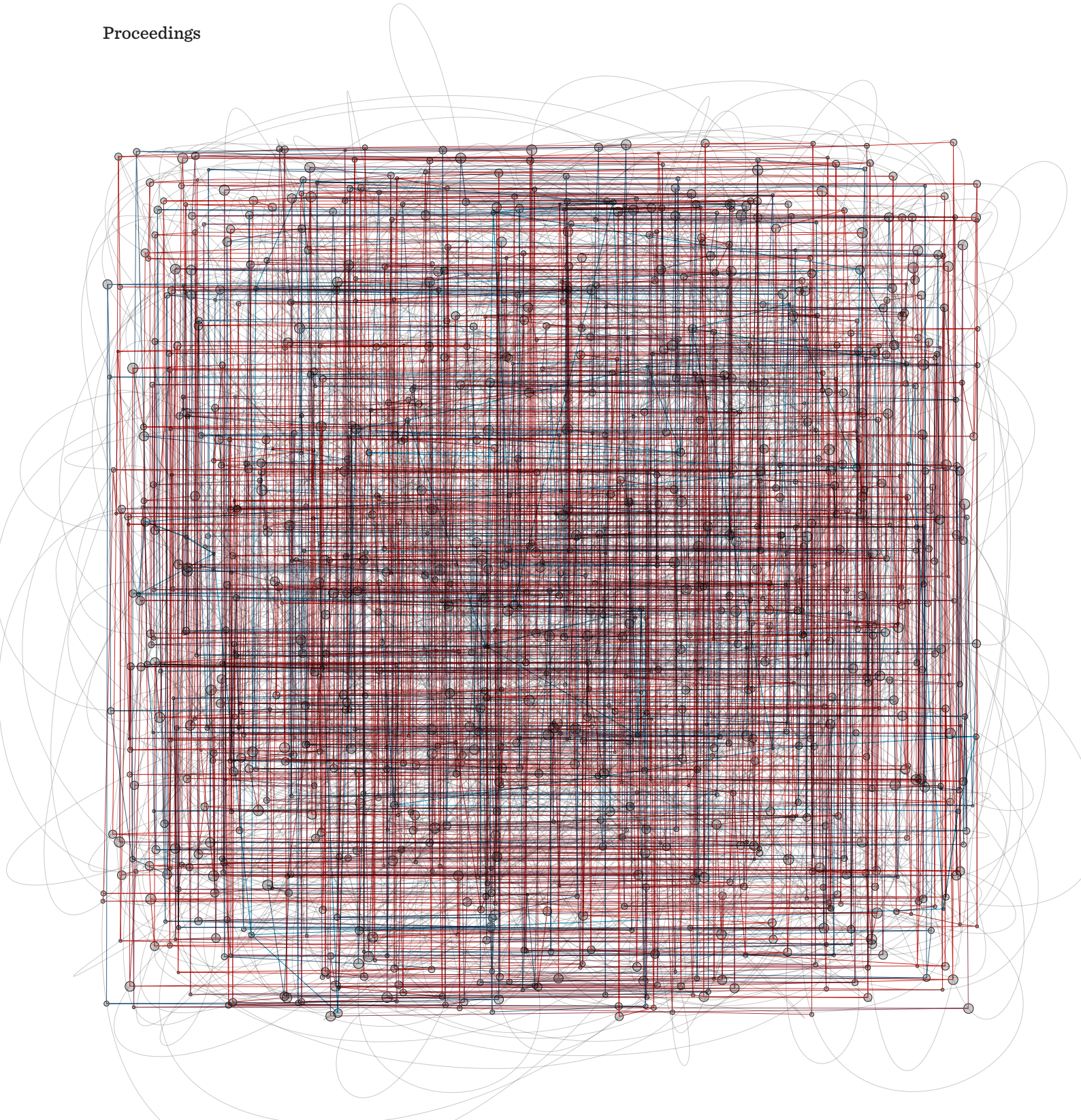
Architecture Connects

ASSOCIATION OF ARCHITECTURAL EDUCATORS

4th international peer reviewed conference

Oxford Brookes University, UK
6–9 September 2017

Proceedings



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An exploration of Socratic learning in a webinar setting.

