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Introducing technical Architecture digitally

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Abstract
Architects design art on a scale like no other medium. Big enough for people to enter and able to last over 6,000 years. Architecture requires an understanding of site and a number of technical challenges to make it a reality, from understanding the available light to incorporating a structure to hold the building up. How best to introduce first year students to university life, to architecture and to working online all at the same time? This article explores the combination of a digital ecosystem, collaboration and balancing different tools to teach large cohorts.

Keywords
technical studies; Architecture; digital teaching; climate emergency; spiral curriculum

Introduction

In practice, architects study a site, develop a proposal and refine it in collaboration with team of technical specialists. Most architecture courses replicate these in-person processes (Vosniadou, 2011) with in-person site visits, sketching, model making, prototyping, drawing and discussion.

In academic year 2021/2022, the BA (Hons) Architecture course at CSM moved to a combination of digital and in-person teaching, alongside many other industries. Adjusting to teaching online was easier for existing students; they have already been introduced to the process and culture, and could adopt online methods while benefitting from previous in-person experiences. Teaching online is more challenging when you are introducing new first year students to university life, to the discipline of architecture and to working online all at the same time.

Shared Ecosystem

The first year of BA (Hons) Architecture is split into four subjects, but the then head of first year, Dr Ruth Lang, was keen that we create a shared ecosystem of digital tools and used a consistent method of communication (Davies, 2020) to help students navigate working digitally using Moodle and Padlet.

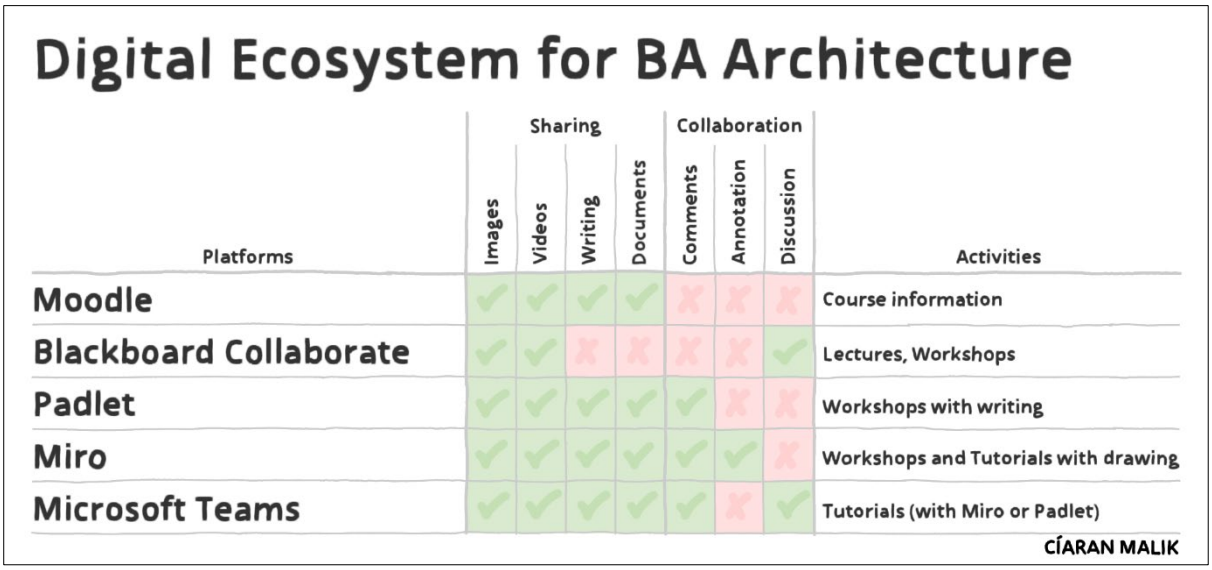

Figure 1: First year shared ecosystem comparing digital tools and course activities. Image: Malik (2021).

Our Media Coordinator, Andrew Sides, tested a number of tools for visual communication. In the previous year we had used Mural as a digital pin-up space, as it worked equally well on computers and mobiles as not all students had access to a personal computer. When we moved to Miro, he contacted them to improve the mobile application, which they shortly updated.

Our Contextual Studies Coordinator, Shumi Bose, pioneered methods for written communication and community building, using all the different Padlet templates to share and discuss writing, images and other interests.

Figure 2: First year contextual studies reading and discussion on Padlet. Image: Bose (2021).

