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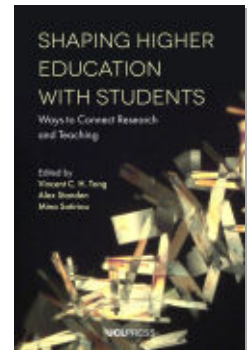
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2.5

Institutes for all

Learning from the Institute of Making

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I enjoyed reading your chapter, and thanks for your insightful analysis (and support) of what we do. Although we have had new knowledge, many journal research papers and spin-out companies emerge from the Institute of Making, I am equally proud of the failures: they say a lot about our culture of uninhibited exploration and playful exuberance.

Professor Mark Miodownik

1. Introduction

The Institute of Making (IoM) is a UCL initiative that opened in 2013, where students and academics from different disciplines engage in research in a shared space, often collaboratively. In its own words it has a 'programme of symposia, masterclasses and public events [that] explores the links between academic research and hands-on experience, and celebrates the sheer joy of stuff'. It runs as a research club and has both real international business and policy impacts.

The MakeSpace is a physical place for members of the institute to put their ideas into practice, to explore what they want and, in doing so, make student-to-teacher and peer-to-peer learning part of the day to day. This is revolutionary in the natural sciences: here is a space, outside

of normal labs, with high-tech equipment that undergraduates, post-graduates and staff can all use at the same time. It is an arena where any distinction between teaching and research blurs, and consequently the boundary between teacher and student is also challenged.

The IoM is run by Professor Mark Miodownik, a material scientist and engineer who, as one UCL colleague pointed out, has the character and charm to attract students. For him, teaching is about creating an environment where students can have creative and productive dialogues. His approach to the institute is very student focused; it is a space for student ideas to flourish. Interestingly, he stresses the importance of an interdisciplinary approach, which he believes is only effective because of the strength of the individual departments across UCL. When students from different backgrounds come together, they inspire one another, they have different parts of the making experience to offer, and everyone can learn. In this way the research and teaching integration also begins to make teachers out of students, for other students.

The distinction between research and teaching is heavily entwined with the division between teacher and learner. As many academics said during the panel discussion at the R=T Launch Event, at which Professor Miodownik described the institute's work, there is a need to move beyond this binary understanding of the lecture hall. In situations where the division blurs, everyone can learn from one another, and it becomes easier to integrate teaching with research practices. The learning process must be beneficial for all. The IoM succeeds because it does just this and creates a culture of curiosity.

The biggest challenge to learning in this way is marking and feedback. In regular lecture halls, lecturers teach to a list and so prevent students from exploring their ideas in the truly open way the IoM does. For Mark, this regimented nature, the way teaching is assessed and the need for output-orientated courses, can all inhibit research-focused teaching. These issues were echoed by academics from all disciplines, with more and tighter circles for student-teacher feedback offered as a solution. It becomes about making the feedback informal and ensuring the student is enjoying the learning process. However, this challenges the very core of how British higher education currently functions. For Mark, the 'tick-box' approach required to meet National Student Survey targets and ensure teaching is of a sufficient 'quality' homogenises the students and acts as the antithesis of student/research-based teaching. We need a continual dialogue and for students to get stuck in, and to research – to pursue their passions.

This chapter addresses what we can learn from the IoM, with a particular emphasis on using it as a method for integrating research and teaching. Highlighting the way it can be applied in a Human Geography context, I illustrate the way interdisciplinary elements such as ‘urban’ can be emphasised in new ‘institutes’ going forward. Addressing the challenges of space, and finding a way of measuring progress, I argue for more field trips, which are assessed through portfolios rather than exams. Taking the idea of the R=T initiative forward, it becomes apparent that institutes are effective tools for creating a research-orientated learning environment capable of integrating all years of undergraduates, postgraduates and academics.

2. More is better

The IoM has been a clear success in UCL, with discussion at the launch event concluding that one way to take forward a research-based education model was to ‘make more institutes’: a range of different interdisciplinary sites, each with a unique, research-led focus. In this section I draw on my experiences of participating in the roundtable discussion at the launch event and from existing interdisciplinary groups to show that while there are problems with copying the IoM model exactly, it has the potential to be a place where people of different backgrounds come together within a department or field of research to learn together.

Thinking from my own, Human Geography perspective, the idea of institutes intuitively makes sense. For example, it would be possible to develop an institute around urban research creation. Specifically, reconciling the institute model with the work of the interdisciplinary PhD group ‘Stadtkolloquium’, there could be an ‘Institute for Urban’ where students from across the university are encouraged to engage with urban processes and understandings. In the case of UCL, with the research and practical elements of the Bartlett Faculty of the Built Environment, there would be a clear ‘leading department’. However, students from all disciplines, including Engineering, Geography, English and Slavonic and Eastern European Studies, have already presented at the PhD group, and there is no reason why they would not get involved with a broader institute. This would also offer a way to integrate already-existing organisations into one space, offering the chance for them to engage with one another rather than exist in isolation.

