use this space in term time, so it is always open for student use. It is also a great space for training and seminar sessions that are scheduled for staff and students to attend together.

We changed the department's approach to managing human resources: academic staff selection criteria, and teaching relief policy. We now advertise for and shortlist only those who demonstrate both a passion and potential for excellence in research and teaching, and the alignment of these activities. We operate a teaching relief policy that enables staff to find space for funded research but also ensures that they remain involved in teaching; thus researchers remain teachers. We have made more space for research, but rather than this being at the expense of teaching, it is symbiotic with teaching; preparation for teaching is preparation for research; supporting a student's development in transferable skills is working on research together, giving feedback on a draft dissertation is polishing a shared publication.

This approach means that students perceive us as more than just teachers, instead they are an integrated part of our academic community, sharing our enthusiasm for Psychology: they are our partners in creating knowledge. Thus, we have developed a culture in which teaching and learning are not conceived of as the transmission of received wisdom but about exploring and questioning.

The biggest struggle in the early days of this journey was convincing staff that this could work, but the results soon spoke for themselves. The challenge that we face now is in understanding how to make appropriate resource allocation decisions. When teaching and research are so aligned it is difficult to determine if we are resourcing teaching or research. This may prove troublesome at points when we are required to account for spend and time for different activities. There is also a risk that in supporting student activity we inadvertently support staff research in a way that is not transparent or equitable. This can be helped by creating equitable resourcing of the aligned activity, for example we have a career development fund where students can apply for financial support to develop their employability. Many of the applications come from those who require travel to get to local zoos for the research they are doing with staff in our Comparative and Evolutionary
strength area. In this instance we are able to resource the applications based on which will be more beneficial for the student. For our Research Based Learning module, each member of staff is given a small amount of money per student, to cover some research costs. This incentivises the alignment of research and teaching, but also does so transparently and equitably.

As a department (staff and students) we have made this transition together with huge success. The proportion of research active staff has grown from around 40% (in 2008) to 62% (in 2015) – according to the definition for ‘research active’ used by our institution, which involves Research Excellence Framework (REF) entry. By our department definition, which requires three peer reviewed outputs, and grant management or PhD supervision, we reached 86% in terms of research active staff. Before we began this journey our National Satisfaction Survey (NSS) showed an overall student satisfaction rate of 85%. Our undergraduate programmes have received overall satisfaction between 92% and 100% over the last three years. We are confident that our students develop many transferable skills from their research experience, since this is simply one way of delivering a complex task, for complex learning (see Merrienboer and Kirschner 2007). The evidence for impact in this area is the data from the Destinations of Leavers from Higher Education (DLHE) survey. The proportion of graduates in paid employment has increased steadily and Portsmouth Psychology graduates now have an employment rate above the national average for UK Psychology graduates. Furthermore, of those entering some form of employment, the proportion entering ‘graduate’ professions has been above the sector average for the last two years. A significant improvement compared to 28% in 2009 (which was significantly below sector average).

How this practice is situated theoretically

Research and teaching

The relationship between research and teaching within universities has been well-documented; Ramsden and Moses (1992) suggested that in order to be a good university teacher, teachers should be active researchers. Adversely, Webster (1985) concluded little to no correlation between research productivity and teaching effectiveness within universities. With Hattie and Marsh’s (1996) meta-analysis of 58 studies on the relationship between teaching and research establishing zero relationship between research and teaching, it may seem logical, if the relationship between teaching and research does not exist, to separate the two, making individual universities centres of purely research or purely teaching. However, Hattie and Marsh themselves, recommend the opposite of this. In their 2004 conference presentation regarding the relationship between research and teaching, they stated that their findings are commonly misinterpreted, asserting that zero relationship between indicators of excellence in the two does not mean that there are no great researchers who also teach, or that there is, or should be, a clear divide in all universities between researchers and teachers. In fact, they suggest that because of their 1990 finding, universities should work harder at creating a link between research and teaching, instead of them merely co-existing alongside each other.