Adapting Technical Studies

Digital teaching tools are still in development and there is no single tool that can be used to replicate everything we do in person. Instead, it requires us to understand the learning objective and select an appropriate tool or choose not to use a tool as there may not be one that is appropriate.

At the start of the year, we would use physical models and digital sharing at the Create and Evaluate end of Bloom's Taxonomy. In the middle of the year, we would focus on digital tools for design and sharing at the Apply and Analyse. Then at the end of the year, we used physical work on site, with digital sharing back at the Create and Evaluate end.

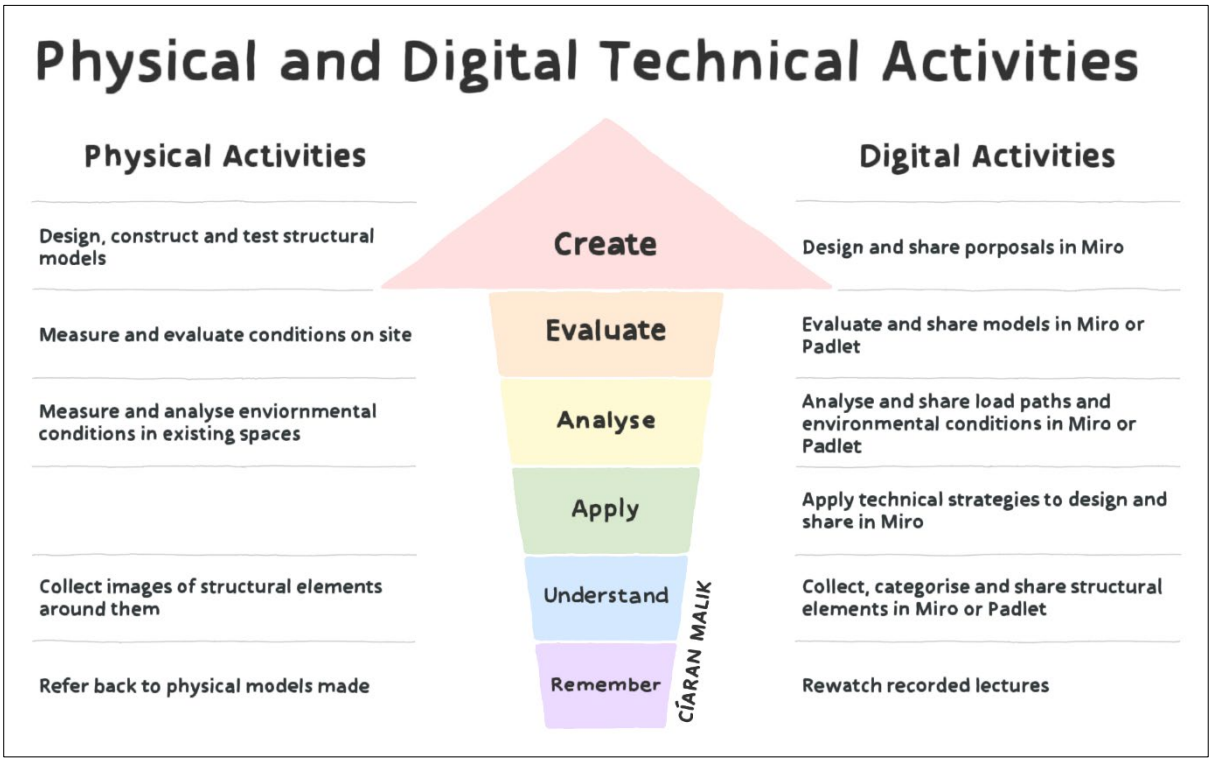

Figure 3: Comparison of 2001 revised Bloom's taxonomy and the digital and physical methods used. Image: Malik (2021).

Physical Models, Digital Teaching

Architecture involves the design and construction of physical objects. Being able to turn ideas into physical objects and record physical objects in drawings are fundamental skills. Technical studies can also be daunting for many students, as many won't have recently studied science or maths subjects which may make them uncomfortable with a technical subject.

We start the course getting students build and test models of different structural elements; beams, cantilevers, trusses, arches, tension structures and towers. They then record their designs; explain how they work and evaluate how effective they were. It introduces the subject in accessible way (Flemming, 1992), helps students feel confident in their choice of university subject and creates curiosity and excitement for the subject. Even though the course was being taught digitally, we still felt that the value of the model making at the start of the year was fundamental, and felt we should retain it.

