6 Making learning spaces: working with architects and estates

Ingrid Murphy (NTF 2015), Gareth Thomson (NTF 2016), Kevin Singh (NTF 2015) and Tim Bilham (NTF 2007)

Keywords: *maker spaces, participatory design, constructed space, project-based learning*

Academic staff are invariably responsible for the choice, and development, of learning spaces such as field locations (see chapter 8), work-based learning (chapter 9) and extra-mural and community spaces (chapter 4), yet not for their *on-campus* teaching spaces. Similarly many teaching staff, and particularly academic developers, are frequently directly involved in the design and development of virtual teaching spaces yet overlooked in advising upon physical teaching spaces, a situation that is surprising considering the growing adoption of blended learning approaches.

A major reason often cited for this exclusion of involvement is the lack of evidence that location is influential in the learning process (Temple, 2009). However Brooks (2011), in a controlled study, found that achievement of learning outcomes was significantly improved in student cohorts that experienced learning in an active learning space, including technology-enhanced learning, over a traditional classroom. In an Australian research study, Sherringham and Stewart (2011: 110) report that design of university teaching space in the past has been driven by '*high-*

level agendas and institutional values' and that the specific requirements of stakeholders and of practitioners using these spaces were frequently discounted because they were unknown to decision-makers.

As a result the traditional didactic and teacher-centric model of university teaching has been entombed by the constructed spaces of the campus, by rigid lecture theatres and formal classrooms (Jamieson, 2003). The transmission mode of teaching is so prevalent that teaching and assessment systems are based upon it worldwide, and '*teaching rooms and media designed specifically for one-way delivery*' (Biggs, 1999: 21). Such architectures, in themselves, significantly determine the teaching style; as learning and teaching approaches become more flexible these same structures, especially the dominance of particular classroom types, arguably constrain the development of innovative, student-centred and flexible pedagogies.

Jamieson (2003) argues that the design and development of new learning spaces and the refurbishment of existing ones fundamentally impact upon the student experience and should be a priority for practitioners. He further contends that traditional university teaching-space architectures are manifestation of the pre-eminent form of power relationship between lecturer and student, and that more progressive relationships require less rigid spaces (Jamieson, 2003). Consequently the opportunity to be involved, as an academic teacher, in the process of the design and specification of physical teaching and learning spaces is an invaluable and all too rare privilege. In this chapter three NTFs recount their experiences of being closely involved in new builds, or renovations, and how they were able to bring their requirements and expectations for their learning spaces to the design, development and build process.

Our first case looks at Maker spaces. Maker spaces in education are formal and informal spaces for creative production of artefacts or products. Frequently seen in the creative arts, in studio spaces, they are also common in science and engineering disciplines, where students blend physical and digital technologies to develop skills, explore ideas and create products often in communities of practice (Sheridan et al,

2014). Our second case is from the engineering discipline and explores the need for practical and flexible space to comply with externally imposed professional requirements, and illustrates the importance of getting correct the small details and practical functions such as power and aesthetics. Whilst there are examples of student engagement in many university activities and processes (Trowler, 2010) there are far fewer instances of purposeful student participation in campus redevelopment. In considering the development of communities of practice in learning, Kornberger and Clegg (2003) call these 'generative buildings' – in other words they are buildings designed in collaboration the users of the spaces. Hillier and Hansen (1989: 2) propose that the '*ordering of space in buildings is really about the ordering of relations between people*'. The final case considers such a participatory approach to developing informal learning spaces, in this instance, for a library and a social space for students.

Commented [PG1]: Rephrasing ok?

The Making of a Maker Space

Commented [PG2]: Some problems with this case study. See comment ***on p. 91.

Ingrid Murphy

The physical environment that students experience in design subjects can have a profound effect upon their creativity and their performance. However, the design of the spaces themselves often receives scant attention, and insights from users - teachers and students- are sometimes not sought (Thoring et al, 2017).