Despite the fact that teaching and research will inevitably co-exist within universities, a 2001 report by Gibbs found that only a very small number of (mainly post-1992) institutions included a focus on the teaching-research nexus in their learning and teaching strategy (p.17). Gibbs states that the relationship between teaching and research is an obvious focus area for future support within universities. With this in mind, we will explore research-led, research-orientated, research-based (Griffiths 2004) and research-tutored (Healey 2005) approaches in more detail.

Research-led learning

Research-led learning, where a University’s current research is being taught within lectures, is among the most common within research-teaching integration. Drummond (2012) discusses how academics within the History department at Leeds University enjoy success within learning, teaching and research, through
keeping lectures up to date with current research within the university, as well as ensuring lectures are taught by experts in the field. Drummond also discusses how this, in turn, helps academics generate new ideas for future research through discussion with students.

While research-led teaching in this sense is probably the easiest in terms of implementation, Kinchin and Hay (2007) suggests that simply creating PowerPoint presentations to structure teaching based on current research may encourage students to adopt a surface-level approach. This was certainly our experience in Psychology; this activity did not generate exciting partnerships with students (for staff or students). However, while research-led teaching as defined by Griffiths (2004) may not be enough to bind research and teaching together as transformational learning, it could be a crucial underpinning of a culture where research and teaching are mutually beneficial. Students gaining knowledge and understanding of their department's current research aims and outcomes could be important for creating knowledge that will be of value should they have an opportunity to later become involved in creating knowledge in partnership with staff. For example, students who receive a lecture regarding current department research into child development, who are later given the opportunity to be involved as a Research Assistant within a project, and later being asked to create research into child development may have a stronger foundation for this level of activity.

**Research-orientated learning**

Research-orientated learning, where students learn about the processes and methodologies used within research, is often incorporated as compulsory modules within degree programmes. However, Winn (1995) states that learning about such methodologies is not always intrinsically appealing to students. Winn suggests a way of overcoming this is creating modules where students learn methodologies through research projects, thus minimising lectures on methodology and offering a hands-on approach. Aguado (2009) discusses the implementation of a research methodology class where groups of students were offered a variety of broad topics to choose from, before creating narrower research questions from the topics, before devising research into these through exploring research methods, data collection techniques and use of statistical software. As we have discovered in our Psychology department, this approach offers engaging hands-on learning that is more motivating. The co-design of research projects (begun by students choosing a supervisor they want to work with) gives them autonomy and means that the learning task has an intrinsic value. This method may be useful in deterring the feeling of undertaking research that does not matter, which may be found when students are given pre-determined research projects to undertake. In fact, Smith and Martinez-Moyano (2012) recommend using real examples when teaching methodological processes and statistics in order to create meaningful links, encouraging a deeper processing of the lesson. A deep-level processing approach, originally identified by Marton and Saljo (1976) is a critical, thorough examination when learning new concepts, with the creation of links to pre-existing knowledge, is generally believed to promote a deeper retention, comprehension and application of knowledge (Entwistle 1988). Adding tasks where students base a project around a given methodology, for example, two by two factorial analysis or a piece of critical discourse analysis, having been taught the basics of that technique in classes, enables an understanding of what research questions fit with each method. Onquegbuzie and Leech (2005) suggest that fostering the idea that research does not have to be either strictly qualitative or strictly quantitative could also be beneficial to future researchers, as both will offer different insights to one topic.

Aguado's (2009) research-oriented method provides opportunities for students to develop critical thinking through complex tasks, such as those recommended by Thomas (2000). Thomas describes complex tasks being given to students through 'project-based learning', either within groups or as individuals. These aim to develop critical thinking skills, managing complexity and encouraging motivation to achieve a project goal. Project-based learning tasks should be realistic, as opposed to purely conceptual. Incorporating the creation of projects within groups, such as suggested by Aguado, may give the opportunity to develop team-work skills. Thus providing complex tasks in learning, such as hands-on research could develop transferable skills (for example team work, project management, communication, reflection, resilience and problem solving) that will enhance undergraduates’ employability.
Using research-oriented exercises such as these can be used to develop students free-thinking, thus providing a transformational learning experience.