When model making in the past, I found that students would over-use material to ensure it worked, often using expensive materials in a desire to stand out, leading to large amounts of waste afterwards. Over time I have moved to using biodegradable materials to reduce the impact of waste

and setting an upper strength limit to avoid over-use of material. Fortunately, these are all materials that are easily accessible, cheap and can be used at home.

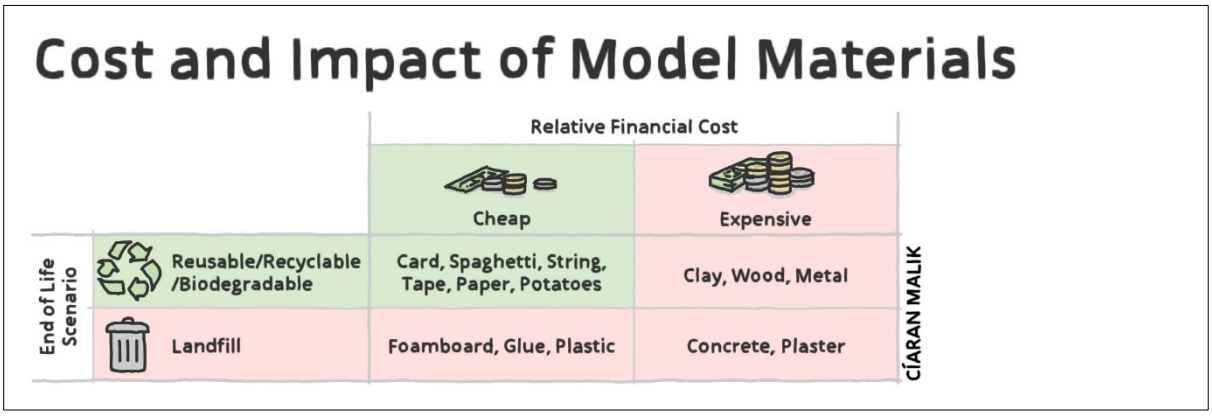

Figure 4: Comparison of relative cost and end of life scenarios for model materials. Image: Malik (2021).

We use the constructive alignment model (Biggs and Tang, 2015) in our shared ecosystem. Students were first introduced to the element in Blackboard Collaborate, they then built, tested and recorded the models at home, they then shared their work on Miro, which we then discussed as a whole year group on Blackboard Collaborate.

