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1

Cultivating student expectations of a research-informed curriculum

Developing and promoting pedagogic resonance in the undergraduate student learning pathway

Corony Edwards and Mike McLinden, with Sarah Cooper, Helen Hewertson, Emma Kelly, David Sands and Alison Stokes

Introduction

While the integration of research and teaching can provide valuable ways of enhancing a student learning experience, establishing such links can be complex and challenging given different practices and levels of understanding of 'research-based education' and 'research-informed teaching' within and between disciplines. Further, it is increasingly recognised that effective integration does not happen automatically and requires proactive steps on the part of tutors (McLinden et al. 2015). In this chapter, we examine the nature of the challenges and deliberate steps that can be taken to cultivate a rich variety of research-teaching links from the earliest stages in the student learning pathway. We see this as being the key means to ensuring there is 'pedagogic resonance' (e.g. Polias 2010) between the perspectives that inform the course design (learning *design*), the learning activities the students will engage in (learning *experience*) and the practices and traditions of the discipline into which the students are being inducted (learning *discipline*). Drawing on relevant literature, we provide an overview of the types of research-informed teaching

that undergraduate students may experience at a university. We outline how a framework of research-informed teaching descriptors could be used as tools to inform the curriculum design process and to support student induction and transitions. We then draw on invited case studies to illustrate ways in which research-informed teaching can foster student engagement, so that students learn their discipline through a curriculum that has *pedagogic resonance*. Each case study illustrates how practitioners have designed their curricula to ensure students become increasingly active and self-directed participants in the process of acting and 'thinking as' a researcher in their discipline from an early stage in their learning pathway. We conclude by summarising the key challenges, and offer some approaches to achieving more active student engagement in a 'Connected Curriculum' (Fung and Carnell 2017; Fung 2017) that is both research-informed and pedagogically resonant.

Research and teaching links in higher education

Over the last two decades there has been extensive exploration of the links between teaching and research in higher education. Key contributors include, among others, Neumann (1994), Boyer (1998), Brew (2003; 2006; 2010), Griffiths (2004), Jenkins and Healey (2005), Robertson (2007), Spronken-Smith and Walker (2010), Land and Gordon (2015), and more recently, the UK government, who in their white paper on teaching excellence in higher education acknowledge that, 'For too long, teaching has been the poor cousin of research. Skewed incentives have led to a progressive decline in the relative status of teaching as an activity' (Department for Business, Innovation and Skills 2016: 12). As reported by Cleaver, Lintern and McLinden (2014), a frequently cited example is the typology developed by Griffiths (2004), subsequently presented by Jenkins and Healey (2005) as four distinct approaches linking teaching and research, namely teaching that it is 'research-led'; 'research-oriented'; 'research-based' and 'research-tutored' (see the introduction to this collection for definitions of these terms).

Jenkins and Healey (2005) report that learning and teaching activities frequently involve a mixture of these four approaches, with the particular blend dependent on the context in which an activity is structured. Embedding research-informed teaching into the curriculum is not

considered to be straightforward, however. The 'nexus' between research and teaching is complex and influenced by a wide range of factors, such as departmental structural arrangements for organising research and teaching activities, and a potential gap in making connections between staff research outputs and students' learning when this research is too far ahead of the undergraduate curriculum to be accessible to students (e.g. Jenkins 2004). Jenkins (2004) argues that students tend to vary in their attitudes towards research depending on their academic orientation to their studies, noting that disciplinary variations occur, with teaching–research relations shaped by how disciplinary communities conceive the nature of knowledge, research and teaching, the forms of pedagogy and curricula in different disciplines and, for some, the impact of professional organisations and student interests on the content and practices of the disciplines. This view is supported by the findings of an institutional survey conducted among academic staff and students at a research-intensive institution in the UK, which investigated how research-informed teaching