The development of a new building for the Cardiff School of Art and Design (CSAD) in 2013 presented us, as users, with a rare opportunity to influence the design of the building and subsequent learning spaces for students from the outset. CSAD was formerly housed Howard Garden's Campus, a city centre 6 story building, designed by Cardiff City architect John Dryburgh in 1966. Although a purpose built art school, after 47 years of occupancy, both the building itself and the spaces within bore witness to the more silo'ed practices of a by gone era. Academic programmes were located in clearly defined physical spaces, students rarely transgressed such boundaries as they were inextricably linked to human and physical resources. This compartmentalisation of practice not only resulted in a duplication of resources but

the architecture itself became a barrier to collaborative or interdisciplinary activity. As the school had grown, new blocks were added, these disconnected structural entities contributed to the sense of fracture. For example research professors and doctoral students were housed away from the schools teaching activities, again creating a perceptual divide between the diverse practices of the school.
Over time even exterior space was demarked along The use of space within the building also echoed the hierarchical fault lines of historical genres of the 19th Century, the Fine Art students occupied the top floor with lofty north lit studios while many of the ceramics, craft students were accommodated in terrapin huts in the car park. Both the location and quality of space operated within a clear value system, but it is not merely physical space which has this currency, area and hierarchical space metaphors within educational practice also infer value as well as who is allowed access to particular forms of knowledge. (Paetcher 2004)
In 2013 the school undertook a comprehensive review of its undergraduate provision, the portfolio of courses changed and an overarching scheme was validated for delivering all UG programme , which included interdisciplinary delivery and cross school modules. It became evident that a change in nomenclature as well as good architectural design would be needed to meet the needs of this newly designed curriculum.

Co-designing the building

The architects Austin Smith Lord's, designed the £14m, 8575 m^2 CSAD building opened in 2014. The design was informed through a detailed consultative process. The project lead and his team visited the original school to view working practices, scoping out the requirements of each stakeholder group, visiting teaching sessions, and meetings with students and staff.
Key aspects identified in consultation included:
Flexible spaces that accommodate shifting student numbers and changing curricula.
Ease of movement between spaces.
Communal space for interdisciplinary learning and socialising.
Natural light throughout the building.

Highly functional non-decorative design.
Industrial workshops, which were inviting to the novice yet met expert needs.
Equipping the building to promote a strong studio culture i.e. meeting the needs of students beyond the timetabled day, e.g. own kitchen areas, food storage and prep areas.
Ergonomic design e.g. the doors swing so that work going to the kilns can be easily transported.

The resulting building won the RIBA regional award for Wales for 2015.

> *'Here is an exercise in efficient, transparent inter-departmental connectivity, planned around a central atrium using its concrete frame and exposed services as an object lesson in value for money'*
> (Stirling Prize Awards, 2015)

Although the architectural space was important in changing our practices, care in naming the areas played a significant role too. Within the school, we renamed physical resources/workshops by the relevant material or process rather than proprietorial disciplines. This reframed how students both perceived and used these spaces. So, the Product Design workshop became Soft Modelling, Sculpture became Wood and Metal, Textiles changed to Stitch. This proved an inexpensive but hugely influential change, as ownership of resources shifted from being course specific to being school-wide, and the students' sense of accessibility and opportunity increased.

> '*For me, the interior architecture of the CSAD building seems to breed opportunities for critical dialogue. The vast central atrium above the heart space gives a feeling of accessibility to every studio and workshop. While the open plan balconies and studios allow for more spontaneous dialogue across spaces and disciplines*'
> (CSAD Student Focus Group, 2017)

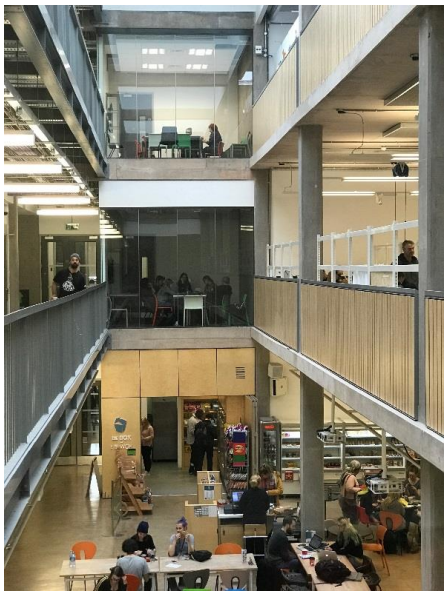

Figure 6.1: CSAD Heart Space and atrium (Photo: I. Murphy)

The Maker Space

While the building itself met its design brief, our newly acquired spacious studios provided little infrastructure, either to curb our imagination or dictate the nature of teaching provision. As the *BA Artist, Designer: Maker* course team our challenge was to design a multi-modal learning space, which encompassed:

- The delivery of formal lectures, seminars and tutorials.
- A 3D making space for casting processes, small metalwork, resin ceramics, enamelling and glass work.
- 120 individual dedicated work spaces.
- Collective teaching/making space
- A digital studio for CAD, scanning, 3D printing and physical computing.
- The ability to revert to a white cube exhibition space annually to house degree shows.