**Research-tutored learning**

Research-tutored learning, as categorised by Healey (2005), is the process where students gain the opportunity to discuss research within a given tutorial meeting, sometimes producing work based on said discussions. While tutorials can be used as a teaching opportunity, Trigwell and Ashwin (2003) suggest that students are more likely to engage with tutorials when they perceive them as a collaborative discussion, as opposed to a teaching exercise. Ashwin (2006) holds up Oxford University as using an ‘ideal’ tutorial system, where tutorials are small, ranging between 1-6 students per tutorial, and tutors have some autonomy choosing topics of focus. The tutorial system also gives opportunity for students to explore questions that a topic may pose, with the guidance of an experienced researcher, such as discussed by Anderson (1997). Trigwell and Ashwin (2013) believe this collaborative discussion may negate students from adopting a surface-level approach, merely aiming to repeat what they have been taught for assessments (Marton and Saljo 1976). Instead, tutorials encourage students to think laterally and form their own arguments, as opposed to just following a focused argument presented to them within a lecture. Pressley, McDaniel, Turnure, Wood and Ahmad (1987) found that asking elaborative questions regarding topics also improves memory retention. They gave undergraduates a list of people performing actions and informed some to think about why that action was being performed, telling the control group to simply memorise, students were much more likely to remember the person and action when they had been asked to question why the action was taking place, suggesting that questioning aids retention of knowledge. Ashwin points out how highly the tutorial system is valued by students and staff within Oxford University as an opportunity to encourage deep learning. Trigwell and Ashwin (2003) examined the experience of undergraduates at Oxford University, they discovered that 1st class honour students were more likely to score higher on adopting a ‘deep approach’ to learning, when in comparison to other students. The students who made efforts to understand new information, questioning where it fit in regarding previous research, were those who performed the best. In contrast, a surface level approach, where students merely aimed to replicate information taught to them, rather than understand the meaning of it, had the opposite implications for final honours.

**Research-based learning**

Research-based learning, defined by Griffiths (2004) as the process of students learning as researchers, may be the hardest of all the categories to actualize. While it could be argued that setting projects such as discussed by Aguado (2009) may fulfil some criteria of research-based learning, it is suggested that these are more focused on teaching the research process and methodology than treating students as researchers. Students often criticise being tasked with ‘contrived’ projects, those explicitly designed to align with a specific teaching purpose, instead of the opportunity to undertake ‘real’ projects, as noted by Preston (2005). Within research-based learning, to achieve transformational learning the aim should be giving students a complex task, in this case, the same opportunities to create knowledge as researchers, without implicitly teaching a syllabus or placing students in the role as ‘students’. We have found that this process, resulting in shared publications, gives the students involved a clear sense of the authenticity of the activity as shared knowledge creation. It also show respect for the students and is a salient indicator of the value they added to the work.

Mezirow (1981) considers three elements necessary for the achievement of critical transformational learning in adults, and saw these as the vehicle by which one questions the validity of their world-view: experience, critical reflection, and rational discourse. All three can be facilitated by the use of complex experiences in learning, which research-based learning can be. More importantly research-based learning facilitates experience, critical reflection, and rational discourse in a way that fit with exploration of self (Dirkx 1997) and core questions in human seeking (Kroth and Boverie 2000). In other words research-based learning is an activity that can be intrinsically motivating, not an artificial educational experience in which learners are driven only by extrinsic motivation for the grade. Aligned to our experience of ‘creating knowledge together’
Taylor (1998) believed that too much emphasis in education is placed on the teacher at the expense of the student. He emphasised that learners share the responsibility for constructing and creating both the environment and the process of transformational learning. Daloz (1986) recognized that growth can be a risky and frightening journey into the unknown, as students are challenged to let go of old conceptualisations of self and the world. He frequently used the metaphor of transformation as a journey in which the mentor or instructor served as a gatekeeper as well as a guide for students on the journey (Daloz 1999).

Harris (2012) writes of a student-led dissertation project, where a student was interested in learning more about woodpigeon's within the RSPCA. The university encouraged the student to undertake the project, subsequently linking with the RSPCA to enable more students to undertake dissertation research with them. Offering students the option to choose their own research topics and interests may be the starting point for research-based learning. Not only does it ensure that students are spending their final year writing about a topic they are interested and engaged in, if students are sourcing relationships with external organisations for research, it can be an opportunity for the university department to create links with external organisations. In our experience this type of approach only works if students have gradually developed their skills, confidence and autonomy through earlier experiences of this nature. Early research-led teaching is also essential as a prerequisite in order that students know from an early stage what research takes place in their department. At worst students can then identify the right staff for Level 6 dissertation supervision and at best can build early partnerships with staff working in areas of mutual interest. In our case there are opportunities to develop these relationship early through volunteering, PSA work and the Level 5 Research Based Learning unit.

