DEVELOPING STUDENTS' ABILITY TO VISUALISE TWO DIMENSIONAL DETAILS

Context

An important aspect of Architectural Technology is the ability to describe construction proposals using two dimensional detail drawings.

Contractors rely on these drawings in order to produce tenders, they form a basis for contracts and work programmes, and ultimately provide the blueprint for projects to be constructed.

This type of detailing involves being able to visualise three dimensional building elements two dimensionally. The reverse is also important, being able to visualise how a two dimensional drawing would work three dimensionally.

To create accurate mental images based on drawings is a complex ability which can take a long time for some students to learn and develop.

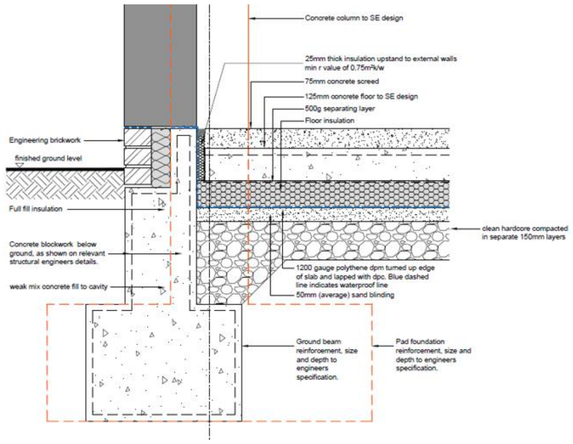

Fig 1: 2D foundation detail (McHarg, 2022)

Aim

As a vocational course our students are encouraged to take a placement for their 3rd academic year.

The proposed research would identify a list of various activities which would help 'jumpstart' the visualisation process so that the student is prepared for their industry placement.

A variety of considered activities would also help with inclusivity as it takes into account the different ways students learn

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Literature review

Freehand sketching and drawing is an important tool to consider in this research. *"Architecture cannot divorce itself from drawing, no matter how impressive the technology gets. Drawings are not just end products: they are part of the thought process of architectural design. Drawings express the interaction of our minds, eyes and hands. This last statement is absolutely crucial to the difference between those who draw to conceptualize architecture and those who use the computer."* Graves, (2012).

NTU's City Campus provides an opportunity for students to draw a detail whilst physically looking at the construction. Arslan et al., (2017) states; *"students developed their skills in creating and mentally visualizing 2D and 3D drawings… by practicing and looking at examples in their surroundings, imagining how the space would look like, visualizing a walk-through of the space, by thinking about the projects, and by brainstorming ideas."*

Methodology

The Construction Technology module consists of a lecture followed by a two hour seminar session in which drawing and research tasks are set.

Within selected seminars it would be proposed to design and set activities with the focus of aiding visualisation.

Potential creative tasks could include:

- Build a physical model of a 2D detail
- Produce a 3D diagram of a 2D detail in drafting software (Sketchup, Revit)

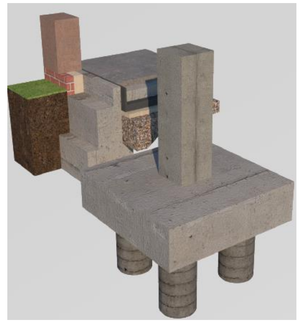
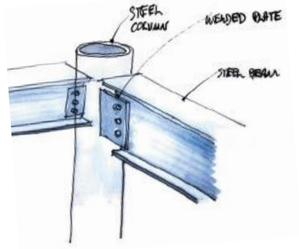


Fig 2: Physical model of foundation detail (Severdija, 2022)
Fig 3: Digital model of foundation detail (Moylan 2022)

- Hand draw 3D & 2D sketches of constructed details around the campus



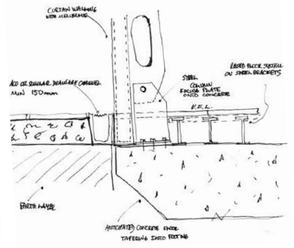


Fig 4: Sketch of Bonington Café steel frame (Cunliffe, 2022)
Fig 5: Sketch of Newton steel frame (Cunliffe, 2022)

- Discussing and circulating materials and manufacturers products within the seminar
- Visiting construction sites

The activities would need to take into account that some students are able to clearly read two dimensional drawings so the tasks should not purely focus on visualisation, they should also include content to broaden knowledge and meet learning objectives

Data Analysis Method

An anonymous survey would be conducted in a Construction Technology session, at the beginning of the academic year, asking who could / could not read technical details.

At the end of the academic year another survey would take place within the session to see if there was any improvement in numbers.

The survey would also ask which specific activities the student feels have helped improve the visualisation process. *(Ethical approval would be required prior to research being carried out)*

This data would then be disseminated to the Architectural Technology course team.

Expected Impact

Further to informal feedback received from students struggling to read details, Construction Technology seminar tasks started to be revised in term two of the 2021/2022 academic year to incorporate some of the previously mentioned activities.
The following student comment was received in the MySay survey:

"All seminars are extremely helpful as I quite often struggle to work through a seminar task without the extra support to help visualise 2D from 3D and vice versa."

The skill to understand technical details will help build the students confidence in their own abilities helping with placement interviews and the transition into their placement role.

Conclusion

Primarily focussing on producing two dimensional details will not help all students understand what they are drawing. A variety of techniques are required.

This research could be taken to a deeper level by collaborating with an academic who has a knowledge of neuroscience. Understanding which part of the brain is responsible for visualisation and how it can be stimulated would provide a valuable insight and perspective into additional "outside the box" methods that could be incorporated into the seminars.

A comprehensive repository of proven, effective activities would not only benefit the Architectural Technology course. I would involve ADBE Learning and Teaching as they have an overview of modules on other courses and look to promote and share good practice. I will also upload this poster to the National Teaching Repository.

"The ability to visualize objects and situations in one's mind and to manipulate those images is a cognitive skill vital to many career fields, especially those requiring work with graphical images" (Sorby et.al. 2005)

References

- Arslan, Ali Riza and Dazkir, Sibel Seda (2017) Technical Drafting and Mental Visualization in Interior Architecture Education. International Journal for the Scholarship of Teaching and Learning: Vol. 11: No. 2, Article 15.
- Graves, M., 2012. Architecture and the lost art of drawing. The New York Times, 1.
- Sorby, S.A., Drummer, T., Hungwe, K. & Charlesworth, P. (2005). Developing 3-D spatial visualization skills for non-engineering students. Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition: (pp. 10.428.1-10.428.11).

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