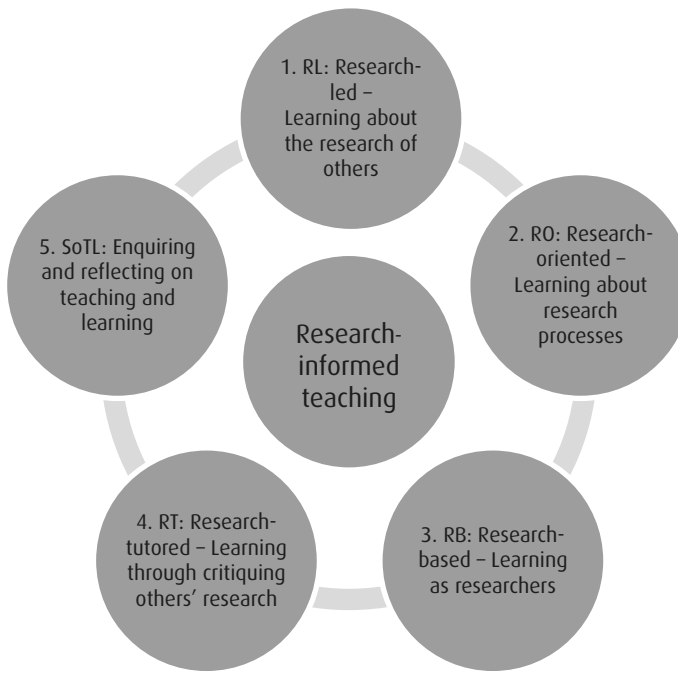

Fig. 1.1 Types of research-informed teaching approaches (adapted from Griffiths 2004 and Healey 2005)

is understood and practised across different disciplines in the university (McLinden et al. 2015). The survey employed an amalgamation of the Griffiths (2004) and Healey (2005) categories in asking respondents to select the type of 'research-informed' teaching they used in relation to five broad headings (Figure 1.1):

1. *Research-led (RL)*: Students learning 'about' the research of others.
2. *Research-oriented (RO)*: Students learning about research processes.
3. *Research-based (RB)*: Students learning as researchers.
4. *Research-tutored (RT)*: Students critiquing others' research.
5. *Scholarship of teaching and learning (SoTL)*: Enquiring and reflecting on teaching and learning.

Case studies of research-informed teaching

In April 2016, we distributed a call via our professional networks for volunteers to act as case study leads for four disciplines (Humanities, applied Social Sciences, a 'pure' Science and an applied Science). Leads were recruited for Humanities, Law, Criminology, Physics and Earth Sciences. A template was provided for the leads to capture examples of research-informed approaches to teaching and learning ('RIT') in their respective disciplines. Interviews were conducted with the leads through Skype to identify defining characteristics and research practices for each discipline. The call resulted in 25 contributions.[1] Given space limitations, we present here one example to illustrate research-informed programme design beyond the level of the single module, with connected, staged and planned inclusion of research-informed teaching throughout the programme. In the penultimate section below we draw on this and four further examples to show how pedagogic resonance can be achieved through alignment of the learning 'discipline', 'design' and 'experience'.

Table 1.1 shows how the five variants of research-informed teaching are embedded in a BA English programme at De Montfort University with combinations of two or more of the variants often used, and explicit links apparent between modules within and across years of study.

Table 1.1 Example of connected, discipline-focused, research-informed curriculum (Humanities: BA English). Contributed by Deborah Cartmell, De Montfort University

➔ Indicates an activity that progresses from the previous year (sequential coherence), for both topic and research-informed approach

