1 Introduction

The first dimension of the Connected Curriculum framework is that of enabling students to connect with research and researchers. The distinctiveness of research universities is that areas of knowledge, analysis and practice, across a wide range of academic disciplines and professional fields, are constantly being enlarged and refreshed. This research is extraordinarily rich and varied, both in terms of its areas of focus and of the activities that researchers undertake. Through research, new understandings, practices and technologies are developed, skills are honed, and ethical issues are uncovered. These can all have a powerful effect not only on researchers themselves but on wider society. Yet students are not always familiar with the research being undertaken in the sector, in their own institution or even in the department in which they are studying. The first dimension thus encourages departments, programme teams and students to look for new ways of building connections between students, researchers and their research.

2 Revisiting learning design

The extent to which students can connect with research and researchers will be affected by ways in which they experience their programme as a whole: the range of types of class (or online equivalent) they experience, the ways in which their learning is assessed, and the extra-curricular opportunities provided by the department or institution. With the
advent of online learning environments, traditional teaching modes such as lecturing, seminars and tutorials are being used more flexibly. This can also open up new possibilities for students to engage with and explore current research. It can be helpful to look first at current practices, then consider how and when students can make the most of studying in a research-rich environment.

It is common in the literature on teaching and learning in higher education to look at teaching methods: how can a lecturer make the best of the ‘lecture hour’? How can a seminar tutor get students to engage fully, both in preparation for and during class? How can students work most effectively in a lab, or on a field trip? These are all important questions, and there have been notable developments in approaches in the past decade. These include ‘flipped lectures’, whereby students watch a video of a lecture, or access key information or ideas through another means, before attending class. The ‘lecture’ time is then spent undertaking interactive activities, such as collaborating on the development of new arguments or solving problems that relate to the information and ideas accessed beforehand. The use of technologies such as smart phones and interactive audience response ‘clickers’ can make such activities possible, even with large numbers of students in a traditional lecture theatre.

Other ‘blended learning’ techniques that mix face-to-face with online activities such as discussion forums and student-created wikis can also involve students very actively in their learning; Evans, Muijs and Tomlinson (2015) summarise a number of useful ‘high-impact strategies’ for promoting active student engagement in their learning. Many of these enhanced approaches can be used as a flexible platform for introducing students to current research and involving them in its practices and findings, as part of the overall design of the programme.

In some contexts it may be possible to take an even more radical look at whether the traditional lecture and seminar format, or lecture and laboratory format, could be significantly amended. What would happen if students on undergraduate programmes were organised in different ways? What would happen, for example, if they were allocated to research groups on arrival at university and spent a proportion of their first year learning by looking through the lens of that specialism? What would happen if, say, 25 per cent of the learning credits in each year of study were flexibly conceived and allocated directly to learning through and from research, empowering students to have more ownership of their own degree profile and journey? Challenges arise for programmes with large student numbers but even very large cohorts can be divided
into small peer groups who can collaborate online or even face-to-face in timetabled sessions (Fung 2007). Access to specialist research spaces and equipment for large numbers of students is likely to be limited, but ‘softer’ kinds of enquiry, for example into the ways in which research in the field is disseminated and applied, can be undertaken without specialist materials, and institutions are increasingly developing online access to highly specialised research in virtual laboratories (see the fifth vignette of practice which concludes this chapter).

Assessing students’ learning is another important issue. What is the pattern of assessments across the whole programme of study? When and how will students receive feedback on their work so that they can learn from that and move forward? Traditional modes of assessment such as essays, portfolios and timed examinations still have their place in the modern university and students benefit from them, but some assessments, including peer assessments and group tasks that mirror the peer review and collaborative projects undertaken by researchers, lend themselves more readily to fostering meaningful connections between students, researchers and research (see Chapter 7). In particular, building collaborative small-group assessments into each year or level of study (Chapter 4) can enable students to work together to investigate research practices and findings.

Some departments or programme teams may be in a position to consider only very minor amendments to their curriculum design, assessment methods and extra-curricular opportunities; others may be willing and able to consider some radical possibilities. In either case, stopping to discuss options for learning design that enable students to connect with research and researchers (Table 3.1) can be fruitful.

3 Practical options for connecting students with research and researchers

The table below (3.1) characterises a range of possibilities for enriching students’ opportunities to benefit from being in a research-rich culture, in ways that suit different disciplinary contexts.