Fundamentally we wanted this space to promote creativity and be a physical manifestation of a community of making practice, which ensured students would spend the maximum amount of time in the studio.

Following research into creative learning spaces and starting with an initial typology of functions, Thoring et al (2012) developed a space development toolkit (*ibid,* 2016; 2017). Their 'Design for Campus' toolkit identifies five different types of spaces that promote creative working and learning activities:

- spaces for **deep work,** providing personal space for focused concentration and reflection
- spaces for **collaboration,** for group work, workshops and student-teacher consultation
- spaces for **presentation,** places to share ideas, present and exhibit
- spaces for **making,** for experimentation, play and production
- spaces for **intermission,** transitional and liminal spaces (cafes, corridors etc) for transit and informal learning

So within or studio we gave every student their own dedicated workspace, for '**deep work'.** Students fill their spaces with their objects, design sheets and/or research images so each space is frequently the most readily accessible indicator of engagement, as these spaces become visual microcosms of students' learning they are a critical space for teaching delivery. Having continuous access to a space containing bespoke stimuli, trials and outcomes enables students to reflect on their progress and learning and promotes a sense of security which is beneficial to creative engagement. Students have access to these spaces until midnight on weekdays and also at weekends. This is critical to promoting a strong studio culture allowing students engaged in lengthy making processes to have appropriate access to their work and critical to fostering a sense of community.
NSS 2018 Q21: I feel part of a community of staff and students: 100% agreement

Figure.6.2: Individual student workspace (Photo: I. Murphy)

Individual spaces are grouped by year and surround more communal and process orientated making spaces, enabling peer-to-peer learning and providing a **space for collaboration.** These communal spaces are used for Field teaching, where interdisciplinary groups work on collaborative projects. These interdisciplinary Field projects, which now constitute a core element of our UG delivery are central to ensuring that students move freely through the building, and have access to all the schools resources. Through this approach students can understand different disciplinary approaches and communities of practice and actively engage in opportunities to work with others.
NSS 2018, Q22: I have had the right opportunities to work with other students: 100% agreement.

Transparency is key for successful communication in any space, staff/student meetings, assessment presentations and vivas are held within a glass walled space which adjoins the studio, so students can clearly see when academics are engaged in non-studio activities, programme committees, student interviews etc. can all be seen and not heard, making the full machinations of programme delivery visible to the student body. This also provides a formal **space for presentations.** Directly outside the studio space and next to the programme office, there is a break out space for students, bedecked with sofas and reading materials. There is a shared kitchenette,

as requested in the architects' consultation process, it provides boiling water, fridges and microwaves for food storage and space for food preparation.

This **space for intermission** provides a quiet and isolated space, it shifts social interaction away from the working areas, and can help students cope with long, or anti-social, working hours. Being placed next to the programme office, which has an open access policy, it importantly keeps the academic team close to where struggling students may seek solace from a noisy studio environment.

Figure 6.3: Breakout Space (Photo: I. Murphy)

In designing a **space for making** it is important that the environment itself promotes a culture of making, fortunately the architectural functionality of the exposed concrete walls and cabling trays, emphasises an aesthetic so closely allied to material and process that is it practically instructional. Over our 4 years of occupancy in the building we have undergone as many iterations of our 'space for making'. Primarily influenced by the shifting needs on the space, what began as a space, which accommodated Maker and Ceramics students, now also houses BA Courses in Interior Design and Architectural Design Technology. Collectively our making practices span from the digital to the very dusty, to accommodate this we created the Arc of Making which spans both sides of the building moving from the hi tech to the low tech, rather then duplicate resources from individual programmes students move to the resource they need. The students use these respective tools or

technologies for vastly different outcomes and this frequently results in unorthodox and creative approaches to tool use, so we were keen to ensure they are exposed the tools or processes beyond their own discipline area.

In April 2018 I undertook a British Council funded Living Research project in China, visiting 38 Makerspaces in the cities of Chengdu and Xi'an, the aim was to identify a network of making practice for British makers to access.