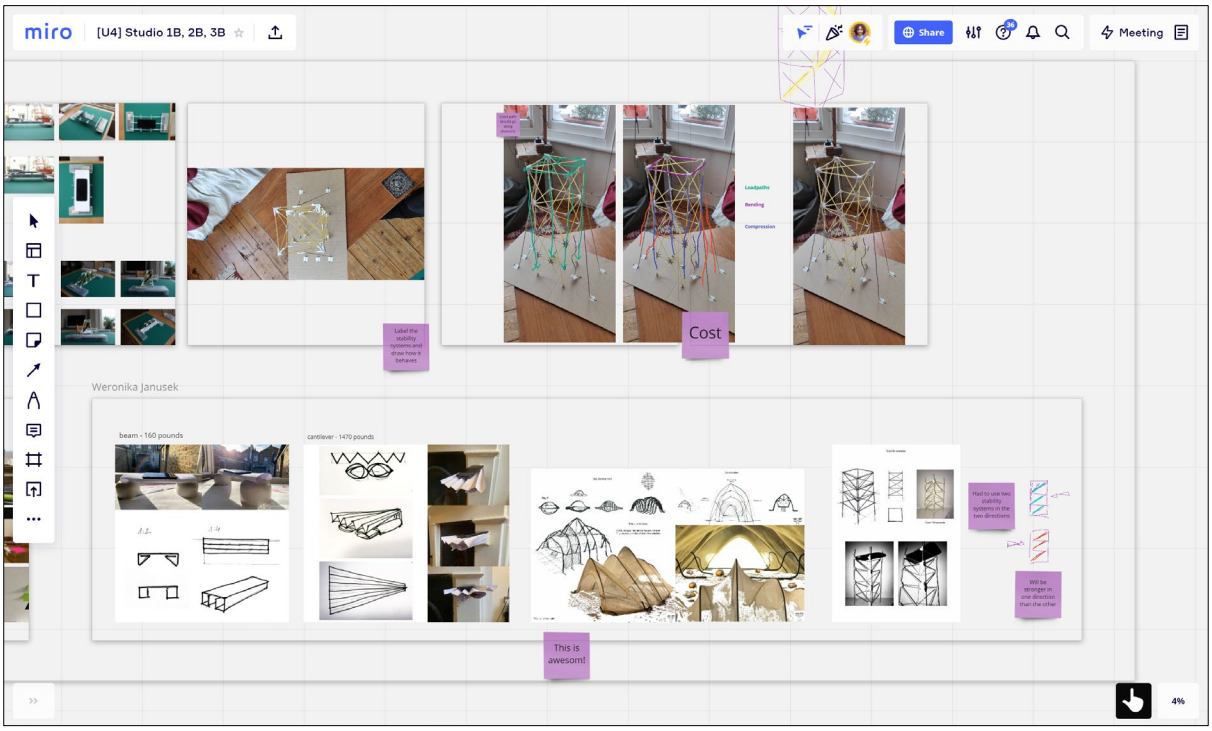

Figure 5: First year technical studies models shared and discussed on Miro. Image: Malik (2021).

Miro is unlike most software people are used to, it has a steep learning curve. As students got into a routine of using it in the same way each session, and as it was being used in other subjects, our students quickly adapted to it.

This year in some of the sessions, we trialled Padlet to share images of the models made. More students were able to share their work in a short space of time, but without the useful annotation function of Miro our discussions about the designs were noticeably more limited.

Annotation and Discussion

In most architecture courses, students present their work and talk people through their process, however in professional practice we mainly use drawings and written communication. In the same way, working online doesn't allow students to always explain their work, and the shared work on Miro needed to be clear and stand alone.

To make technical studies more understandable I have been developing a consistent visual language (Flemming, 1992): colours used to show forces, arrows used to show load paths and how to categorise elements. This made it easier for students to quickly annotate their structural models so we could discuss them in sessions together. We then augmented this by annotating images of spaces to understand the heating, cooling, lighting and acoustic methods being used.