There is no ‘best’ profile of opportunities for students; this will depend very much on the discipline and the context in which they are studying. We will look in more detail at how such activities can be part of a holistically designed programme (Chapter 4), and at how students can produce work which engages different audiences (Chapter 7). The challenge here is to explore, pilot and evaluate activities that can
### Table 3.1  Students connect with research and researchers

<table>
<thead>
<tr>
<th>Students connect with research and researchers by:</th>
<th>How, where and when?</th>
<th>To what effect?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Finding out about research</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploring what research is, within and/or across disciplines</td>
<td>Before starting their programme of study, online or during a visit day</td>
<td>Improving understanding of the university’s mission</td>
</tr>
<tr>
<td>Investigating different research methodologies and associated methods</td>
<td>As part of an induction activity at the start of the programme</td>
<td>Characterising the nature of the discipline(s) and/or professions</td>
</tr>
<tr>
<td>Reading, seeing or hearing about current research studies, both the approaches being undertaken and the emergent findings</td>
<td>As individual preparation for classes</td>
<td>Developing students’ overall awareness of how knowledge is created and extended</td>
</tr>
<tr>
<td>Observing research being undertaken in real time (face-to-face or online)</td>
<td>During classes, as part of critical analysis in/of the subject</td>
<td>Enabling students to see through different disciplinary ‘knowledge lenses’</td>
</tr>
<tr>
<td>By attending department-wide research seminars</td>
<td>Through interdisciplinary projects</td>
<td></td>
</tr>
<tr>
<td>Through interdisciplinary projects</td>
<td>As part of a ‘capstone’, synoptic module at the end of the programme</td>
<td></td>
</tr>
<tr>
<td><strong>2 Talking about research</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting individual researchers and engaging in dialogue with them</td>
<td>Collaborating with others in a peer study group to study the work of a researcher</td>
<td>Developing students' sense of belonging to an active learning and research community</td>
</tr>
<tr>
<td>Discussing others’ research informally through discussion (face-to-face or online)</td>
<td>Undertaking peer review activities in class or online</td>
<td>Increasing motivation and engagement</td>
</tr>
<tr>
<td>Undertaking specific peer review activities</td>
<td>Preparing for formative and summative assessments</td>
<td>Developing confidence in using the language of research</td>
</tr>
<tr>
<td>Participating in events such as seminars and conferences.</td>
<td>Undertaking field trips, visits, explorations of place</td>
<td>Enabling students to contribute questions, insights and critiques from their different personal, cultural and national perspectives</td>
</tr>
<tr>
<td></td>
<td>Contributing to departmental seminar programmes, student research conferences, etc.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Doing research</strong></td>
<td>Engaging in collaborative enquiry as part of a peer group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Undertaking individual enquiry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Undertaking a research project (as part of a team, and individually)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluating one’s own research, including ethical considerations</td>
</tr>
</tbody>
</table>

| 4 | **Producing research ‘outputs’** | Developing awareness of ways in which research is already communicated to others | Considering different audiences for the findings from research | Enabling students to develop (transferable) skills needed for ‘digital citizenship’, including managing own digital identity and ability to work in different media |
|   |                                 | Communicating the findings of own research effectively to different audiences | Analysing different modes of research communication, including informal modes such as blogs and videos, and formal peer reviewed publications | Developing effective oral, written and visual communication skills, including use of different language registers |
|   |                                 | Engaging with different kinds of audience (including alumni), face-to-face or online, to develop ideas in partnership | Writing or creating one or more outputs from own research (individually or collaboratively) | Creation of a body of produced work available to external agencies, such as employers, which gives students a distinctive profile and voice beyond the programme |
|   |                                 |                                                                                           | Analysing and learning from the effectiveness and impact of the outputs |                                                                                           |
|   |                                 |                                                                                           | Following up with responses from audiences and future opportunities for engagement |                                                                                           |
engage students even more meaningfully with research and researchers. Working in partnership with students or student representatives and interested alumni to discuss the range of appropriate possibilities for the given departmental context (including the discipline and number of students) can be a very productive way forward.

4 Meet the Researcher: a flexible student activity

One activity that can be run either as an extra-curricular project or as part of the formal curriculum is ‘Meet the Researcher’. This example builds on work done in the UCL Geography department some years ago, when first-year students were asked to interview a member of the research staff (Dwyer 2001). More recently at UCL, this idea was developed further and promoted across the institution as a student induction activity.