When asked, ‘what does R=T mean to you?’, Mark answered that it means creating a space where people from different backgrounds

can come together with their ideas in a research-focused space. But if creating the space is possible, what will attract the students? One of the big appeals of the IoM is access to the latest equipment, which students would otherwise not have the chance to use. In this respect, the institute idea might not work in all disciplines, but the idea of ‘access’ to something new or something ‘exciting’ could perhaps be expanded upon. Technology is continually evolving and is ever more present in the classroom; building on this, virtual spaces that mimicked the environment of the IoM could be created. An effective virtual environment such as, for example, ‘Slack’, which has proven successful in the business world, might present a similarly successful space for students to opt into, and engage with academics. Responding to a presentation at the 2016 UCL Teaching and Learning Conference, Professor Jason Ditmer of UCL Geography described how he had already started a slack space for the department. However, it is about making this space fun, granting access to otherwise difficult-to-reach parts of ‘Geography’.

More broadly from the discussion, two issues with the institute approach became evident. First, logistics and estate management, with universities unlikely to have unlimited, unused space meaning that finding an area that could always be set aside could be problematic. This is especially true for lab-based work, where estates management strictly divide research and teaching areas. Looking forward to new buildings and new spaces, Professor David Price, UCL Vice-Provost (Research), spoke of the possibilities for UCL East. Dealing with this issue more generally requires a great understanding of the estates’ teams’ motivations for the divisions. Is it just a traditional, institutional way of operating, which can be altered, or is there a more fundamental, unavoidable reason for the split?

Second, the institute idea rests on the premise that in their spare time, students will opt in to research. The nature of having an opt-in research space means that those who want to stretch themselves on the course or those who prefer research to content-learning will have the chance to excel. This is great for those who come to university curious to learn more. But for those students who, like me, realise only when they do a dissertation in their third year that they would have enjoyed research the whole way through, the opportunity can easily be missed. The other negative consequence of an opt-in programme is that it privileges those who live closest to university or who do not have the time constraints of a part-time job. Furthermore, for those who do extracurricular activities, their time is already limited. It becomes necessary to work hard on the recruitment process and address how students can be encouraged to try

it out. One approach, as the IoM trialled this year, is to offer free trial membership. Another would be to run an early seminar session from the institute. However, this would most likely result in department-specific institutes, something that goes against the very nature of the model.

Clearly the institute model could be effective, if implemented in a way that encouraged active engagement from the beginning of a student's degree. With enough space, as campuses expand, creating 'fun' environments where the 'doing' of a subject is integrated with learning is possible.

3. Get out there and do it: creating an identity

The second area I wish to explore is fieldwork, and how this too can be viewed as an effective tool to engage teaching and research in a way that begins to challenge the student–teacher binary. Addressing the pros and cons of fieldwork, I explore how it can be used to create a student 'identity'.

Field trips, such as those used by UCL Archaeology, which gear students towards becoming archaeologists, are essential in creating rich, research-led environments. Reflecting on this in the context of the broader function of the university, it becomes easy to see the benefits of immediately setting the tone of a course: a week-long trip or event to show what being a biologist or being a historian might mean in practice directs students towards being a member of a discipline, rather than learning that discipline. The benefits of overcoming the student–teacher binary identified as part of the institute can thus be used in other forms of learning.

There are issues with fieldwork though, especially for those subjects with high 'basic skill' requirements or health and safety issues. As Professor Liz Shephard of UCL Biosciences asserted at the launch event, research in her field requires a basic set of skills, which must first be taught. The natural answer to this is to teach the skills through the research process, find a level of research (however limited this may be) that can be done based on prior knowledge, and begin with that. At the same time, a natural concern for others are the health and safety implications of immediate fieldwork, but health and safety remains an issue for everyone doing research, at all times. The best way to tackle it is head-on and teach students about the immediate potential issues in this respect as well: research is a complex process that is not just about the immediacy of the experiment or the data collection, but rather the broader decisions

and preparations that go into fieldwork. Why not get students to go out there and get stuck in to all aspects of research from the start? As research shows, to be most effective, 'learners must be actively engaged in learning' to achieve deep understanding (Barkley et al. 2005, 10).

Geography is a discipline traditionally associated with trips (Sauer 1956); in my case various British hostel trips where we battled daily with what felt like a year's worth of rain to go and walk up what appeared to be Everest, admiring where glorious glaciers used to exist. For me, geography at school was all about the adventures, the exploration and learning in the field. In a learning environment in which, by comparison, economics was about memorising eight bullet points and linking them to form the 'perfect essay', geography offered salvation because of its research, because as students we were encouraged to find a topic we wanted to know the answer to and to go out and find the answer. It created a very active learning environment, since it was not only a place to perform research but to learn about new concepts or theories (Pawson and Teather 2002). At university this does not need to just be the case for geography: all disciplines can inspire their students through fieldwork and exploration.