In our department we ensure that students undertake ethics reviews and risk assessment for projects, take responsibility for booking their own equipment, laboratory space and technical support, recruit their own participants or collaborators and organising their own schedule to write up their findings and respond to feedback on a draft (akin to peer review) they experience a complex task and cannot overlook the realities of research. This complex process is what we regard as research-based learning. Students are given the opportunity to experience all aspects of being a researcher.

As Al-Nakeeb and Howard (2012) point out, despite the PhD market becoming increasingly competitive, the majority of undergraduate students do not gain opportunity to submit work to peer review as part of their university experience. Newman University College has a peer reviewed, interdisciplinary journal, Critical Commentary, which offers students of varying levels the chance to submit research for peer review (Al-Nakeeb and Howard 2012). This gives them the chance to experience, first-hand, feedback from peers, the need for editing and re-editing to meet the journal's requirements and, finally, being published. This would be the next step in our department. It is argued that experiences such as these could be extremely valuable, not only due to chances to gain real world experiences, but in terms of future job or postgraduate applications within the field or research or for employability more generally. Of course, the same effect can be achieved if a department aims to publish undergraduate dissertations which are of high standard, with students undertaking the publication process with some guidance from their dissertation supervisors. This method benefits the supervisors who can gain joint publication, as well as generating ideas and theories for new research topics, however, an in-house journal allows for more students to experience this.

Above, we explored our own attempts to align research and teaching so that they were mutually beneficial for staff and students. Below we provide links to other universities that have interesting initiatives to share. One that has been similar to our PSA scheme is the research assistant scheme, run by the University of Worcester (Wilson 2012). Their scheme offers students the opportunity to collaborate with a researcher over the summer vacation to create future research, potentially gaining the chance to earn publication. Like our PSA scheme the assistants are selected via a selection process.

Activities aligning research and teaching can be very different to ours, determined by the academic's individual teaching style. For example, Brew (2001) states that an academic focused on external environments may introduce activities such as students attending research conferences, or engaging in work
placements, in social and economic impact within their chosen field. Indeed one of our projects that employed over 90 PSAs from around the University, not just our own department. They were trained to administer a research underpinned intervention in schools. In another project a member of staff recruited two PSAs to collect data in a local wildlife centre about the visitors’ understanding of science before and after exploring an interactive exhibit underpinned by research. This resulted in an excellent REF entered paper evidencing impact on public understanding of science.

The literature presented above and the experiences that we have had in our department demonstrate that through research-oriented learning, students will have learned about processes and methodologies of undertaking research. Early support should also involve learning through research-oriented classes, learning about the research of those around them and discussion of research ideas through research-tutored activity. Only when this is provided then can research-based learning be achieved in a way in which is beneficial to both staff and students, partnering to create knowledge together. Finally though, to turn Trigwell, Prosser and Waterhouse’s (1997) identified teaching conception on their head, it is our experience that in order for a department to fully engage in creating knowledge in partnership with their students they need to eradicate ‘information transmission focus’ conceptions of learning. Since, holding on to this conception will always place the academic staff member as the giver of knowledge and the student, the passive receiver. It is moving away from this conception that makes our department the exciting learning community that it is today. We don't want to present an illusion though. We still have many students who want to receive knowledge, but what we can be sure of is that we encourage students to be more active in learning, and give them the necessary skills, confidence and opportunities to do so should they choose to. In an average three-year cohort of 650, about 40% of students will have engaged with one or more of the optional complex tasks on offer (be that research or work based). All students will have experience of a good deal of hands-on practical research in our core research methods and analysis units and will have conducted an individual, co-created Level 6 dissertation where they are responsible for the whole research process, rather than a staff designed and managed project. We have also taken much of the conflict out of research and teaching by aligning them and enabling staff to work on and achieve both goals simultaneously.