For this activity, students are asked to work in small groups to investigate the work of one of the department’s researchers, to meet up with them and to produce some kind of ‘output’ relating to their findings. The aims, as expressed in a flexible UCL template (UCL 2016b), are to:

- introduce students to the research culture of the department in general and to the work of one researcher in particular;
- help students get to know one another and begin to develop teamwork and project-management skills;
- develop students’ abilities to distil, synthesise and communicate key ideas;
- develop their communication skills, including their ability to select appropriate language and media for a specified audience, and enhance related digital practices (for example, the use of presentation slides, video or e-poster).

Students are encouraged to plan carefully for when they meet the researcher and consider the sorts of questions they will ask. These may include, for example:

- What is the researcher trying to achieve, and why?
- What is it like to be a researcher, on a day-to-day basis? What skills are needed?
- What are the highs and lows of research?
- How is the research funded and how is it communicated to the public?
• How will the researcher know when she or he is successful?
• What excites them about their field?

This activity can form the basis of a student induction activity on arrival, which has the advantage of familiarising students with the idea of research in the discipline and also of giving students the opportunity to meet and work meaningfully with a small group of peers from day one, or it can take place later in the programme.

The students’ group task, that of creating an artefact of some kind that communicates the work of the researcher to a lay audience, can be treated as a formative, developmental activity or count towards the marks awarded for a given module or unit of study. Giving students the opportunity to select the form of their communications ‘artefact’ allows groups to share their technical strengths as well as their creativity.

Evaluations of the ‘Meet the Researcher’ approach have been remarkably positive (see, for example, Standen and Evans 2015), with students appreciating the opportunity to familiarise themselves with some of the department’s research, and researchers appreciating the students’ interest and the work they have produced when profiling their research.

5 ‘Only connect’: why connecting with research and researchers matters

The value of connecting with research and with researchers can be seen on a number of levels. Students can be very highly motivated by cutting edge thinking in their chosen subjects. Of course, the nature of this will differ widely across disciplines. Students can gain, for example, by observing and working with leading practitioners in the creative arts, or they can benefit from working alongside experimental chemists or physicists in a laboratory. They can have their eyes opened by contributing in some way to clinical trials or to action research in a classroom, by connecting with those gathering and analysing social and environmental data, or by participating in new lines of dialogue and debate with leading thinkers in literature-based disciplines. The common ground across all disciplines is found in the benefits drawn from widening students’ knowledge horizons and increasing their grasp of disciplinary depths, boundaries and bridges.

A particular benefit of connecting with researchers and research derives from the detailed awareness researchers have of what is not
known. Faculty members at the University of Cambridge in the UK recently held a discussion about this, the notes from which offer the following insights:

All the participants agreed strongly that there is value in having a researcher in the classroom. Paradoxically, participants agreed that the value of researchers is that they know what we don’t know about the subject. A non-research-active teacher, or a textbook for that matter, can easily explain a subject and present a summary of knowledge that looks complete and authoritative. A researcher would unravel this knowledge, presenting a picture not just of what we know but also of what we don’t know and of how people are trying to tackle the gaps in our knowledge.

The researcher, that is, will be able to show students how knowledge is constructed in the discipline and will lecture in the penumbra of knowledge, exposing its outer limits. A teacher without research knowledge would struggle to do this, and it leads to a difference in focus in the classroom: non-researchers tell students what is known, researchers tell students what we don’t know.

(University of Cambridge; Personal email 21 October 2016.)

The principles of philosophical hermeneutics, as discussed in Chapter 1, find a strong echo here. We need to test interpretations of what we see and hear, and human knowledge must be underpinned by awareness of what is not known.

Learning, like research, is about paying attention to where the edges of knowledge are. This is at the core of scholarship: critiquing the potential weaknesses in the fabric of our existing knowledge, and seeking better knowledge and understanding.

Teaching-led research

It is worth also considering the potential of connecting students more readily with researchers and their work for the benefit of research. The primary focus in the field of research-based education tends to be on student learning, and the extent to which students benefit. But can researchers and research itself also benefit?

