DISCURSIVE STRUCTURES OF INFORMAL CRITIQUE IN AN HCI DESIGN STUDIO

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ABSTRACT

Critique has long been considered a benchmark of design education and practice, both as a way to elicit feedback about design artifacts in the process of production and as a high-stakes assessment tool in academia. In this study, I investigate a specific form of critique between peers that emerges organically in the design studio apart from coursework or guidance of a professor. Based on intensive interviews and observations, this informal peer critique appears to elicit the design judgment of the individual designer in explicit ways, encouraging peers to follow new paths in their design process, while also verbalizing often-implicit design decisions that have already been made. Implications for future research in academic and professional practice are considered.

INTRODUCTION

Critique is considered to be at the centre of design practice, both in the education of a designer and in formal design practice (Anthony 1991; Schön 1985; Schön 1987). Informal methods and communities for facilitating critique have arisen in recent years (Xu & Bailey 2012; Xu & Bailey 2011) to support a more dynamic, on-demand critique culture, although latent features of critique culture are already a part of many professional design organizations, often driven by clients or stakeholders (Morton & O'Brien 2006). Insofar as education in the design studio and professional practice share a common set of cultural practices in a given discipline (Brandt et al. 2011), understanding the role of critique in the studio is critical to recognizing the place of critique-like behaviours in professional design practice.

Despite the current recognition of critique as an important method for evaluating the progress of an individual design student or interrogating a design artefact more deeply, the behaviours and discourse surrounding this critique process is not well understood. Heretofore, study of these phenomena have focused on common implementations of critique as features of the pedagogy (Anthony 1991; Shaffer 2003), but has not focused on the effect of these pedagogical features on the development of design thinking of the individual design student. Design educators have long recognized the importance of engaging design students in realistic practice, with the ultimate goal of moving them towards patterns of expert design thinking and judgment (Cross 2007; Dannels et al. 2008; Harrison et al. 2006; Lawson & Dorst 2009). In activating this educative process, Holt (1997) notes the importance of early practice in engaging in interaction with objects of design precedent, and in understanding the relationships of those artefacts to the design task at hand. Quoting Vickers, Holt notes "judgement is made with a sense of obligation to discover the rules of rightness that apply in a particular situation" (Holt, 1997, p.114).

In this paper, I argue that a richer understanding of critique is necessary to develop alignment between the pedagogy and practice of design, by first understanding the role of explicit critique in the education of design practitioners. While critique has been reasonably well documented in formal, evaluative settings (Anthony 1991; Boling & Smith 2010; Percy 2004; Shaffer 2003), critique in informal settings is not well understood. Once the trappings of traditional, high-stakes, professor-led critique are removed, what is left when students engage in critique on a self-directed basis with their peers? Using design artefacts to promote discussion of tacit knowledge has been helpful in related contexts (Akama et al. 2007), but it is unclear whether the

experiences of practitioners in this study are directly mirrored in the design education context.

I will focus on the role of informal, peer critique in encouraging verbalization, and thus, some level of conscious awareness, of tacit design decisions, as well the guiding role of critique in considering new design directions. While previous research has addressed issues of form and function, centred around individual *desk crits* between professor and design student (Boling & Smith 2010; Hokanson 2012), or *design juries* between a design student and multiple design professors (Anthony 1991; Parnell, et al. 2012), I have chosen to focus on critique that arises organically between peers in an informal studio space. This exploratory study employs rich analysis of relatively few participants to uncover discursive elements of this form of critique that may inform future research.

The primary contribution of this exploratory study is to work toward understanding the discursive features of peer, informal critique and how these features inform verbalization of tacit design decisions. I am not evaluating the effectiveness of this critique, but rather am exploring an apparently functional element of the design studio that contributes in some way to the development of expert design practice and knowledge. To discuss the role of critique in this peer, informal sense, I will outline the primary elements of the design studio, conceptual representations of design thinking, and forms of critique that inform discussion of results from this study.