A great advantage of fieldwork, as with the institutes, is exposure to other students doing different levels or types of degrees. Pedagogical studies show that the best undergraduate education includes deliberate and extensive interaction between students of all levels and with staff, in an active learning environment (Orndorff 2015). From these relationships 'role models' are formed, as Professor Anthony Smith, UCL Vice-Provost (Education and Student Affairs), argued in his closing statement at the R=T Launch Event. Fieldwork offers the chance for students from different points in their degrees to come together; PhD students who want a chance to teach can lead elements of the course, while Masters students who want more exposure to research environments can do their own research, at a more advanced level, with the undergraduates. This creates partnerships across departments where students see how research can develop and lead to further research opportunities and degrees, as well as an opportunity to stretch the students at the top of the class by challenging them to engage with postgraduates. It can also lead to further partnerships. To offer one example from my own experience in geography, an undergraduate student who was taught and assisted in his research project on a field trip by a first-year PhD student subsequently collaborated with her the following summer, the results of which fed into his third-year dissertation and her PhD thesis.

This is not to say field trips are for all subjects, or that they are not without their own set of problems. Once again, they are often expensive

and time-consuming to organise; there can be questions around logistics and how to engage students in a wide range of topics within just a few days' worth of projects. If the point of research-led teaching is to foster the students' innate curiosity, part of fieldwork should be allowing them to pursue their personal project, but this is not always possible. The answer is managing expectations: if students know what to expect of the experience and they understand that the idea is to prepare them to be a member of their discipline, this will help to shape the way they approach it.

There is also the fear of losing sight of the broader objectives, and of fieldwork instead simply mimicking the classroom, becoming another means of achieving a pre-defined series of objectives for meeting certain pre-defined levels of 'success'. While in many cases fieldwork has been shown to get students more involved and more active in their learning, it can also take the fun out of the activity itself, thus reducing research and enquiry to just another means to an end (Hupy et al. 2005). Hupy (2005) suggests that the answer is to bring in an element of competition, and that by using this 'within a field setting proves an excellent means of teaching geographic tools, techniques, and principles' (Hupy 2005, 134). Such an approach echoes the institute model: in these situations, the students get an unprecedented chance to shine and 'be the best', not through tests but through ingenuity and genuine and deep engagement with their subject.

The alternative would be to flip the idea on its head: instead of having a week pre-course for fieldwork, have an intensive week pre-course for the basic skills, loading students with the necessary knowledge to then allow the remainder of the curriculum to be taught through research. It is about challenging the underlying premise of higher education. Teaching should not just be about imparting knowledge, a transfer from teacher to student. Instead, it should be about discovery and learning from one another and from the situations the students are put in. As Mark reminded those present at the launch event, teaching is about creating the perfect environment to foster knowledge development.

Field trips can be exhilarating: they can be a space in which students and academics finally breach the binary and where a student realises just how much of a 'Historian' or 'Chemist' they really are and could be. They are a place where students from different years and at different points in their academic environment have the chance to learn and research together – just as the IoM offers on-site. In this respect, field

trips could be a solution to some of the problems of institutes. On the other hand, they raise problems with funding, they can require skills that students lack before the trips begin, and the experience could reinforce disciplinary boundaries rather than move towards the interdisciplinary approach the IoM advocates and creates.

4. When it all goes wrong – and how to fix it

The field trip and institute-based approaches to learning are very effective in integrating a research agenda into the teaching process. They blur the boundaries between teacher and student and foster a more creative and engaging learning experience. However, aside from their individual problems (which have potential solutions as outlined above), they are both subject to three key challenges: how to assess the student's performance, weekly variation and broader applicability.

Research is not always successful and this is an important part of the learning experience. However, given the output-focused nature of higher education and the need to continually assess a student's progress through formative, summative and exam-based assessments, when research fails to prove a hypothesis or goes completely wrong, how can we assess the student during field trips or in an institute setting?

Instinctively, the answer is to design assessment that measures how well the student dealt with the failings, what caused them and how the research methods were applied or not applied. But in some situations, marking criteria are prohibitive, often requiring data collection or successful experiments for analysis and conclusion marks. The reality is that even when some failures are arbitrary or beyond the control of the student, there is a subconscious acknowledgement of their failings, as well as a sense of failure on their part. Students are under increasing pressure to 'succeed', and so in output-focused curricula, research can place undue pressure on students, for whom things outside their control dictate their grade and feeling of self-worth.