There is an emerging interest in this question. Tony Harland, Professor of Ecology at the University of Otago in New Zealand, draws
on developments in his own curriculum to offer a conceptual argument for ‘teaching-led research’, in which ‘university lecturers construct courses that directly and positively influence their research, while at the same time, safeguard and enhance the student experience’ (Harland 2016, 461). He argues that teaching can be undertaken with a ‘clear understanding that it enhances research’ and that a ‘research-pedagogy across the research-led higher education sector might be an attractive way for academics to go about their work, a caveat being that it must benefit both student and teacher’. Harland cites an empirical study by Robertson (2007), in which teachers in higher education reported that their teaching was, for them, a form of research and indivisible from it.

Recent work on ‘Student as Producer’ (Neary 2014, 28), developed at the University of Lincoln but now influencing a number of other institutions including some in the United States, presents a values-based, critical argument relating to the role of students in the academy:

Student as Producer seeks to re-engineer the relationship between teaching and research to consolidate and restate the public values of academic life, emphasizing the role of students as collaborators with academics in the production and representation of knowledge and meaning. (Neary 2014)

The argument here is that students are capable of becoming co-producers of knowledge and of research ‘outputs’, and that recognising them as such can break down some of the orthodox hierarchies of the current higher education system. We will return to the potential of students creating research outputs when we look at the ways in which student assessments can be directed to specific audiences (Chapter 7).

6 Conclusions

The focus of this first dimension of the Connected Curriculum framework is both on enhancing student education and on promoting the importance of research. At their core, research-based education models, including the Connected Curriculum, are underpinned conceptually not only by social constructivist learning theories that highlight the need for active engagement in and ownership of one’s own learning (Evans, Muijs and Tomlinson 2015), but also by a strong awareness of the need for societies to invest in research, and to be evidence-informed in their decision-making and practices. Research has been described in a recent
European policy paper as ‘one of the best investments that can be made with public (and private) funds’, with economic rates of return ‘in the order of 20–50 per cent’ (Georghiou 2015), and with significant additional benefits:

the value of research is not only economic. There is a direct contribution to societal challenges (which itself requires better measurement through understanding impacts on human behaviour in general and on policy in particular). Beyond that research should be valued for its role in creating a critical and reflexive society. (Georghiou 2015, 10)

Rather than setting the importance of research in opposition to that of student education, by seeing them as competing priorities, the challenge of developing the synergies between the two becomes the exciting goal.

7 Vignettes of practice

The following short case studies, or vignettes, highlight current practices across a range of university disciplines that reflect aspects of the first dimension of the Connected Curriculum framework. They illustrate some of the diverse ways in which it is possible for the principle ‘students connect with research and researchers’ to be put into practice.

The first vignette shows how a ‘Meet the Professor’ activity at UCL has been adapted and expanded to suit a range of science disciplines. The second presents a collaboration between two universities, one in Germany and one in the UK, which enables Archaeology students to experience research in another country, meeting with researchers both within and beyond their own institution. In the third, students in Ireland undertake summer projects in the social sciences, while in the fourth they engage with research-focused 3D modelling projects at the University of Reading. The fifth vignette addresses a common challenge associated with engaging students in research – that of giving them access to physical spaces and specialist equipment. It shows how the Open University in the UK is using virtual solutions to provide large numbers of students with access to research.
1. ‘Meet the Professor’ in Life and Medical Sciences at UCL

The aim of building the Meet the Professor activity in UCL Biosciences was to introduce our first-year students to the wide range of research activity undertaken in the department. While elements of current research are touched upon during year one lectures, we were aware that our new students did not have a clear perception of the extent and range of subjects that are under current investigation.

In 2012 we introduced a Meet the Professor session to our post-exam key skills timetable. This one-week, non-credit-bearing module was designed to expose our students to independent research as they design and follow a protocol to purify a specific protein. In addition, students consider future career options and work as a team, both in the laboratory and as part of a presentation team, and practice giving oral presentations. The Meet the Professor session complements this range of activities.

Students are sent to interview a member of the academic staff in groups. They are given the brief of finding out about their current research, their career path to date and any motivational people or events that influenced these choices. After the interview, students are asked to introduce ‘their’ academic to the rest of the student cohort via a short oral presentation, as dissemination of research knowledge is a key aim of this activity. Feedback from these sessions has been overwhelmingly positive, from both a staff and student perspective.

We have expanded its use in the first year of study so that students now have a similar experience looking at the work of their personal tutor. They begin by having an informal discussion in a scheduled tutorial meeting, then go away to carry out further independent research, which is presented as a single page report. After further discussion, students then visit the relevant research facilities within the department to further enhance their understanding of the research environment.