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ABSTRACT

Although digital technologies have started to impact the architecture studio, this field is largely under-researched. Limited empirical results are available on Socratic learning, enabled by student-tutor interactions in the crit, especially associated with the synchronous online studio. This study is situated in a blended undergraduate programme in architecture at a University of Technology in South Africa. The part-time programme was designed to broaden access to the architectural profession, by enabling previously disadvantaged and non-traditional working students to upgrade their qualifications, through a blend of office-based mentorship, on-campus blocks and online learning. The aim of this research was to explore the student-tutor interaction in the live online crit, facilitated via a webinar platform. A better understanding is needed of how Socratic learning is mediated between the concrete and the abstract, to address challenges in the studio related to increased student numbers, diversification of the student body and utilisation of available learning technologies.[1] Drawing on learning design, online learning, Socratic learning and design critique literature by Laurillard,[2] Gunawardena,[3] Lam[4] and Blair[5] respectively, four modes of student-tutor interaction were identified. These are Negotiation, Exploration, Application and Reflection (NEAR). A focus group interview of recent graduates and three online crit protocols provided the data. All four modes of interaction were found in the focus group interview and observed in the live online crits. The data was thematically analysed and the crit protocol analyses were translated in notations to visualise the student-tutor interactions. The crit notations, read in relation to the graduates' reporting, revealed patterns of interaction and insights about which party took the lead (the student or the tutor) and when, how the use of media impacted on the learning episodes, how the modes of interaction were sequenced in the live online crits, and how and when the most valuable learning interactions occurred.

KEYWORDS student-tutor interaction, Socratic learning, design studio, crits, online learning

Background

Design expertise is acquired through the application of theory in practice and involving elements of design thinking and design making.[6] The practice through which this learning is facilitated, the studio critique, also known as the crit or design review,[7] is 'characterised by the Socratic traditions of lively and robust questioning and discussion between students and teachers'.[8] Although the term 'crit' carries a negative connotation,[9] I chose to use it because it is widely accepted and recognised in architectural education and practice. The crit takes on many forms, including the desk crit, pin up crit, group crit and other;[10] and modes, including face to face and online, in

real-time (synchronous) or over time (asynchronous), and involving different parties and media.[11] Research by Finkelstein,[12] Pilkington,[13] Ng,[14] Cornelius and Gordon[15] and Cornelius[16] address the online crit, but these are mainly focused on asynchronous interactions. There is limited scholarly discussion on the character of the interaction between students and tutors,[17] especially online. Existing research on studio interactions either focus on the design process, for example Goldschmidt's Linkography,[18] that shows the links between design ideas, or the crit content, like Anwar's Cognitive Interaction Matrix,[19] rather than the modes of student-tutor interaction specifically.

The crit setting that forms the focus of this study, is the webinar. The word, 'webinar,' is derived from 'web-seminar', and it is a synchronous online presentation, seminar, lecture or workshop[20] that comprises of visual and audio components. Although peer to peer learning is acknowledged as a valuable component of the studio, this study focuses on the important[21] learning interactions between the student and the tutor.

Conceptual framework

I drew on literature linked to conversational learning to identify four modes of interaction, namely *Negotiation, Exploration, Application and Reflection* (NEAR). The first three were borrowed from Gunawardena[22] and the fourth from Blair[23] (see table 1). I adapted Laurillard's Conversational Framework[24] with reference to research by Gunawardena,[25] Blair[26] and Lam.[27] Laurillard's Conversational Framework contains four communication forms including discussion, adaption, reflection and interaction. These operate on two levels, the discursive and the experiential.[28] The discursive is for articulating and discussing theory, ideas, concepts and forms of representation and the experiential provides for acting on the world, experimenting and practicing on goal-oriented tasks. As part of an iterative learning process, concepts are built through reflection on practice and concepts are tested through exploration of theory. Laurillard[29] posits that, for learning to happen, students need to constantly move from the concrete to the abstract and back again. Gunawardena et al.[30] identified five phases of online interaction, including sharing/comparing of information; discovery and exploration of dissonance or inconsistency among ideas, concepts, or statements; negotiation of meaning/co-construction of knowledge; testing and modification of proposed synthesis or co-construction; and agreement statement(s)/applications of newly-constructed meaning. Blair's[31] eight crit functions are sharing, explanation, presentation, clarification, simulation, feedback, reflection and critical analysis. Finally, Lam[32] describes the Socratic Learning Method, a constructivist learning approach that involves a series of asking and answering questions to stimulate critical thinking and to draw out ideas and assumptions. It comprises four critical steps, namely 'eliciting preconceptions', 'clarifying preconceptions', 'testing hypotheses' and 'deciding to accept the hypotheses' or not. A question is asked, followed by the formulation of a hypothesis that is tested, accepted or rejected and then acted accordingly.[33]