BASIC CONCEPTS OF THE STUDIO

The studio is a way for design students to "participate in the cultural practices of a discipline" in a way that "prepares students for the complexities of professional practice" (Brandt et al. 2011). The studio serves as a critical link between the education of the student and the expectations and habits of a practitioner, thereby placing the studio at the centre of educational and professional practice (Schön 1985; Shaffer 2003). Shaffer (2003) discusses a range of pedagogical and surface features that define a studio environment in the norm, concluding that it is a combination of these features that create the studio experience. Pedagogical features are aspects of the studio that are implemented as part of the course requirements and evaluation, including: reviews, desk crits, extended design problems, generative feedback, and assignments focused on different aspects of design. The studio includes a number of surface features, which are elements that support the overarching pedagogy of the studio. These include flexible hours to access the studio space, the presence of experts, provision of permanent space for individual work, availability of external reviewers, and use of variable media (Shaffer 2003). Efforts have been made in the past decade to translate the studio pedagogy from fields where it has traditionally been held as a signature pedagogy (Shulman 2005) to fields that have not traditionally been taught in the studio mode, like human-computer interaction (HCI) (Blevis et al. 2007; Brandt et al. 2008; Hundhausen et al. 2011; Reimer & Douglas 2003).

The studio where data was collected for this study operates under many of the principles of a studio as Schön and Shaffer described (Callison 2011), but exists primarily as a workspace and hub of activity for the HCI Master's program, rather than a centre of classroom instruction. No explicit individual space is afforded to the students, but because the pedagogy indicates primarily group projects, the studio space serves as a natural meeting location with numerous resources for collaboration and sketching.

Based on this conception of the studio, Schön makes use of several concepts to discuss how the judgment of an individual design student can be understood, including largely tacit patterns of reasoning, decision making, and explicit reflection. Each of these concepts will be discussed in turn.

KNOWING-IN-ACTION

Schön (1983) points to the concept of *knowing-in-action* as a critical part of design judgment, as employed by design practitioners. *Knowing-in-action* can be seen as "consisting of strategies of action, understanding of phenomena, ways of framing the problematic situations encountered in day-to-day experience," an outcome of which is "a process of continual adjustment in the service of maintaining a sense of constancy" (Schön 1985). The process of knowing-in-action reveals tacit knowledge and assumptions in the act of designing. This conception of tacit knowledge draws extensively from the work of Polanyi (1966), and describes judgments that are made without explicit verbalization.

REFLECTION-IN-ACTION

Reflection-in-action is one of the primary forms of reflection encouraged in the design studio while a problem is being actively addressed. This reflection may be somewhat conscious, especially to beginning designers, moving more and more to the tacit dimension as expertise is gained (Lawson & Dorst 2009), with the designer engaging in a "reflective conversation with the materials of the situation" (Schön 1985). This conversation elicits, often in only a pre-emergent sense, the patterns of design thinking and judgment underlying a single decision. This includes a multitude of issues that may conflict—directly or indirectly—when considering a specific, situated design, including issues of "uncertainty, uniqueness, and value-conflict" (Schön 1985).

The concept of *knowing-in-action*—a manifestation of tactic knowledge—in tandem with the implicit design judgment explained by *reflection-in-action*, functions in the studio as a method for design exploration. These conceptual frameworks for understanding the way designers think allows the pedagogy to directly support these activities, ultimately resulting in more efficient and appropriate patterns of design judgment that

characterize an expert practitioner (Lawson & Dorst 2009).

FORMS OF CRITIQUE

Based on these guiding concepts of how a designer thinks, engages with tacit knowledge, and reflects on their design decisions, it is important to see these concepts activated in some external, observable form. Critique—often manifested in *desk crits* or *pinups*—is a core part of the design studio pedagogy, and provides some form of externalized reflection and justification of design decisions (Barrett 1988; Boling & Smith 2010). These pedagogical opportunities for critique allow either individual or small-group interaction around a student's design, including conversations that encourage the kind of reflective behaviours discussed previously. Left uninspected, these forms of critique have become laden with implications of power and often function as a high-stakes assessment in the design classroom (or at least feel to design students as high-stakes). This is especially true of the formal *design jury*, where a design is presented in front of multiple design professors or experts in a process that includes a presentation and intensive questioning (Anthony 1991; Parnell et al. 2000).