As a result of the success of this type of activity it has now been introduced to almost all of the personal tutorial systems on degree programmes within the Division of Biosciences, and implemented by other Faculties within the School of Life and Medical Sciences.

Vignette of practice submitted by Dr Amanda Cain, Senior Teaching Fellow and Deputy Head of Teaching for the UCL Molecular Biosciences degree, and Charmian Dawson, Teaching Fellow and PhD candidate.
In theory, Archaeology as a discipline offers plenty of opportunities for research-based education, for example in the form of hands-on engagement with ancient artefacts or through practical fieldwork campaigns. These have the potential to provide early experiences of working in international settings, and exposing students to different research methods and theoretical approaches. However, the extent to which this potential is harnessed varies considerably between different universities and curricula. The Q-Kolleg is an innovation that aims to provide sustainable opportunities for students to connect with research and researchers across national borders.

The Q-Kolleg started as a collaborative initiative linking the Winckelmann-Institute of Classical Archaeology at Humboldt-Universität zu Berlin (HU) with the Department of Classics at Nottingham University. Faculty members developed this format to expose students to different national traditions in their discipline. Under the general heading of ‘Methods of studying images in Classical Archaeology’, small groups of students (8–12; the ‘Q-fellows’) from both universities develop their own research projects around a predetermined case study. For example, students may investigate the friezes of the Pergamon altar in Berlin or of the Parthenon in London. Case studies run for an entire academic year.

To negotiate the geographical distance between the two groups, a blended learning approach is employed, whereby students collaborate as a plenary group in virtual milestone-conferences and participate in two in situ working visits. They meet in their local groups at HU and Nottingham and work independently in international HU-Nottingham pairs or small groups. Participating students gain not only research experience and disciplinary reflectivity but also language and intercultural competences.

The project begins with a virtual workshop, during which the two local groups are linked via video conferencing. During this session the students get to know each other and intensify their engagement with the initial theoretical and methodological input of senior academic staff at both institutions. The students form international pairs, based on shared tentative research interests, and begin independent work on developing a research question and project, with occasional feedback from the professors. These initial proposals are presented and discussed
at a second virtual conference and reviewed thereafter. During a first week-long working visit at one of the two partner institutions, the students meet in person. Working hands-on, they are coached on objects and texts related to their projects, participate in research seminars and present their work-in-progress. After this, students continue to work in pairs on their project, contextualise their findings and submit drafts of their project reports for peer review online. The Q-Kolleg concludes with a second week-long visit to the other institution, with an emphasis on reflecting on the research process and preparing the finished work for presentations at the host institution.

The Q-Kolleg in Archaeology/Classics has run five times since autumn 2012. After successful evaluation, adapted versions have run in the Departments of German Literature (collaboration with Columbia University, New York), Cultural Studies (with the Universidad Nacional de Colombia, Bogotá), Art History (with the University of Innsbruck) and Economics (with the National University of Singapore).

Vignette of practice submitted by Wolfgang Deicke, who leads the bologna.lab at HU in Berlin, a cross-faculty laboratory for the development and implementation of innovative teaching and learning formats, and Arne Reinhardt, formerly a research associate in the Winckelmann-Institute of HU and leader of the Q-Kolleg in Classical Archaeology, now at the Institute of Classical Archaeology at the University of Heidelberg.

3. Research Summer School at the Royal College of Surgeons in Ireland

The Research Summer School (RSS) has created a space that provides a stimulus for all our undergraduate students from the Schools of Medicine, Pharmacy and Physiotherapy. It empowers them to start their transition to be our researchers of the future.

Students seek out their own research project and apply for funding from internal and external sources. This gives them an insight into the highly competitive environment of research. Once they have secured their research project they participate in the RSS programme. This runs for eight weeks during the summer. It commences with Research Skills Workshops, which are delivered to all students over the first two days. The intention is to give our students their ‘tool box’ as they set out on their research journey for the summer. It includes a series of talks and hands-on activities. Topics covered include Clinical Study Design, Research Governance, Drug Targeting, Nanomedicine and Analysis of Genetic Material.