Bringing makers from different cultures to work together in makerspaces is not unlike bringing students form different disciplines to share the same physical resources, frequently the language or terminology of tool use or process can be different. However making is a universal language and tools can help unite makers across culture and discipline. To facilitate tool use learning we have developed an Augmented Reality co-creation project with Maker students, each student creates instructional video content on how they specifically used their tool of choice, the online content can be accessed by scanning each tool image (an AR Marker) with a smart device. These images cover the walls of our studio allowing for a much more dynamic way to access a large amount of instructional or contextual information then normal display would allow. Not reliant on language, it can quickly familiarise a maker with the capabilities of their environment, or a novice with the potentials of a new tool. Currently this resource is being further developed to go into local schools in a campaign to promote making. I am also working on a collaborative version of this project with fellow Living Researchers Jon Flint and Gemma Latham, alongside the British Council and selected spaces I visited in Xi'an and Chengdu, to help to forge links between traditional craft spaces and the more technology orientated makerspace.

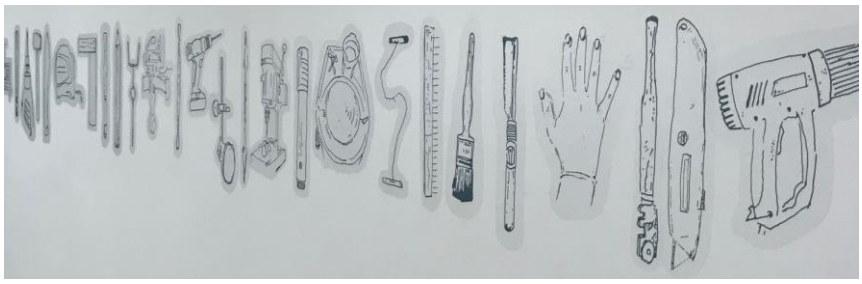

Figure 6.4: AR Interactive Tool wall (Photo: I. Murphy)

In 2017 another co-creation project between the FabCre8 research group and the 3rd year Maker students created a radio frequency identifiable material library (fig. 6.5), which links physical materials to digital content. Again this enables students to access within their physical environment a large amount of online content, this bespoke student produced content is only accessed through handling the test tubes of materials in our studio. The video content demonstrates how the material can be used in related making processes. The material library can be used for repeat visits to help understand more lengthy processes like bronze casting as a student learns the various stages, this helps to scaffold learning and also promotes creative applications of process and material. Importantly the content is accessible at any time and at the point of need in the studio. As the content was produced by fellow students, in our workshops, it has high levels of fidelity with a new students own learning experience and thus promotes a more immersive interaction with the content then untrusted sources. As physical computing is part of our curriculum, it is useful to design such projects which enable students to use their newly acquired knowledge to enhance their own learning space, thus directly benefitting their own learning community.

Figure 6.5: RFID Interactive Material Library (Credit: I.Murphy, J.Pigott and A.Taylor, 2017)

'The interaction between the physical object and the digital content makes you want to explore more, viewing both the material and the process in a new light. It helps to develop my learning allowing me to see new avenues for developing my work'
(CSAD Focus group, 2017)

In further attempts to create an immersive making environment which seamlessly links physical space and artefacts with digital content, we have recently invested in in Oculus Medium, here a VR studio can be accessed via a headset and haptic tools can be used to sculpt virtual clay which can be directly exported to a 3D printer.

Conclusion

In the making of our Maker space, our aim was to construct a creative learning space, which not only allows us to deliver our complex curriculum, but also extends learning beyond the teaching timetable. The ways in which we have done this are:

Used Thoring's Space Development Tool Kit for creative spaces

Co-created physical/digital resources that are physically embedded into the space to create a more immersive learning environment.

Worked with the principles of 'placemaking', which strategically places resources for greatest social interaction and revitalises underutilised space. Placemaking principles can help meet the more diverse and sometimes basic needs of students, helping establish a learning community, which can aid retention.

Ensured diverse groups can be facilitated in the space promotes collaboration and interdisciplinary practice.

Co-designed with students the spaces they use. This is critical to their sense of place, and as needs change involving them in empirical problem solving is inclusive and empowering, and ensuring their voice is heard.

Our biggest problem with the Maker space we have developed is asking the students to leave.

NSS 2018 Q27 - Overall I am satisfied my course: 100% Agreement