Year 1	Year 2	Year 3
Shakespeare is taught on a compulsory introductory course in four strands, including 'adaptation' (a key area of research at DMU). Adaptation is taught by academic staff and PhD students working in the field, using key publications of the school, including two international journals edited by members of staff. (RL, RO)	➔ Students can elect to take a 30-credit option in Rewriting Film and Literature which continues from the first year and draws on the module leader's specialist interest in Victorian adaptations. The module leader's book on adaptations of *Wuthering Heights* is a key text. (RL)	➔ Students can further their interest in adaptation by taking a 15-credit module in Radical Contemporary Adaptations and/or Studies in Literature and Film, utilising the Centre for Adaptations' most recent research outputs. (RL)
Students are introduced to a range of approaches to Shakespeare's plays, looking at Shakespeare through dramatists' adaptations and taught by published scholars in both Shakespeare and adaptation. (RL)	The range of texts widens and students are encouraged to challenge the views of their tutors and others. (RT)	➔ In the final essays on the adaptations modules and in the undergraduate dissertation students set their own research questions and choose appropriate texts for study. This is a deliberately planned 3-year programme for developing independent research skills. (RB)
Students start with a structured staff led project, then progress to a more independent, student led project. Year 1 scaffolding takes the form of staff setting the research questions, and providing online resources.	The tasks become more independently designed; students work in groups to reflect on different approaches to a text and its adaptation. (RL/RO/RB)	The work involves the interrogation of different methodologies and the practical application of these. Students may opt to write screenplays with their own critical reflections on these. (RO/RB)
	➔ Students find their own articles to answer a staff set research question.	Students present their work at a 'Dissertation Conference' and take turns leading discussions in the 3rd year Adaptation module. They are able to both teach and learn from their peers, developing skills in presenting and responding to research. (SoTL)

Although details of the programme-specific manifestations of research-informed teaching were not collected in the McLinden et al. study (2015), the survey revealed different practices and levels of understanding among students and staff as to the nature of research-informed teaching both generically and within different disciplines. A key conclusion of the project was that, however well justified the claims to be *offering* 'research-informed' teaching, there is a risk of disappointing the expectations of the students if staff are unable to explain when and why they are being taught through a range of 'research-informed' approaches, appropriate to their disciplines, since it cannot be assumed that without such explanation, students will recognise research-informed teaching when they experience it. This observation is reflected in Brew's (2010: 44–5) report of research at Monash University, Australia, where she cites 'evidence that many of the University's initiatives in research-led teaching were initially teacher centred [and there was] … realization that the concept … was by no means clear, and developing understanding needed to be worked on continually'. In spite of this, Brew also reports that 'there was growing evidence that these activities resulted in improvements in students' awareness of research in the university'. McLinden et al. (2015) recommend developing resources to promote greater awareness of research-informed teaching approaches supported with examples of good practice for staff and students, and ensuring students are made aware of the different types of research-informed teaching and associated skills they will experience, with reminders of this throughout their programme of study. We consider next how, from a student perspective, the different types of research-informed teaching approaches can be conceptualised, and expectations and understandings suitably cultivated.

Cultivating student expectations of research-informed teaching

As noted above, research-informed teaching can be conceptualised in various ways leading to differences in understanding, expectations and experiences. In Figure 1.2, we present an overview of the types of research-informed teaching approaches that undergraduate students may experience during their studies, but described *from a student's perspective*.

The figure is offered as a tool for use with students, to highlight the characteristics of the different approaches. We suggest that this generic model may serve as a resource to draw on, first as a prompt for