PURPOSE OF STUDY

The purpose of this study is to more fully understand the pedagogical impact of peer informal critique, how it may differ from more formal methods of critique, and in what ways this form of critique results in verbalization of design thinking and judgment in a specific HCI design pedagogy.

METHODS

The methods used in this study are informed by naturalistic inquiry (Lincoln & Guba 1985) and critical theory perspectives (Carspecken 1996). I used a combination of intensive interview and observation techniques in the process of data collection. Intensive interviews were used to target beliefs and behaviours related to critique that were largely tacit in nature, while an observation of critique between study participants allowed for a more naturalistic view into the behaviours and strategies *in situ*.

Table 1. Study participants.

Participant Pseudonym	Gender	M.S. Year	Country of Origin	Critique Dyad
Paul	M	2nd	USA	A
Emily	F	2nd	USA	A
Lisa	F	1st	USA	B
Jiao	F	1st	China	B

STUDY PARTICIPANTS

Participants were solicited through a departmental listserv and a student social media group. The invitation requested that they be a current HCI Master's student, that they feel comfortable critiquing a student within their program, and that they provide a project they have previously designed (or were in the process of designing) to be critiqued. The final pool of study participants included four students, including three females and one male. The participants were evenly split between the two years of the Master's program (see Table 1).

THE RESEARCHER

Because qualitative methods were used in the data collection and analysis of this study, the role of the researcher in the chosen context is important to consider (Lincoln & Guba 1985). The researcher has performed multiple studies in this design studio, and was well known by most of the students in the Master's program at the time of data collection.

DATA COLLECTION

A series of two interviews were performed with each participant, as well as one observation of each critique dyad (see Table 1 for assignees to each dyad). Each session was approximately one hour in duration, and audio and video recordings were taken to allow for transcription and further analysis. The first interview served as an initiation to each participant's beliefs about critique, the way they used critique in their design process, and their feelings about critique activated in an auto critique of their chosen design artefact. In a separate session, an observation was performed using a constructed critique dyad of two participants of the same academic year. Each participant was asked to critique his or her partner's design artefact in turn, with no interruption from the researcher. A debrief at the end of the observation allowed the participants to share any immediate thoughts about their experience. Finally, following initial analysis of the first interview and critique dyad, a stimulated recall session was scheduled with each participant individually. This session allowed for member checking of collected data, review of initial coding schemes, and in-depth conversation about 5-6 video segments. These segments were used as either exemplars of primary themes, or where the intent or motivation of the individual was unclear. Clarifying questions were asked to triangulate meaning and ensure that the analysis of the data by the researcher matched the perceived intent of the participant.

ANALYSIS

The initial interview about the participant's belief about and practice of critique was transcribed and coded using an open coding scheme based on emergent themes. Separately, the observation of critique dyads was transcribed and coded using a one open coding scheme for the participant critiquing and another for the participant being critiqued. These two coding schemes were used consistently across all four critiques included in the two critique dyads. The resulting coding was used to develop a sequence analysis of the conversation flow

during each critique. This sequence analysis informed analysis of turn-taking behaviours, settings and sub-settings within each sequence (Carspecken 1996), and underlying discursive structures that inform these behaviours.

A fuller discussion of the behaviours, settings, and sub-settings identified during this analysis process will be provided in the following section, including important break points or setting shifts in the conversation, themes that elicited *knowing-in-action*, and instances of explicit *reflection-in-action* that revealed aspects of the design student's individual process.

FINDINGS

Based on the thematic analysis of the critique dyads, codes were created and applied. These codes were independently created from emergent data by analysing each side of the conversation—themes for the participant critiquing the artefact (the critic) and themes for the participant whose artefact was being critiqued (the recipient). These themes are provided in Table 2, with codes of similar content across each grouping placed in rows to show either a shared thematic relationship, or a "trigger" effect—where the critic code triggers another code from the recipient. Codes were applied non-exclusively to conversational units or turns.

Table 2. Codes applied to the person critiquing (critic) and the person being critiqued (the recipient).