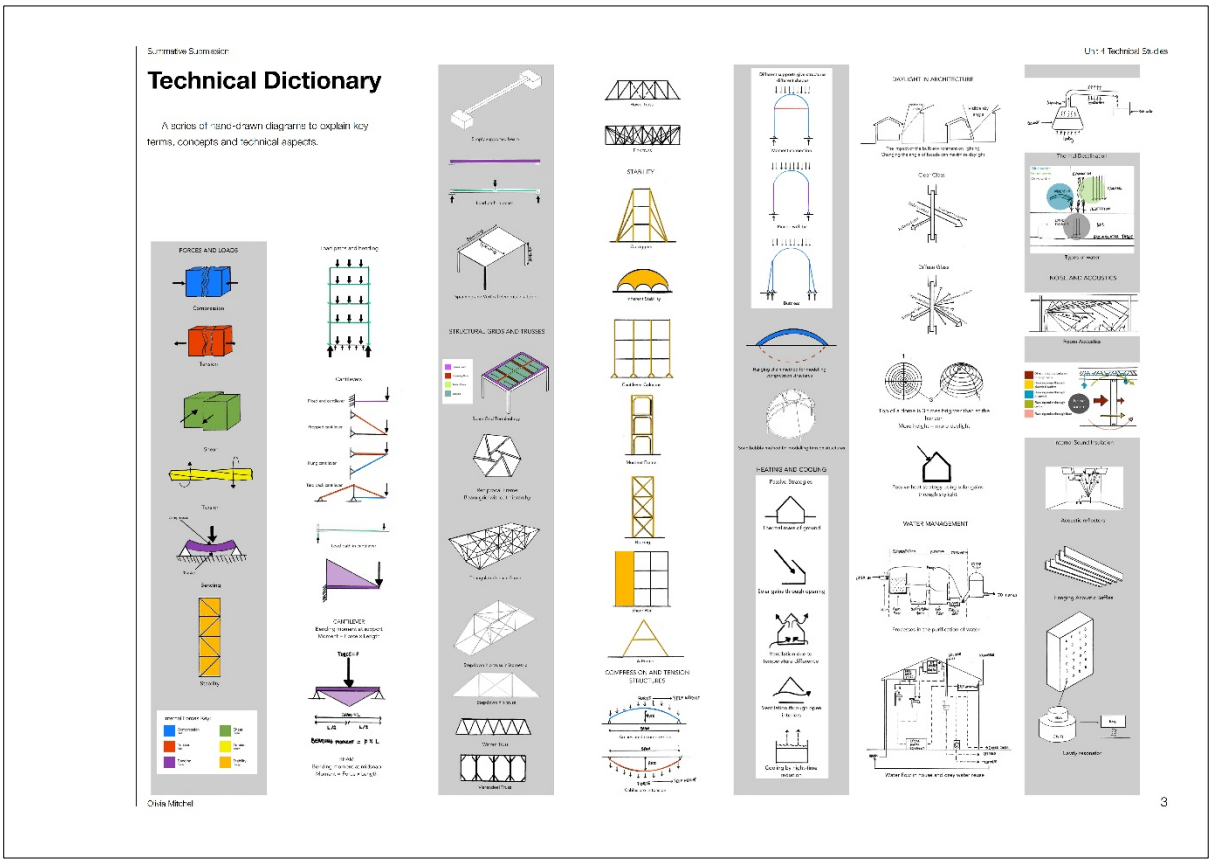

Figure 6: First year technical dictionary showing the visual language used. Image: Malik (2021).

Using Miro for Design

The technical studies course is structured using a spiral curriculum (Bruner, 1960), moving between structures, construction, materials, sustainability and environment. In the first term students complete the first spiral as they are introduced to each of the areas through the initial workshops. This means from then on, students are using familiar digital tools to deepen their understanding of each area.