Gunawardena et al 1998	Blair 2006	Lam 2011	Laurillard 2002	This study		
Online interaction	Formative assessment in design	Socratic Learning Method	Conversational framework	Student-tutor interaction		
Phases	Crit functions	Steps	Communication forms	Modes of interaction	Student	Tutor
DISCURSIVE LEVEL						
Sharing/ Comparing Negotiation	Explanation Presentation Clarification Sharing	Clarify	Discussion	Negotiation Theory		
Discovery/ Exploration Testing	-	Test	Adaption	Exploration Test concept		
EXPERIENTIAL LEVEL						
Agreement/ Application	Simulation	Decide	Interaction	Application Practice		
-	Feedback Reflection Critical analysis	Elicit	Reflection	Reflection Build concept		

Table 1. Conceptual framework and crit notation key (Author)

Methodology

The main research question was 'how do students and tutors interact in the live online crit?' A focus group interview of recent graduates and three online crit protocols were thematically coded, using the four modes of interaction generated from the literature (see table 1).

A 90-minute focus group interview was conducted with five out of a total of thirteen 2015 graduates (A to E), using Blair's[34] open-ended questions, including questions on the purpose and value of the crit. Three crit protocols (see figure 1) of 2016 year-1 students (C1-C3) were transcribed and thematically analysed,[35] first in Excel and then using Atlas.ti7. Then the findings were translated in a graphic notation to visualise the modes of student-tutor interaction, for each of the three crit protocols (see figure 2).

Read from left to right, they show the (numerical) turns grouped in (alphabetical) episodes that relate

to the modes of interaction of the student (shown in black) and tutor (shown in grey), respectively. Participant (titled 'person') roles are shown as 'S' (Student), 'T1' (Tutor 1) and T2 (Tutor 2). A turn is not related to a unit of time, but, instead, corresponds with Goldschmidt's definition of a unit, namely that 'a unit comprises the spoken output, or verbalisation, of each of the participants (teacher and student), until the other party takes a turn in speaking.'[36] For every turn, the most prominent thematic code was assigned. An episode is a series of turns that display similar characteristics. On the notation a dotted line separates the experiential mode from the discursive mode of the online student-tutor interaction. The discursive is shown above the line because it denotes theory and abstract concepts and the experiential below the line, associated with the concrete, implementation and praxis. *Negotiation* (on the discursive level) appears as a rectangle above the line and *Application* (on the experiential level) is shown as a rectangle below the line, in grey or black, depending on whose turn it is. Movement between the discursive and the experiential is shown with an L-form turning up for *Reflection* and down for *Exploration*. The on-screen marking and drawing activity is represented by hollow dots to show changes in on-screen images, and solid dots to indicate on-screen markings or drawing.

I am the University coordinator of the part-time programme and to perform this research, I acted as participant observer. This means that a degree of subjectivity was inevitable. However, it equipped me with valuable perspectives and insights.[37] Verification strategies that I employed, include triangulation using multiple data sources namely a focus group interview and crit protocol analyses; and peer review by a colleague not involved in the programme, who checked the research process and coding samples. Furthermore, to balance my input as a tutor in the crits, another colleague performed the role of tutor 1. The three crits were selected through convenience sampling[38] for collecting qualitative data. The focus group interview with recent graduates revealed how they experienced the online crits, and the protocol analyses[39] shed light on the nature of the interactions between the student and the tutor.

The Crit Cases

The two-year blended undergraduate programme is offered through a university-industry collaboration, implemented to address demographic transformation in the architectural profession.[40] It is aimed at working individuals who have been unable to complete their studies, due to financial reasons or life commitments, and those who have been excluded from higher education in the past. The students are based in architectural workplaces that are spread across South Africa and neighbouring countries of Namibia and Zimbabwe.