A viable and effective alternative to traditional methods of assessment is portfolio-based, as research shows across disciplines (Defina 1992; Yancey 1999; Hamp-Lyons and Condon 2000; Harris and Sandra 2001; Song and August 2002; Chang, 2008). At the IoM, Mark Miodownik uses portfolios, as they can constantly evolve, recording student activities and research. Portfolios ensure that all stages of the process can be assessed equally and that, even when things go wrong, students have all

the marks they would have for the events prior to it, and can illustrate the choices they make going forward to get the remaining marks. Developing a portfolio is also a great way to reflect on the process as the student develops, and can encourage them to pursue something 'beyond' or 'out of the box'.

There remain problems with portfolios though, as shown in both the reality of the IoM and existing research. Studies evaluating the effectiveness of portfolio-based assessment for postgraduates in medical schools in the UK show there are a number of very practical elements that must be considered, primarily the need for strong institutional support (Tochel et al. 2009). Furthermore, portfolio management and assessment is time-consuming and requires the academic to constantly observe progress, checking in with the student and ensuring they are updating it as they go along. This is where Graduate Teaching Assistants (GTAs) could come in and be used for weekly checks, making sure the student is on track. Again, this speaks back to achieving a more effective faculty where there is cross-degree and more student–teacher interaction: in this case giving GTAs more responsibility and allowing them to be effective 'go-betweens'.

One potential problem is weekly variation in both students' and teachers' timetables. The nature of ten-week terms with different people doing different courses, affiliate students and interdisciplinary programmes, creates huge week-by-week variations. This is further exacerbated by personal commitments: weekly away football matches, for example, or working up to an art exhibition that requires extensive organisation in the final few days. Therefore, asking students to contribute every week could be an issue. This could be solved with consistent, periodic marking, instead of weekly check-ins. If the students had half-termly checks by the course convener, giving everyone some flexibility, issues surrounding termly fluxes in workloads would be overcome. Another problem is the intensive nature of checking a portfolio. Since it is part of an ongoing project, it would require the academic to check and return it almost immediately and, again, they too have other commitments and are often used to working to different deadlines.

The portfolio approach could be a great solution for core courses. It would force a more research-focused, student-orientated approach to learning and reduce problems with experimental failure. It requires a change of mindset, though, with both academics and students needing to prioritise the continual updating and research involved with this course over others, which perhaps should be the case with core courses anyway.

5. Taking it to the next level

Research-based teaching, which inspires students to excel, to pursue discovery and to look for answers, can have incredible impacts beyond their degree. As the IoM has shown, it can lead to company formation, new products being made and new grants received. We need to take this as an example of how students can drive change within and beyond the university.

There remains a central challenge to the institute approach, and that is the dilemma posed by having a research space that exists outside the taught curriculum, and therefore has limited impact on the wider university teaching environment. Can the portfolio approach discussed above and the example set out by the IoM, be reconciled with growing pressure on output-focused results to create a programme where the student has the chance to explore ideas that interest them in a safe, learning environment? Previously at UCL, students have worked throughout their second year to contribute to a departmental project: each year a new cohort engages with the project and eventually there is published output where every student involved is a named author. This necessitates a research-focused learning situation, which waits until the student has learned basic skills in their first year but without disturbing their final-year dissertation. Crucially, it also gives them something to show for it at the end: they can hold the publication and know they were part of it.

Alternatively, the project could be run across different years, so for the duration of a student's degree they are engaging with one extended research project. In the first year this could be structured around a basic grounding or understating that gives them the necessary skills to do more research, perhaps similar to the MPhil year for a PhD (i.e. probationary period of many doctoral programmes in the UK): a vital part of the research process, but one that would not require a huge amount of prior knowledge. The issue that arises is the breadth of disciplines and changing interests: university is also about developing as a person and exploring interests, and students are likely to change their preferred area of study during a three-year course. Furthermore, the breadth of subjects that students might want to pursue could make supervision or structuring classes around it challenging. Building on this, these research projects could be structured around the departments' stated research clusters. In this way students could add to broader disciplinary debates, stay on top of current academic thought and help shape it themselves.

6. Conclusion

Looking forward, the model provided by the Institute of Making is a viable option for many institutes. For those with the space and the enthused academics, it is a way to show students that learning can be fun, and for students with different backgrounds to learn to respect one another's respective skill set. In this way the IoM offers some important point for any R=T learning situation: the student–teacher binary must be broken down; students of all disciplinary backgrounds can add to a project; and anyone can be involved in research, if they want to be.

Going forward, the most important thing is to take these lessons and learn from them. In this chapter, I have tried to demonstrate how there are ways of addressing the potential flaws, and finding a way of making institutes accessible and attractive for students, irrespective of incomes, academic dreams and extracurricular activities.

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