(Continued)
The programme continues with the Friday Discovery Series, whereby students interact directly with researchers from the research community. Each researcher delivers an interactive session with the intention of exposing the students to aspects of research where they can hone their analytical and critical skills. An integral aspect of the programme is the Book Club, which allows students to interface with the Humanities. Each student is gifted a copy of the book of choice which is contextual and intentionally provocative. Their remit is to read the book in time for a discussion session with in-house researchers.

Students are required to submit an abstract, poster and slide presentation of their summer research for participation in the annual RCSI Research Day. They are encouraged to submit their work to conferences and for publication. The RSS has also empowered our students to create their own Research Conference: ICHAMS (International Conference for Healthcare and Medical Students; www.ichams.org), now in its fifth year. The concept of the RSS is intentionally flexible, providing a springboard for students to create opportunities that allow them to become more intimately involved in research.

Students benefit by taking active responsibility and ownership of their learning in their own research projects. They manage their experiences proactively, independently constructing their own knowledge. Putting the research they undertake into the context of their studies more widely, they can make connections between different elements of their learning and come to recognise the beauty in the persistence of becoming an expert.

Submitted by Dr Sarah O’Neill, Director of the Royal College of Surgeons in Ireland Research Summer School (RSS) and Senior Lecturer in the Department of Molecular and Cellular Therapeutics.

4. Classics and 3D digital modelling at the University of Reading

3D digital modelling offers a powerful way of visualising vanished buildings and places. A large digital model of ancient Rome created by a researcher, Dr Matthew Nicholls, proved popular with students, who often asked about the research and modelling process underlying the final, visual results. A scheme was developed, funded through the University of Reading’s Undergraduate Research Opportunities Programme, to establish the potential for working with students
as research partners and for teaching them the necessary software competence.

This series of pilots, which also involved talking to software experts and other 3D educators worldwide, worked well. Undergraduate-researched 3D reconstructions, for example, were broadcast in a BBC TV documentary on Roman Scotland, with the student researcher named in the programme credits.

Dr Nicholls then developed an undergraduate module in which students learn to use simple but powerful 3D modelling software (called SketchUp) to create reconstructions of buildings from the nearby Roman town of Silchester. This connects to the University of Reading’s own extensive excavation work and field school at the site. The module encourages the development of advanced computing skills that are unusual within the context of a UK humanities degree, and which have proved useful to more than one student in subsequent job interviews.

Although this module is radically different in its content and assessment from others offered by the Classics department, its leader worked with external examiners and colleagues across the University to ensure parity of intellectual depth and rigour by requiring, for example, a written commentary to accompany the digital work, explaining the aims of each student’s model and the choices made in its construction.

The resulting module has proved popular with students and has gathered substantial attention within and beyond the University: this work led to Dr Nicholls winning the national Guardian/Higher Education Academy Teaching Excellence Award in 2014. This educational work also contributes to Dr Nicholls’ academic ‘outputs’: he regularly uses his own digital models in commercial, broadcast, and public-facing contexts.

Case study submitted Dr Matthew Nicholls, Associate Professor and Roman historian in the Classics Department of the University of Reading.

5. Access to research through the virtual world at the Open University

The Open Science Laboratory at the Open University in the UK is an online laboratory that brings practical experimental science to students wherever they are. The laboratory uses a mixture of experiments and investigations based on on-screen instruments, remote-access experiments and virtual scenarios using real data.

(Continued)
A number of the activities are available to everyone, while others are available only to students of the Open University.

A key principle is that all the science is authentic. Interactive screen experiments capture every step of a real experiment conducted in a physical laboratory and then allow the remote user to follow a ‘virtual’ (but not simulated) version of the experiment. Others simulate exact conditions – for example, one field trip allows geological fieldwork to be conducted in a 3D immersive environment.

There are also remote experiments. For example, PIRATE is a remote-controlled observatory with a 17-inch telescope on a robotic mount. Students and researchers are able to book times when they are able to control the telescope to collect their own data (http://pirate.open.ac.uk).

The laboratory has a number of tools for helping students create, conduct and manage their research investigations. Many of the activities are embedded within the Open University curriculum but they also exist as standalone activities. In addition, increasing use is made of webcasting technology to stream live experiments being conducted in the lab and allow students to influence the decisions taken about the way in which the experiments are conducted.

Vignette of practice submitted by Dr Sam Smidt, formerly Director of Student Learning Experience and Associate Dean (Learning and Teaching) in the Faculty of Science at the Open University, now Principal Teaching Fellow in the UCL Arena Centre for Research-based Education.