Codes Applied to Critic	Codes Applied to Recipient
Association with User or Problem Space	Identification of Problem Space
Alternative Problem Space/Solution	
Limitations of Prototype	
Analysing Potential User Reactions	Setting New Scenario (Based on Critique)
	Support with Research
	Referencing Former Critique
Replay Prototype	Showing Off Prototype/Artefact
Worst Case Scenario	Response to Worst Case Scenario
	Potential User Scenario
Constructed Scenario	Internalizing New Perspective
Clarification (Interface)	Request for Clarification
Clarification (Idea)	
Unsure/Confused	Caught Off Guard/Explanation
	Conflicted/Personal
Drawing Parallels	Parallels to Other Projects
How to Proceed/Next Steps	Next Steps/Self Critique
Positive/Affirming	Thanks
Humour	

The critiques under analysis include four separate primary sequences—two from each critique dyad. Critique duration ranged from 16 to 25 minutes, with no substantial difference in duration between the two critique dyads. Conversational units ranged more widely, from 42 to 87 conversational "turns" during the course of the critique.

Several of the most interesting of these discursive structures, including relationships between critic and recipient codes will be further illustrated.

BEGINNING THE CRITIQUE

Each critique began with the recipient leading the conversation, moving first to a conceptual grounding of their project. While they each had a copy of their design artefact on the table in front of them, they instead chose to identify the problem space they were addressing, explaining what constraints they had set in the process, and in rough terms, how their design came to be in its current form. The recipient drew not only on a conceptual framing of the problem space, but also relied heavily on shared history with the critic, referring to projects they had completed in the past, or referencing how that project had evolved since the critic may have seen it previously in class or in the studio. Examples include:

- *Jiao: Um, this is a workbook one, definitely on the topic of um—death*
- *Emily: OK, alright. So, this is a—well you've already seen this in class, but I'll OK—this is a prototype that I made for my capstone project. Um, I am focusing on newly diagnosed HIV+ individuals and um through a lot of research, I've kind of gotten into the topic of identity development, um kind of just accepting the fact that they are HIV+…*
- *Lisa: You probably know a lot about Anchor already. Um it is a tablet application that links sailors and their loved ones um during deployment. So during deployment when there are times when there's little communication, um it pulls media from a locked box—things they have prepared for deployment, um synthesizes a new message, even if there's no data connection.*
- *Paul: Nice, um cool. So, this project um was basically a project that we were trying to um find a way to help soldiers returning from Iraq and Afghanistan cope with instances of moral injury that they had suffered while deployed…*

After introducing and explaining the problem space, the recipients moved more directly and physically to their prototype. The prototype was used to ground a discussion of the potential user, common task flows, or primary features of the artefact. These explanations of the prototype tended to continue until the critic inserted himself or herself into the critique, most frequently with a clarification of the prototype or user/problem space. This constitutes the most stable setting shift—from design explanation by the recipient to a critique of the design artefact by both participants.

MAJOR SETTING SHIFTS

Settings are an agreed upon direction of conversation, shared implicitly and tacitly consented to between the conversation participants (Carspecken 1996). A setting includes "a tacit specification of the basic purposes of the interaction, its rhythm, and the tacit agreement on associated values, norms, and/or beliefs." (Carspecken 1996, 116). Within this discursive context, settings can shift over time if both participants agree, again implicitly, to this shift. Setting bids are the actions by either participant to change the direction of the conversation, and these bids can be either accepted or rejected based on how the opposing participant responds, either verbally or using paralinguistic signals (Carspecken 1996).

These settings and bids are especially important to consider in an active discursive setting like critique, where bids continually reframe the conversation around areas of critique that are perceived to be mutually beneficial or profitable. In the analysis of these four critiques, all of the themes listed under each section could potentially serve as setting bids, but three in particular seem to change the direction of the conversation most significantly. The "limitations of prototype" and "worst case scenario" codes from the critic, and the "internalizing new perspective" from the critique recipient seemed most indicative of a major setting shift, frequently chaining together, requiring deep introspection on the part of the recipient either in verbalizing past design judgments, or in imagining new design possibilities.

LIMITATIONS OF PROTOTYPE

When limitations of the prototype under discussion emerged in the critique, almost invariably it prompted a deeper explication of assumptions and design decisions. In this example, Jiao is critiquing Lisa's artefact, and brings up a potential American bias to their design. Lisa is prompted to explain their rationale, revealing a richer explanation of their (yet unstated) target user group, and other options they considered early in the design process.