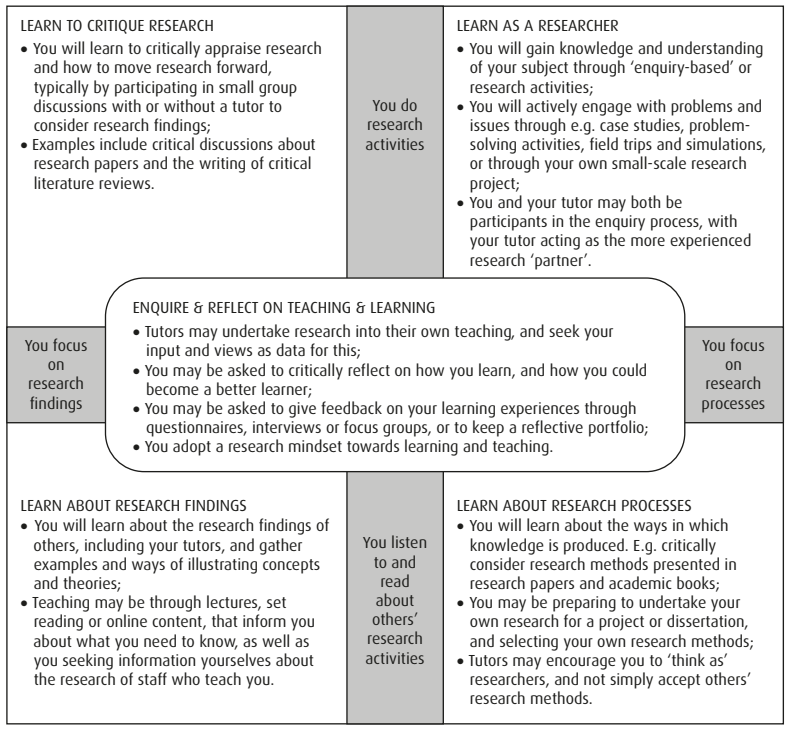

Fig. 1.2 Approaches to research-informed learning described from a student perspective (adapted from McLinden et al. 2015)

programme and module leads when considering the range of learning activity designs they will include in their courses, and secondly, if augmented with discipline-specific examples, as an aid to student induction and transition. Talking through this model with newly arrived students could assist with explaining the pedagogy they will encounter, making explicit how research is embedded into their programme as part of the learning design, thus helping to cultivate expectations from the outset.

Attention to the *process* by which students gain knowledge and understanding of their discipline requires particular consideration, since it is through engagement in discipline-appropriate learning activities that the learning experience becomes 'pedagogically resonant'. While traditional, transmission-based lectures may form a part of this process (akin to conference presentations for staff, for example), they could offer an impoverished 'learning diet' unless balanced with other ways of engaging with research.

In our discussion thus far, we have moved from generic conceptions of the different expressions of the research-teaching nexus towards a practical consideration of how these might be experienced by an undergraduate student during a programme of study. In relating this experience to the notion of 'pedagogic resonance', we propose that by making the learning *design* explicit, we can cultivate appropriate expectations of students' research-informed learning *experience*. We have also suggested that programme and module leads can draw on the research-informed teaching frameworks to inspire a more connected, research-informed curriculum design. We have made limited reference thus far, however, to *disciplinary* considerations which we argue are an integral component of a curriculum that has pedagogic resonance. With reference to our case studies, we consider next some of the particular disciplinary orientations and traditions that shape the precise nature of the pedagogically resonant learning *design* and *experience* at programme level.

Pedagogic resonance and disciplinary considerations

In this section, we draw on the notion of 'pedagogic resonance' to elucidate the alignment between curriculum elements and how these are experienced by students *within their chosen discipline*. The term 'pedagogic resonance' has been variously defined. As examples, Trigwell and Shale (2004: 529) discuss 'the bridge between teacher knowledge and student learning', while Polias (2010: 42) uses the term to describe how teaching approaches and resources can 'work in unison so they do not confuse the student but instead make the learning pathway more effective and efficient'. If we want students to fulfil their academic potential, this is a highly desirable condition for maximising learning, to which we should aspire. Our interpretation of the term in relation to the 'Connected Curriculum' (Fung and Carnell 2017), is from the *student* perspective, in seeking to ensure resonance between three components: the learning *design* (aspects of course design, including intended learning outcomes, selection and sequencing of subject content, time allocation, resources, teaching modes, assessment design and criteria, etc.), the student's learning *experience* (the learning and assessment activities students actually engage in, including interactions with tutors and other learners, and the cognitive processes these engender) and the practices and traditions of the learning *discipline* into which the students