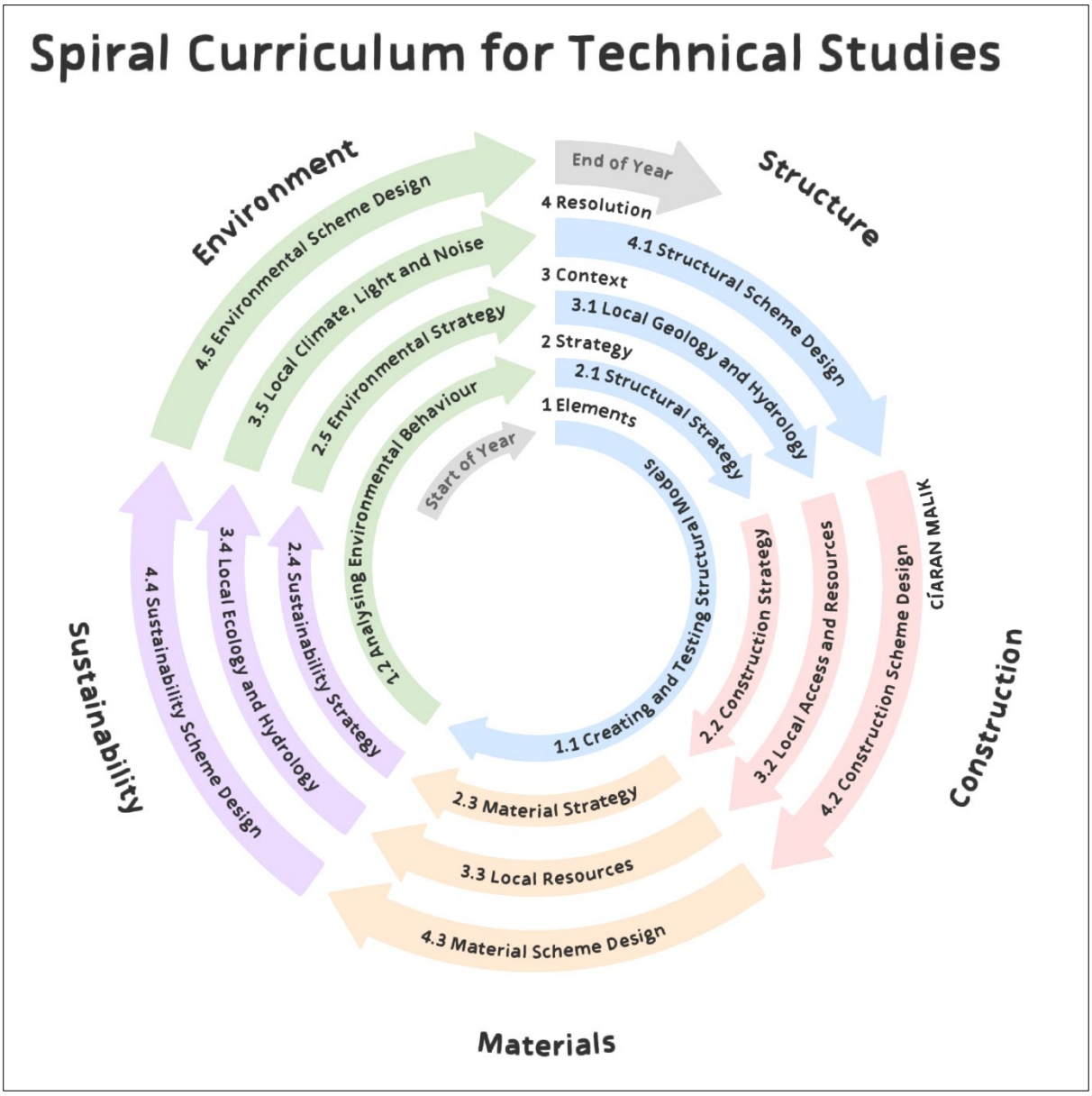

Figure 7: First year technical studies spiral curriculum. Image: Malik (2021).

In the second spiral, students went through the process of developing a technical strategy for a given floorplan. Each week they would learn how to develop a strategy for each area, draw and annotate their design in Miro and then discuss it online. This takes them through the process they will apply to their final project and allows them to see how the different areas fit together (Rosenkranz, 1872).

Miro is not a drawing software, so it encouraged students to show their ideas rather than focus on making it look perfect. It allowed them to see each other's work and allowed us to discuss work from more students than if we had the session in person with 150 students.

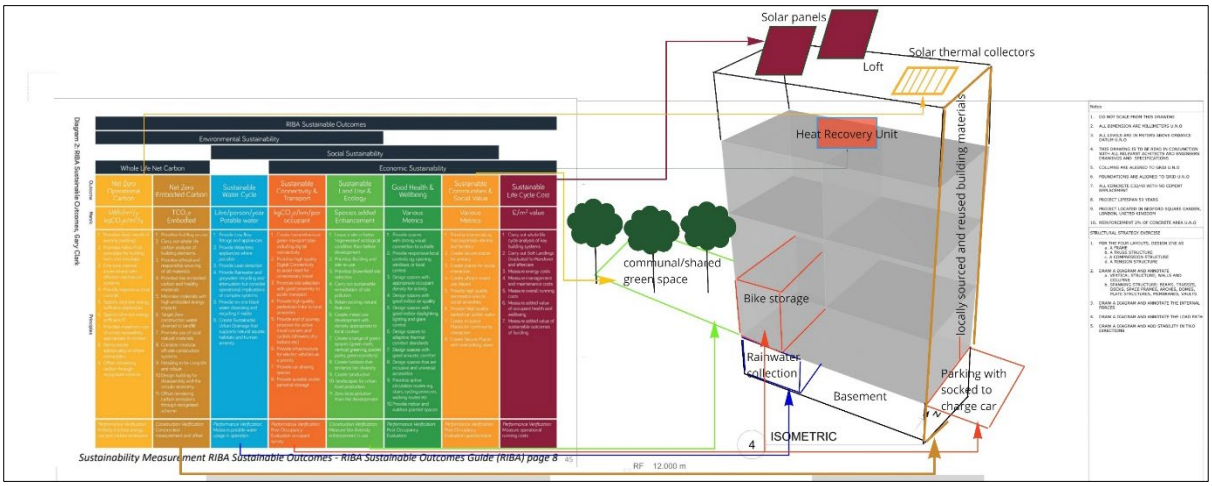

Figure 8: First year student drawing a sustainability strategy in Miro. Image: Malik (2021).

Collaborative Design Development

In the last part of the year, students develop the same project in the design studio and their technical studies. As the complexity of the project increases, students are able to dedicate more time to the project and receive more support.