> *Jiao: But I'm not sure, and uh I was curious where you guys are only designing for American [inaudible]?*
>
> *Lisa: Um, well we designed this thinking about um, well—we—we made our target user people on deployment in the Navy or people on ships. Um and so this—I think this could be expanded to other military branches.*
>
> *Lisa: It doesn't have to be the US, and also like people like migrant workers, where one of the first people who like popped into our head for ways to expand this. Um, so I don't think it—it's tied to an American population. I mean, that's what we chose to be our—our starting point. But you can definitely—*

WORST CASE SCENARIO

Playing the "devil's advocate" in the context of critique frequently surfaced important design considerations, either through a change of perspective (often coupled with potential user reactions or a new scenario) or a question regarding technical functionality. In the conversation segment related below, Paul is probing Emily's project on HIV/AIDS disclosure for potentially damaging use cases:

> *Paul: It might be a newer maybe newly diagnosed, it might be kind of jarring to like hear these stories of like, of people who've been having troubles as opposed to stories of people who have been living with it for a long time or people who've had like successful shared stories—*
>
> *Emily: Yeah*
>
> *Paul: Versus like, oh crap, that was awful or something.*
>
> *Emily: Yeah, well, you know, that's definitely one of the, I think one of the biggest problems with this is that it has potential to have really negative outcomes, too, because you know, if I am a African American gay male and I see the story of another African American gay male who was disclosing his status to his mother, and his mother you know called him a fag or something, and like you know, and—and he's like, you know, is this going to happen to me? So I—that's definitely something—[laughs]*

These instances of "worst case scenarios" often resulted in limitations of the prototype being surfaced, or the re-evaluation of the problem space or target user. Thus, the worst case scenario activated evaluation and support through research, or a projected change in the prototype to address this new scenario.

INTERNALIZING NEW PERSPECTIVES

Three out of four critique recipients invoked this code, which describes some outward sign that they are considering a new scenario, user type, issue with their prototype, or other perspective. This consideration is often coupled with active listening or a sense that the recipient is proactively testing this new information against their design concept. In the following segment, Paul is advocating that an online community for

supporting individuals disclosing their HIV/AIDS status has similarities to support groups:

> *Paul: It feels like communicating the idea is kind of the same thing.*
>
> *Emily: Yeah, and this is kind of more like if you need support you have to ask for it rather than like—*
>
> *Paul: Yeah*
>
> *Emily: What you said with like going there and seeing like, this support is being offered.*

Emily seems to take this potential perspective and incorporate it into her design "conversation," considering what effect it may have on her prototype. Following this brief consideration, Emily more explicitly referenced research as it related to her problem space, externalizing design decisions that had been unclear to this point.

ENDING THE CRITIQUE

While the recipient readily began each critique, the features of the discourse that ended the critique were less decisive. The critic had the last conversational turn in each critique, but the content of this turn varied—ranging from reiteration of the next steps in the design process, externalized thoughts of whether they had anything else to add, or bland positive encouragement to the recipient. Examples included:

- *Lisa: And you could cremate the person and put them in their real tree! [laughs] They would grow in it. Oh. Somebody posted on Facebook this thing where like you get cremated and then it's essentially like, I don't know, like a Chia pet for creation, and like you can—you can grow out of a tree or something.*
- *Jiao: Out of the tree [laughs]. How could it? We almost done—*
- *Paul: Not really, I mean—anxious to see where it goes.*
- *Emily: Me too! [laughs] Awesome, thank you.*

Because the participants in the critique dyad had some form of prior relationship through their coursework and interaction in the studio space, this seemed to bring more humanity to the end of the critique. While the central portion of all four critiques was quite focused and professional, each critique ended with more absurd notions (e.g., a memory tree for terminally ill patients being a real tree) or anticipation and support for the next steps in the design process. The central portion of the critique seemed in character with a professor-led *desk crit*, both in content and style of inquiry (often serving to externalize *reflection-on-action*), but the character of each critique by the end was more directly supportive of the informal, peer nature of the critique.