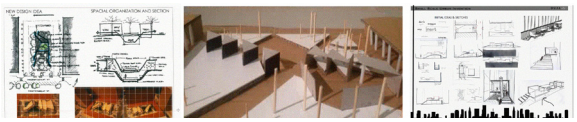

Figure 1. Screenshots of Crits 1, 2, and 3, from left to right (Author)

The learning design comprises office-based mentoring, occasional on-campus blocks and online learning facilitated in formal and informal online spaces, both synchronous (real time) and asynchronous (over time). Social and informal online platforms are set up in Facebook and Pinterest, and student-only WhatsApp year groups serve as private back channels. A SharePoint site, referred to by the students as 'the portal', contains organisational information such as study guides, institutional rules and regulations, a calendar and announcements.[41] Learning content is provided through interactive project briefs, recorded lectures, class notes, and video and text-based resources. The portal also houses student assignment uploads, online written and graphic feedback by tutors, record of student grades and online crit recordings. Google documents, linked from the portal, host ongoing individual student design journal updates, for feedback by tutors, in written and graphic formats.

Every fortnight a group of about ten students per one-hour session meet, with one or two tutors online, in a virtual GoToWebinar space. Students upload their work, in pdf format, to the portal on the Monday preceding the online crits that take place on Tuesday and Wednesday afternoons. A webinar link is sent to students by e mail the day before and can be accessed using a PC, laptop, tablet or smartphone, with a headset. To save time, the lead tutor shares the student work on her screen, visible to all crit participants, and

the student whose work is being reviewed, directs the tutor to advance the slides as needed. The webcam is not used. Students and tutors are given virtual pens of different colours to point and create on-screen markings and diagrams on work displayed on the screen.

The webinar text chat is used for comments, written input and feedback by students and tutors, and to share links to support material, including blogs and websites. These inputs were minimal in the crits that were studied, and they were therefore not included in the study. The online crits are automatically recorded and made available to students to view in mp4 format, soon after the crits are concluded.

The three crits of between 20 and 30 minutes' duration each, addressed individual project work generated by three year-1 part-time students respectively (see figure 1). The project is a small-scale intervention in the urban landscape of the Cape Town CBD. The aim of the project was to develop fundamental design principles and understanding of design process by employing a conceptual idea to generate a design proposal, and to communicate it appropriately. The project was completed in two parts. The first part was done as a vertical studio project during the first on-campus block for the year, with one year-2 and two year-1 students allocated per group. Each group was assigned a conceptual spatial idea that was generated through readings by the year-2 student in the group, in preparation for the on-campus block. Each group was required to find a space in the city that could be modified employing the allocated conceptual idea. The intention was that space-defining elements would be manipulated in accordance with the selected spatial concept. The single project outcome per group comprised of diagrams, freehand sketches and a conceptual model.

The second part of the project involved individual work. Year-1 students were required to develop the group project in the two weeks following the on-campus block, supported by their workplace mentors and facilitated online by their tutors. They had to record their design process in an online design journal, and participate in two online crits. The crit session that forms the focus of this study, was the last crit before the project submission. The final submission of individual work contained a clear representation of the allocated spatial concept, details of and the reasons for the site selection, the student's personal response to the group proposal, the nature and qualities of the intended spatial experience and at least one appropriate conceptual precedent. This was presented in the form of a short motivation explaining the design strategy, diagrams, sketches and at least one 1:200 concept model.

Below follows an overview of the design intent of each of the three projects and a summary of each respective crit (episodes indicated in brackets), illustrated as notations in figure 2.

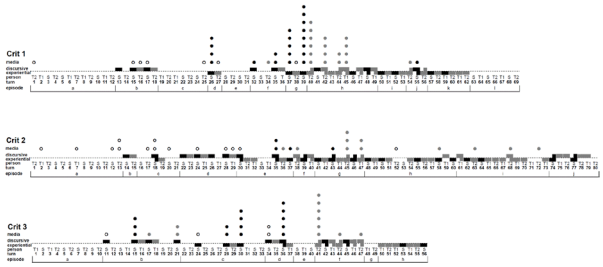

Figure 2. Crit notations (Author)

Crit 1: Architecture and human senses

Student C1's chosen site was a small public square. His design intent was to provide a range of spatial and sensory experiences through guiding the users' movement. The crit material contains mainly freehand sketches with annotations, and a photo of the conceptual model (refer to figure 1: image on the left). The crit comprises 69 turns, visualised in episodes a to l (see figure 2: top notation). The slides contain text and images, including precedent research, sketches and a photo of the conceptual model.