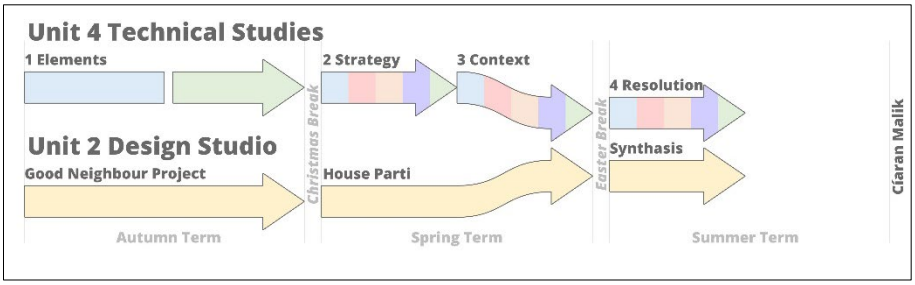

Figure 9: Design Studio and Technical Studies collaborating in the second half of the year. Image: Malik (2021).

During the third spiral for technical studies, students begin to understand their site and how it will impact the structure, construction, materials, sustainability and environmental design. The site analysis is conducted in studios together, with in-person tasks for those who could go to the site, and equivalent online tasks for those working remotely.

In the final spiral, students develop their design and technical resolution. To support students who are having difficulty and stretch those wanting to go further I share online digital webtools to allow them to experiment (Malik, 2021).

Miro was a really useful tool in this process, allowing students to share work, draw on it in discussions with their design and technical tutors, add notes and see each other's work develop. There are some advantages to this as there is notes can be added to the relevant page as the discussion continues and students can see much more closely what is going on. At the same time, limitations to the drawing tool and having so many users together can make explaining feedback more difficult.

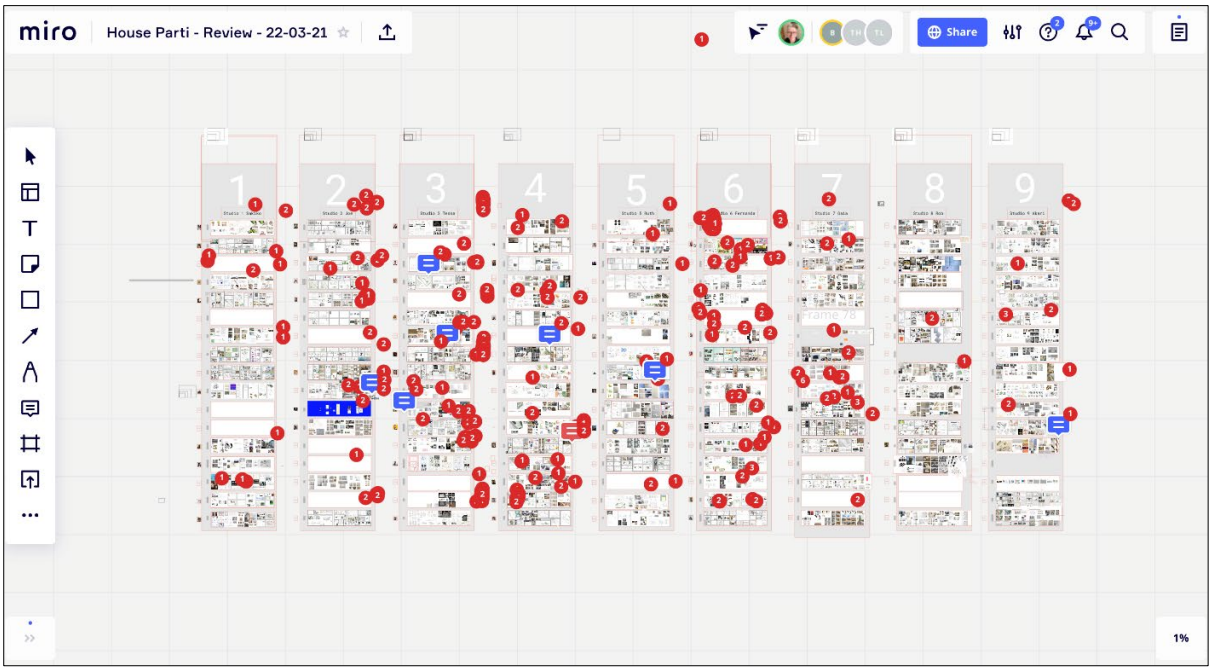

Figure 10: First year review in Miro with all studios and student work. Image: Malik (2021).

Discussion

The methods we used worked and the quality of work produced was as good (if not better) than in previous years. One reason for the improvement could be attributed to this being the second time this new technical studies course was being run and there would normally be improvements as a course is refined.