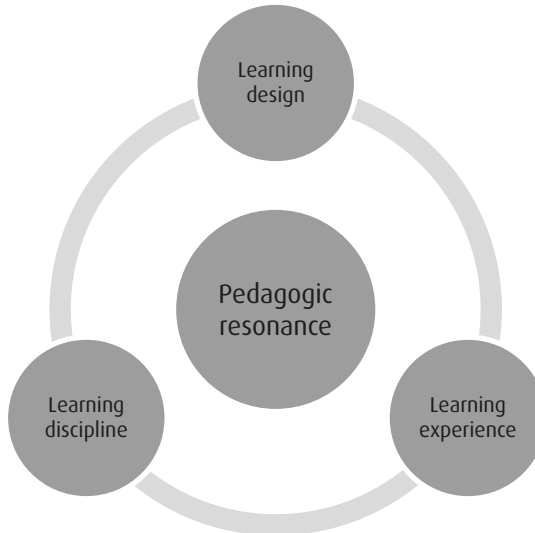

Fig. 1.3 The components of 'pedagogic resonance' in the 'Connected Curriculum'

are being inducted, including research traditions and practices, values and ethics, and underlying epistemologies and ontologies (Figure 1.3).

This notion of resonance builds on, but goes beyond, the concepts of 'synchronic coherence' (how the learning on a number of separate, but synchronously taught, modules is experienced) and 'sequential coherence' (how the learning of a topic at the beginning of a course relates to the learning of the same topic later in the course) (Wallace 1991:153). It also differs from, but needs to be supported by, the now familiar concept of 'constructive alignment' of course design (Biggs 2003), where the intended learning outcomes, learning activities and assessment design must align. In our interpretation, disciplinary cultures, practices, values and traditions can intersect with considerations of both coherence and constructive alignment through the programme-wide adoption of research-informed approaches to teaching and learning.

The deliberate and progressive integration of a range of research-informed approaches into the learning design and activities of all stages of an undergraduate programme of study, as illustrated in the previous section, is, we contend, integral to ensuring that pedagogic resonance is fully achieved and experienced by students, with the learning benefits that it aims to bring. Furthermore, in seeking to promote 'pedagogic resonance' between the components outlined in Figure 1.3, we argue

it is important to find meaningful ways to make our own thinking as tutors and learning designers explicit to students. The process of explicating our thinking pushes us to clarify and test our own logic, as well as helping learners to engage with activities that they may initially find alien and challenging. This suggests that in terms of suitably cultivating learner expectations, induction into research-informed teaching and learning must be embedded into the earliest stages of the learning pathway, as part of a wider, supported transition process, with opportunities frequently and repeatedly provided throughout the programme to consolidate these ideas and to ensure alignment between learner expectations and their actual experience. We consider next how the components outlined in Figure 1.3 can be drawn upon to examine how research-informed teaching activities are embedded into the case study discipline programmes.

Pedagogic resonance in the disciplinary case studies

Humanities (English)

Learning discipline. The case study lead described Humanities as a group of disciplines with 'fuzzy identity' (Chan 2016: 1657), where the defining characteristics relate to a cluster of intellectual skills. Humanities disciplines, including English, focus on understanding interconnections, seeing the bigger picture, and the realities and the consequences of actions. Reflexivity and awareness of multiple perceptions are threshold concepts. Mixed methods are often used in research, with scholars tending to start with very open questions, seeking to uncover and understand complexity. Critical thinking, ways of being able to explore and come to understand the world are fundamental.

Learning design. Chan (2016: 1667) envisages constructing the Humanities curriculum to help develop a subject identity, through activities such as 'capstone projects which integrate and consolidate subject knowledge', similar to the dissertation in the UK, and also through the use of discussions and debates which address students' academic discipline identities, and their purpose in the wider social context of the 'real world'. In our case study (Table 1.1) we see the inclusion of a dissertation as the culmination of three years of deliberately designed preparation, where students are scaffolded through an increasingly independent approach to conducting and presenting research. Tutors model 'Humanities' research

questions in years 1 and 2, before students are asked to set their own research questions.