The crit starts with greetings and a brief social conversation (a), followed by the student's project presentation (b). He refers to the images, explaining the background to the project, design influences and conceptual idea. Other than advancing the pdf slides and acknowledging his presentation, the tutors don't give any feedback at first. Then the student stops the presentation and turns to the tutors to find a pen and to move to the next slide in the presentation (c). He continues, but now focusing on the application of his ideas (d), whilst making use of on-screen drawing. After another short interruption to find the right drawing (e), he continues to elaborate on the conceptual aspects of the project (f), followed by a further explanation of the application of the design

intent (g). At this point the tutors join in with feedback alternating between the concrete and the abstract. During this up and down weaving between practice and theory, there's a lot of on-screen marking and sketching activity. The next phase involves a focus on the application of concepts (i and k), with only one short reference to theory (j), again with on-screen sketching. The crit ends with a brief period of social exchange (l).

Crit 2: Pathways and planes

Student C2's project is located in the busy Cape Town railway station precinct. The design intent for this project was to employ pathways and planes to enhance the experience of movement and rest and for the gathering and dispersal of commuters. Overhead planes define informal market spaces that also frame Table Mountain views. The largest part of the crit focuses on the three-dimensional exploration through discussion of the physical models (refer to figure 1: image in the centre). The crit contains 80 turns, visualised in episodes a to j (refer to figure 2: notation in the centre).

The crit starts with a social phase and introduction about the crit process and the student testing the on-screen drawing tool (a). C2 starts to explain the context of his project in relation to the group project, the influences on the project, moving from slide to slide, but without on-screen drawing (b). The tutors give minimal input, but compliment the student on his use of several cardboard models for design exploration, in-between finding the relevant slides (c to f). He then moves from the theory to describe the application of theory, using the on-screen drawing tool (g). The tutors join in, first prompting the student for further explanation and clarification on his design decisions related to scale and then moving the discourse up and down between theory and practice (h), using images of the models and on-screen drawing. The remainder of the crit is focused on practice (i), with occasional references to theory to justify design decisions (j). The final stage of the crit revolves around the value of the model as design tool (k), after which the crit is concluded (l).

Crit 3: Duality

Student C3 employed the concept of duality to remodel an existing urban flower market space in a heritage area. His design intent was to introduce a sense of intimacy, bring nature back into the city and create opportunity for rest. He tried this by inserting a glass box between two historic buildings, visualising a quiet and intimate elevated sanctuary in a noisy urban space.

The presentation contains text and images, including precedent research, sketches and several photos of models of conceptual alternatives (refer to figure 1: image on the right). The largest part of the crit focuses on the three-dimensional exploration through discussion of the physical models. The crit contains 56 turns, visualised in episodes a to h (see figure 2: notation at the bottom).

The crit starts with greetings and finding the right starting place (a), followed by the student explaining the design concept and design informants (b), using the on-screen drawing tool. Short interruptions occur for the advancement of slides and navigating the material. The student continues with an explanation of the practical implementation of his ideas (c), whilst still using the drawing tool. The final phase of his presentation starts by focusing on the theory (d), followed by a demonstration (e) of how he implemented the theoretical ideas generated from the precedent. After a short social break interspersed with tutors' compliments, the tutor moves the discourse back to the conceptual level (f) with up and down movements between the theory and practice aspects of the project. After another short navigation phase (g) the crit ends with practical tips and encouragement by the tutor (h).

Modes of student-tutor interaction

All four modes of interaction, *Negotiation, Exploration, Application* and *Reflection* (see table 1) were identified in the focus group interview and observed in the three crit protocol transcripts. Although it was possible to assign one of the four modes to each turn, in some cases more than one mode could apply and the boundaries between different modes were not definitive.

On the discursive level, I used Negotiation[42] to describe the mode of interaction used for the clarification of preconceptions[43] and negotiating understanding of theory.[44]

In the crit visualisations, the Negotiation mode of interaction mostly occurred during the first half of the crits and was often accompanied by on-screen

marking. Although the main purpose of the student's presentation is to elicit feedback from the tutors and peers, articulating understanding helps the student with sense-making, as described by graduates E, A and B:

"Sometimes you understand something, you worked it out a million times in your head, and you understand it, but the next person doesn't understand it as well as you do, and you sometimes think the person will understand it easily, but you need to, when you present your work, you sort of need to take a step back, and think how will another person look at this and read it". (E)

"Sometimes it is the opposite. You don't understand your work and then, as you're talking, you're like, okay... now I have to do that and I have to do that." (A)

"That's true. Saying it out loud is different to just sitting behind your work and just drawing. If you say it out loud, sometimes it just makes sense or doesn't and then you have to start over." (B)