How others might adapt or adopt this practice

Most departments have the basic ingredients to develop a creating knowledge together culture: researchers and students.

The key to adopting this approach is to:

> explore conceptions of learning within your department and challenge the outcomes for staff and students, of an ‘information transmission’ focus;
> identify the research strengths that you have so there is a clear sense of what research is being aligned to teaching;
> develop curricula around those strengths. Even within professionally accredited programmes core units can cover the generic area, with the flavour of the research strengths. For example, within our individual differences module when intelligence is covered it moves into Implicit Theories of Intelligence, the module leader’s area of expertise;
> build the alignment of research into your strategy, resource allocation, infrastructure and staff recruitment and selection;
> support research-based learning with early teaching that is research-led (where students are taught research findings), research-orientated (where students learn the processes and methodology of conducting research) and research-tutored (chance to discuss research collectively);
> create optionality and autonomy within modules and across modules so that students can specialise in what they are motivated by;
create extra curricula complex tasks that facilitate students to build working relationships with staff (for example paid roles, internships, volunteering opportunities, attending research seminars together, and shared research conferences);

- allow opportunities for hands-on experience to replicate the whole research process/complex (for example for research include ethical review, risk assessment and peer review);

- ensure that the research activity/complex task is authentic, for example has the potential to lead to a real-world outcome such as publication or social and economic impact);

- when research-based learning is used as a complex experience to promote transformational learning, the role of the teacher is to: facilitate trusting and sensitive relationships among the participants (Taylor 1998); be a mentor, not a provider of knowledge, and to act as a role model who is willing to demonstrate their own willingness to learn and change (see Cranton 1994);

- the complex experience should be one in which those participating have full information, are free from coercion, have equal opportunity to assume various roles, and can become critically reflective of assumptions (see Mezirow 1997);

- the complex task doesn't have to be limited to research. In our department we also offer several work placement and study abroad opportunities;

- show students respect for what they can offer during these activities;

- provide students with equal access (as academic staff) to research facilities and technical support;

- provide a physical space for students to carry out the activities they are working on (whether individually or in groups, with staff or with other students), such as a social learning space;

We are one of many other departments that have attempted to align teaching and research

### Conclusion

When you see the words ‘Researchers from the University of Portsmouth’ in articles about research findings like the ‘Chimps’ laughter: Not just monkey see, monkey do’ article, ‘researchers’ are staff and students. Taking the conflict out of research and teaching has become the key to growing our research activity while offering our students a transformational learning experience. We encourage and support our students to create knowledge with us. The article referred to above was written by a member of staff with a student. The student began working voluntarily with her and moved to a PSA post. This staff student partnership culminated in a peer reviewed journal article where our students’ contribution to the research is clearly acknowledged with a joint authorship: Davila-Ross M., Allcock, B., Thomas, C., and Bard K.A. 2011 Aping expressions? Chimpanzees produce distinct laugh types when responding to laughter of others, *Emotion, 11* (5) 1013–20.

It would be pertinent to leave the final word to this student researcher:

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1 Here are just a few others which will be of use:

http://www.staffs.ac.uk/research/research_informed_teaching/background/index.jsp

http://www.hope.ac.uk/research/researchinformedteaching/

http://www.uclan.ac.uk/research/explore/groups/centre_for_research_informed_teaching.php

While I was studying for my undergraduate degree I got the opportunity to work on several research projects run by staff at the department and it was probably the best experience I could have received for my career. I was able to see first-hand how real-life research is conducted which now means that when I run my own studies I can draw on knowledge from experience, and not just theory. There are so many little details which you have to consider when you conduct studies in the real world that are just impossible to teach in a lecture hall... I do not come from an academic or affluent family, and I do not have a strong academic background, and so with the opportunities provided I was able to show that I am able to conduct research effectively. It also shows that being a good researcher isn't just about getting the highest grades, it's about creativity, persistence, and patience. These are traits which you cannot express in any other way except through working with your future peers.

Our student's reflection on his experience reveals that he has not only developed skills, but that his confidence has developed too. What is perhaps most important is that he indicates that this is not an activity for the few high achievers in the department but any undergraduate that wants to embrace the opportunities on offer.

**References**


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