Learning experience. Characteristics of a discipline-focused learning experience can be seen in the series of English 'Adaptation' modules which run from years 1 to 3, in the course of which students experience all of the fundamental variations of research-informed learning, from learning about research findings and processes in year 1, to more active participation in the critiquing and challenging of views in year 2, to the undertaking of independent research or adaptation, and critical reflection on this process, in year 3.

Law

Learning discipline. Law is both a profession and an academic discipline with a vibrant research community, which draws on 'a wide range of methods and techniques, some of which are specific to the discipline but some of which are drawn from the humanities and social sciences' (QAA 2015: 6). Furthermore, 'Law [is] a human creation… that is subject to the ethics and values of those that make and apply it' (QAA 2015: 6). The case study lead for Law explained how her school bases its identity on the core values of access to justice, pursuit of excellence and internationalisation, for example.

Learning design. As a vocational subject, Law focuses on the development of the wide variety of skills and knowledge students need to develop in order to be successful legal professionals. 'Doing' is seen as an effective mechanism for achieving this. Of the 10 case study contributions, there were many rich examples of modules that combined authentic research and other skills needed by a practising lawyer through extended simulations or authentic activities linked to the professional practice of the module lead. Co-curricular opportunities for authentic 'lawyering' also abounded, through work placements and *pro bono* work; mooting was offered as a typical example for students to 'do' law in a simulated environment. Academics underpin their teaching with their own experiences of 'doing' the law, as well as their more conventional academic research and writing. These practices are designed not only to inform students' legal knowledge but also to engender an appreciation for wider issues (e.g., commercial awareness, cultural sensitivity and politics) and the development of softer skills relevant to 'lawyering'.

Learning experience. Students are expected to critique both academic and government research, and research undertaken by other

students. Group work participation fosters a collaborative and mutually supportive environment for constructive criticism and subsequent improvement. Students experience situations that require a deep consideration of the ethical issues noted as being a defining characteristic of the discipline. For example, one course introduces students to human rights and *pro bono* work in optional year 1 seminars, with some students undertaking UK-based *pro bono* work in the form of minor casework and research tasks; in year 2 they can apply for an international internship, followed in the final year with a dissertation option.

Criminology

Learning discipline. As a relatively young discipline, Criminology represents a federation of established disciplines with different identities and epistemologies, described by the case study lead as a 'rendez-vous' subject. The range of disciplinary approaches brought by the staff is seen as an asset, as students are consciously exposed to a range of perspectives and research practices – a 'melting pot' of history, politics, international relations, crime, security studies, sociology, law and psychology.

Learning design. The case study programme team have developed a clear focus (and boundaries) to the subject for their programme in order to manage the diversity of subject perspectives, with a number of clear themes creating coherence for both staff and students. For example, research is a theme introduced from the start of year 1, with different disciplinary approaches covered within this. Workshop-style support is the main teaching mode for the research modules in years 1 and 2, with the level of challenge increasing from highly scaffolded, interactive introductions to research methods (year 1) to group assessed projects in year 2, and a popular, optional research project (dissertation) in year 3. Learning and assessment modes are designed to foster interaction, engagement and development of transferrable skills.

Learning experience. Students develop the capacity to appreciate different viewpoints and to understand that there is no absolute 'right' way of doing things. Many students arrive with a narrow view of the world and an often naïve, single viewpoint; by the end of year 1, they can appreciate diversity of views (a threshold concept), and by year 3, can take their own standpoint and ownership for their position. Diverse assessment modes (simulations, poster presentations,

podcasts, journalistic pieces, group project reports) foster student engagement and enable the acquisition of transferrable skills as well as subject knowledge.