I found that the Negotiation mode of interaction was dominated by the student articulating concepts, rather than the tutors explaining content, from which I could infer that this mode was characterised by student presentation[45] as observed in Crit 1:

"So basically, like I said there, the spatial design and the concept is enhancing the human senses by moving through spaces. The idea of using architectural and natural elements to enhance certain human senses by manipulating form and function. So that's the spatial design concept." (C1, Crit 1, turn 13)

In this mode, the student often makes use of the on-screen pointing and marking tool to support his verbal presentation. The tutor's responses are brief and mainly involve confirmation, acknowledgement of the student's presentation, hints and occasional compliments:

"Nice sketches." (T1, Crit 2, turn 25)

I used Exploration to identify the interaction that involves the student testing hypotheses or encountered propositions of concepts,[46] and the tutor, in turn, modelling it. Exploration moves the discourse 'down' towards the experiential level.[47] The tutor models the testing of design alternatives or prompts the student to do so, as suggested by graduate B:

"It was something that Tutor 1 or Tutor 3 said. They just said: 'but why not do whatever and at that moment when they said that, I thought, well flip! Why didn't I think about that? [...] It was a question. Like most of the input in the crits will be questions." (B)

Exploration is present in all three crits, and for both tutors and students. In two of the three crits (1 and 3) Exploration occurs only in the second half of the crit, and concentrated in two episodes. In Crit 1 it occurs in episodes h and j and in Crit 3 in episodes e and f. In Crit 2 Exploration instances are spread more evenly through the crit, starting in episode c. It is often accompanied by on-screen pointing and marking, by both the student and the tutor. Student C3's consideration of alternative flower display arrangements, below, is an example of this mode of interaction:

"I think that you see a lot of flowers hanging from those flower-hanging walls and types of stuff where they can maybe mount the buckets with the flowers and stuff and because they have plenty of flowers [on the] underneath, I'm not even sure if they have enough space, just like that. So, if we make layers and they can add it, like maybe it high and let's say higher, or how can I say it? Ja, like just higher levels of flowers and people can look actually at more flowers than just the ones on the ground". (C3, Crit 3, turn 42)

T1 models Exploration by suggesting C2 considers different scenarios (Crit 2):

"So, what would happen early in the morning when everyone's rushing out of the station to go to work? What happens when everyone's coming back from work and trying to get on the trains? What happens at midday? What happens on a Saturday afternoon? What happens on a Friday night? You know, just maybe run a couple of scenarios where you could demonstrate how those spaces could be appropriated for different uses at different times by different people." (T1, Crit 2, turn 61)

In the three crit protocols, Exploration displays as the testing of ideas, as suggested by Gunawardena[48] and Lam.[49] On the experiential level, Application is associated with 'deciding whether or not to accept the hypothesis.'[50] In these crit protocols, Application involves the implementation of design decisions, by the student showing the tutor how he decided to act on his theoretical understanding in preparation of the crit, for example:

"I was playing with different materials. I've moved from wood to steel to concrete to platted elements to allow mottled sunlight through. I'm still working through the different aspects and results and of what, if I choose a material what will happen in the site?" (C2, Crit 2, turn 55)

Or in response to the tutor's questions or feedback in the crit:

"All right. Can you talk a little bit about the overhead planes, the roof elements that you're making?" (T2, Crit 2, turn 54)

The tutor responds with feedback and suggestions and prompts the student to clarify or explain:

"Okay, that height was, I think, 2.7 [metres] because the height at the back there [student marking in red] was 4 or 3 [metres], sorry. So it was just lower." (C2, Crit 2, turn 37)

Graduate D explains how, online, the tutor shows or suggests design behaviour rather than designing with the student to find a solution:

"I think when you're drawing face to face, it's more like you figure out stuff, whereas online it's more like the lecturer [tutor] showing you something. When Tutor 1 used to draw something, and you draw, it's like your idea, it's not necessary how to figure it out like we'll sit there and work it out, it's more like this is how you think it's supposed to be and then afterwards you will work from there backwards and stuff. It's not like we have to resolve this, let's start drawing, it's more like maybe you should have done this... let's start drawing...it's more like getting to a point and moving on again." (D)

I found that Application occurs mostly in the second half of the crits, following on the first Negotiation episode. Like Negotiation, Application involves brief tutor responses; mainly confirmation, acknowledgement of the student's presentation, hints and occasional compliments.