Additionally, having a clearly structured course in the first place made it much easier to adapt to digital teaching and likely make it better to adapt to other shocks in the future. Having a supportive and collaborative team was critical to creating a shared ecosystem, mutual planning around when certain tools would be introduced to students, and being able to learn from each other in a short time.

Architects are part of a shared community. A lot of effort was made to create an online community but it was not a replacement for the interactions in person between students. Teaching online with students videos and microphones off may have made students more comfortable, but has impacted the relationship between staff and students. Of the 150 students in the year, I only saw three of them.

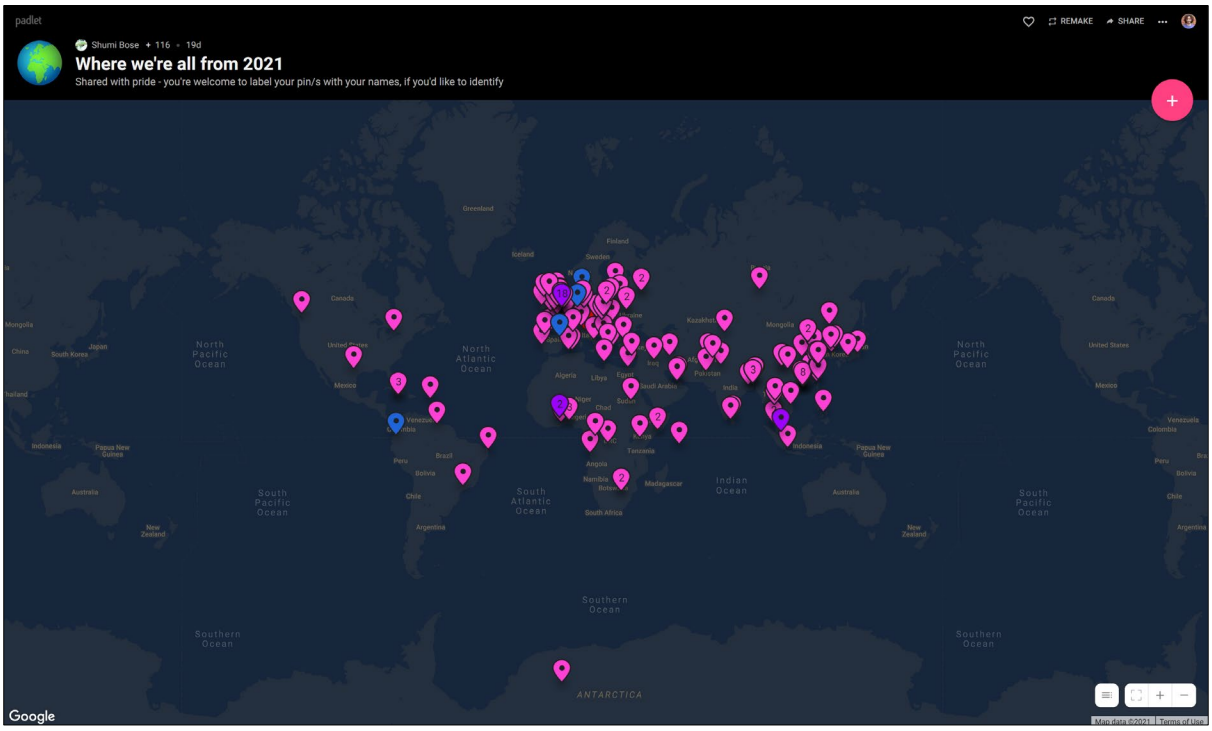

Figure 11: Mapping with students where they come from (year). Image: Malik (2021).

How we teach is always changing, but the need to teach online has provided a large change in a short time. We won't return to working exactly the same way we did before and I will continue to use those methods that worked better than in person.

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Biography

Cíaran Malik was formerly Senior Lecturer in Technical Studies for BA (Hons) Architecture at Central Saint Martins. He is a structural engineer, teacher, and regenerative designer. He studied engineering at the University of Cambridge, trained as a teacher at the University of Buckingham and regenerative design at the Regenesis Institute. Cíaran is interested in exploring ways to improve technical teaching in architecture, especially as a way to address the climate emergency. His research into sustainable and regenerative architecture has led to projects like the Round House at the Story Garden and the Horticultural Classroom at Walworth Gardens. He specialises in low carbon design, water management and ecological integration.