Physics

Learning discipline. The case study lead described how two views of Physics prevail: as a theoretical, mathematically-based subject that investigates the laws of the physical universe, in a quest to understand how the universe works, and as a more practical subject that connects maths with the physical world through experimentation and application. Physics, as a science, is considered to be not just a 'body of knowledge' to be learned, but a process of systematically testing theories against the evidence. Physics is fundamentally a quantitative discipline that adopts a reductionist perspective, aiming to identify, clarify and simplify principles and laws, and test these through empirical observation. Physics is thus about solving problems. Of note is the Quality Assurance Agency (QAA) (2008: 2) description of Physics as 'a demanding discipline. A deep understanding of the frontiers of physics often requires advanced knowledge, which cannot necessarily be acquired during a bachelor's … degree programme'.

Learning design. In seeking to develop students' thinking as physicists, undergraduate programmes tend to reflect the QAA subject benchmark guidance: learning is typically viewed as incremental, lending itself to 'systematic exposition and the ordered and structured acquisition of knowledge', with practical skills, including an appreciation of the link between theory and experiment, also being developed (QAA 2008: 5). A range of teaching and learning methods are used to achieve this, including flipped lectures, group tutorial work, practical work, computer simulations, electronic resources, project work (some of which may be team-based), and activities devoted to generic and subject-specific skills development. The case study lead challenged the view that the foundations must be established before students can do research (normally in Physics programmes research comes in the later stages of a course), stating that aspects of research can be introduced at a much earlier stage. Tutors can help students to develop conceptual understanding that moves them towards developing a more coherent conceptual framework and 'investigative habits of mind' (c.f. 'learning about research processes' and 'learning to think as a researcher').

Learning experience. An example of students developing an 'investigative habit of mind' is seen in a quantum mechanics course where understanding is developed through a series of simulations. Students engage in a process of research, in that they have to interact with the simulations and do something with the material. Learning is scaffolded through directed activity. The learning experience is practice-based and includes application of maths to the physical world while practical skills are also developed. In another example, flipped lectures provide an opportunity to engage students in 'qualitative reasoning', an important part of the mental process of modelling in Physics, rather than simply use lecture time to transmit 'the body of knowledge' that students must acquire. In a third example, group-based experimental problem solving is introduced in year 2, where students work in small groups to solve a set experimental problems over a number of weeks. By having to design and execute the experiment themselves, students discover that there is no such thing as a perfect experiment, and gain a better understanding of the complexities of experimental physics and experimental uncertainty. Following this, final year students undertake a project involving a real investigation, experimental, computational or theoretical. The investigative skills developed in the second year are thus deployed and further enhanced.

Earth Sciences

Learning discipline. Earth Sciences is an interdisciplinary subject that investigates the workings of the Earth and its different systems. It is a historical subject in that it seeks to understand what happened in the past in order to understand what is happening in the present and predict what might happen in the future. While boundaries with related disciplines were described as 'porous' by the case study lead, much of the advancement in knowledge and understanding in these subject areas is founded on accurate observation and recording in the field, investigating evidence for processes that take place on large physical and long-term time scales that cannot be observed directly. Observation and visualisation are a central theme. Knowledge generation is based on inference to develop multiple working hypotheses to explain observed phenomena, and research methods span the spectrum of quantitative and qualitative approaches. Earth scientists rely less on the scientific method than

other scientific disciplines but they do develop specific habits of mind, e.g. spatial thinking, temporal reasoning, systems thinking and gradual building up of layers of knowledge and understanding through collaboration between scholars from different disciplines.

Learning design. To develop an understanding of Earth Sciences, students need significant, immersive exposure to field-based learning and assessment (which presents an access challenge for some students with disabilities). The integration of fieldwork with other learning methods is seen as key to achieving skills such as the ability to visualise and extrapolate data in three dimensions, or understanding the application of practical methodologies. Developing field-related practical and research skills is essential. A range of research approaches are introduced and developed throughout the three-year undergraduate programme.