I used Reflection[51] to denote the mode for building concepts, by moving the interaction from the experiential up to the discursive level. Reflection happens at various stages; before, during and after the crit. For example, it refers to the student explaining his reflective practice that led to the submitted work: reflection-on-action (the student reflecting on his submitted design) or reflection-in-action (the student or tutor reflecting on the student's work in the crit).[52] Graduate D explains how the live online crit helps the student reflect after the crit:

"while you were critting there weren't necessarily answers yet to the questions [...] and then you can actually go think about it, okay, I'll try this, and you can reflect again about it" (D)

C2 reports on his reflective practice in preparation of the crit (reflecting on practice):

"After I finished building the model and looked at it I thought it would have been an interesting idea to vary those heights because I am playing with the horizontal elements of the ground level itself, but I hadn't thought about that further in the sheltered areas." (C2, Crit 2, turn 39),

And reflecting on feedback:

"Those sheltered areas are open at the back, so you can actually stand here and look up at the mountain like that. [student's markings in red] So you look through the sheltered area at the mountain as well. So, it almost frames the view for you." (C2, Crit 2, turn 43)

T1 models *Reflection* by demonstrating it on the student's work:

"But also along the sides that you're creating [tutor's markings in yellow – drawing from the top downwards] – you know not just necessarily a single route but that it kind of splays out and invites you in or squeezes you out, depending on how you're moving through. [tutor's markings in yellow] So I think that you know that kind of edge treatment as well is also starting to make spaces that engage across rather than it just being purely an edge that wraps the building." (T1, Crit 2, turn 47)

Conclusion

The four modes of interaction derived from the literature (see table 1), namely *Negotiation, Exploration, Application and Reflection* (NEAR) were found in the focus group interview and observed in the three crit protocols.

All three crits displayed the modes of Negotiation and Application and for both, the student dominated. The tutor's role was limited to brief inputs, prompting for clarification and explanation, hinting, questioning and occasionally complimenting. Most of the on-screen drawing activities in these modes were performed by the student. These findings correspond with the recent graduates' description of the live online crit as formal and 'like a presentation.' It can therefore be expected that the live online crit supports presentation and articulation skills specifically. Negotiation was concentrated in the first half and Application in the second half of the respective crits. This supports the general pattern of the crit conversation as starting with the abstract and theoretical and ending with the concrete and practical aspects of the discourse. An exception is Crit 2 where these two modes occur, alternating, throughout the crit.

The tutor's role features more prominently in the Exploration and Reflection modes, relying on on-screen drawing for modelling. Exploration is associated with the testing of ideas and Reflection with the building of concepts. Exploration and Reflection often occur together, alternating in phases. In Crit 1 this occurs in episodes h and j; in Crit 3 in episodes e and f, and in Crit 2 these alternating modes occur more frequently, in episodes c, e, f, g, i, j. These modes (Exploration and Reflection) are often accompanied by active on-screen pointing and marking, by both the student and the tutor, except that, of the three students, only C2 performs Reflection in the crit. In the light of Lauillard's[53] suggestion that students need to constantly move from the concrete to the abstract and back again, it might be concluded that these episodes provide the key learning interactions.

Based on who initiates the change in conversational level (from discursive to experiential and vice versa), in other words who initiates Exploration and Reflection, it appears that the tutors lead Crit 1 and the student lead Crit 2. Crit 3 shows a more equal distribution of the initiation of 'up' and 'down' interactions. Various reasons may be ascribed to the difference in crit pattern of Crit 2 compared to Crits 1 and 3 and exploring this question requires further research. However, since the dominance of the use of physical models by C2 is the only obvious difference, this might be a reason. Not only did the prominence of physical models help the student continuously reflect on his own practice, but it seems to have helped navigate the conversation more equally between the concrete and the abstract; the practical and theoretical.

Analysing crit protocols according to NEAR modes of interaction, *Negotiation, Exploration, Application* and *Reflection* revealed valuable patterns and themes to broaden our understanding of the student-tutor interaction in the live online crit. However, the findings of this study are not generalisable. The sample is too small and the context too specific and further research is therefore needed, to uncover different crit patterns and behaviours. Such research may include studying crits of varying duration, at different project stages, based on projects ranging in complexity, focusing on tutors with different tutoring strategies and students at different levels of design expertise. I hope that the method of visualisation developed in this study and the initial conclusions, will be developed through future research to further explore the complex practice of the architectural design crit in all its forms, and to address the challenges presented.

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