Learning experience. The QAA benchmark statement mandates that completion of a programme of fieldwork is compulsory for all students graduating from geoscience programmes, and for accredited programmes, the Geological Society of London stipulates a minimum number of days that must be spent in the field. From day 1 students keep a field notebook – a skill they develop over three years. Year 1 field activities are prescribed in some detail; by year 2, students should know what they need to record and how, and by the time they start their final year independent project (creating a geological map), they have the necessary skills in place. These include the ability to look at things on different scales, to extrapolate from 2-D to 3-D and possibly the 4th dimension of time ('visual penetrative ability'), to develop multiple working hypotheses and seek evidence to support or reject hypotheses. Students learn to work with others as members of a group, develop discipline-specific technical vocabulary, and skills in using specialist equipment.

Conclusion: addressing challenges to research-informed teaching

In this chapter we have proposed a model of pedagogic resonance that seeks to ensure there is alignment between students' experience of a given learning *design* and learning *experience* within a given *discipline*. To conclude, we identify three significant challenges in relation to achieving such resonance through embedding research-informed teaching across the undergraduate curriculum.

Challenge 1: Understanding research-informed teaching and learning

As noted above, there is evidence to indicate that while there is substantial activity by staff in relation to the linkage between research and teaching, this is not always clear to students, and may be experienced by them in a piecemeal and confusing way. Brew (2010: 147) notes that:

> While there is a good deal of research that has examined the levels and kinds of learning that take place within inquiry-based learning contexts, there is relatively little that examines students' perceptions… The little research that has been conducted suggests that students respond differently according to the discipline in which the inquiry-based learning is situated (Abrandt Dahlgren and Dahlgren 2002) and according to their epistemological beliefs (Tsai 2000).

While particular groups of students may or may not benefit from the full range of research-informed approaches to teaching, a key issue to address, therefore, is a lack of understanding among both staff and students of what research-informed teaching is and how it relates to their current or future learning experience (McLinden and Edwards 2011). We have offered in this chapter some explanations of research-informed teaching and learning, illustrated with examples from a range of disciplines, which we hope will prove useful in elucidating the various manifestations of such teaching approaches.

Challenge 2: Cultivating student expectations and supporting transition to research-informed teaching and learning

McLinden et al. (2015) report that a particular challenge in embedding research-informed teaching and learning is in finding effective ways to cultivate students' expectations at an appropriate point in the learning pathway, so they recognise and appreciate the relevance of the links between research and teaching in relation to their particular disciplinary learning experiences, and approach their programme of study feeling confident and prepared. We have suggested a framework in this chapter that could function as a useful tool to support student induction and transition both at the start of their undergraduate programme and at key points throughout it. The case studies outlined show how these generic descriptions can be 'translated' into programme-specific illustrations of the research-informed teaching and learning experience that students can expect.

Challenge 3: Achieving pedagogic resonance through systematically embedding research-informed teaching and learning across the entire curriculum

In this chapter, we have argued that we need to take our efforts to practise research-informed teaching and learning even further, as the key to achieving pedagogic resonance through *deliberate*, connected and coherent embedding of the full range of research-informed teaching approaches across the entire undergraduate programme – something that may be difficult to achieve as a retrospective adjustment to an existing programme. We propose the achievement of pedagogic resonance as the outcome of a curriculum that is not only constructively aligned, but that is also rendered accessible and meaningful through the use of research-informed approaches to align learning *design*, *experience* and *discipline*.

The case studies we have presented provide evidence of the disciplinary practice that is already being undertaken in the sector, with inbuilt pedagogic resonance as an emerging or fully embedded design feature. A key challenge for the wider sector now is to develop and promote similar practice in disciplinary appropriate ways. Only thus we contend, will we succeed in fully engaging our students as active participants in their induction as members of our respective disciplinary communities.

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