FLOW OF CONVERSATION

The critique sessions generally began with longer conversational turns, as the problem space was identified and the prototype was introduced. The discursive space appeared to become more informal over time, resulting in shorter conversational turns, and a rapid-fire approach emerged where it was unclear which participant was the original designer and which was the critic of the design. In this way, the design conversation turned to collaboration in a couple of instances, which seemed to be supported by the participants' recalled past experiences of informal critique in the studio.

DISCUSSION

The settings and shifts that were observed to structure the discourse of these peer, informal critiques fit within Polyani's (1966) assumptions about tacit knowledge and Schön's (1987) conceptualization of how this tacit knowledge may be externalized in the design process. While these generalizations about externalizing design thinking are helpful in framing the conversation, each design discipline brings with it different mechanisms, methods, and tools to actually verbalize important information.

In this set of critiques carried out within the HCI discipline, the critic encouraged verbalization from the recipient by using several key frameworks germane to features of designed artefacts in this field. These included: framing the problem space, projecting user reactions, constructing potential use scenarios, and "playing through" prototypes. Each of these tactics or strategies seemed to bridge the explicit critique context with underlying realities of designing interactions or experiences, recognizing the role of user groups, defining the problem, supporting research, and use patterns of the final design artefact. Each of these frameworks is discussed further, with additional detail around how *knowing-in-action* and *reflection-in-action* were activated in a productive way.

FRAMING THE PROBLEM SPACE

By defining the problem space early in the discussion—which is encouraged by the pedagogy of this specific Master's program as an epistemological feature of the studio (Shaffer 2003)—alignment is achieved between the critique participants early on in the conversation. This problem space serves to contextualize the prototype walkthrough, potential user concerns, or other clarifying comments. In addition, problem framing was used throughout the critiques by both the critic and recipient as a device or structure for changing perspectives or imagining different design possibilities. Making explicit alterations to the design landscape like re-framing the problem required active *knowing-in-action* to understand the change and translate existing design decisions into new design judgments. In the first example, the problem space is framed in isolation, while in the second example, the problem space serves as an

opportunity to discuss supporting research that advised the recipient on past design decisions.

- *Jiao: Yeah, and you know the topic then um we sort of call—have three or four two interviews with our participant who are [name redacted] and—and [name redacted]. They all lost their um relatives, especially for [name redacted]. [name redacted] lost her father um two years ago and it's really painful for her, but that's sort of a journey that we kind of—we don't know much, because um of course we lost our um relatives or our friends, um so our topic was um how to—how to help people who lost their loved one in terms of terminal illness.*
- *Paul: …and especially um, I feel like a support group uh along the lines of Alcoholics Anonymous or something like that. Like the one thing that kind of charac—characterizes it is the like regularity of the meetings, but also accountability?*

PROJECTING USER REACTIONS

Participants often invoked a persona or generic identity to investigate the experience of the design artefact they were critiquing. In many cases, this sense of what a user *might* do or think was a way to find holes in the design, or explore segments of the design rationale that had not been fully considered or explored. This tactic was also used to actively support *reflection-in-action* on the part of the recipient—almost forcing verbalization of design decisions, which may have been tacit up to that point. In this example, Lisa asks a series of clarifying questions about the prototype to understand what the user experience would be like. In doing so, she improves her understanding of the design artefact, while encouraging explicit *reflection-in-action* on the part of Jiao—forcing Jiao to make these critical decisions, even if they had not been made heretofore.

> *Lisa: OK, can the family members see what the terminally ill person is saying, or?*
>
> *Jiao: Yes, they can, but also, everyone who are going to post, they can select whether it is private or public.*
>
> *Lisa: Whenever it's private, does that become public after you die?*
>
> *Jiao: Um, I don't think so.*

POTENTIAL SCENARIOS OF USE

Scenarios, or imagined walkthroughs of the use of an artefact, were used quite frequently as a device for visualizing the user experience. This method was highly effective for exploring tacit knowledge through *knowing-in-action*—framing new situations, contexts, and users in ways that were productive in generative ways to the overall design conversation. This technique was often linked with a re-framing of the problem space or projecting user reactions, but in a more explicit, tangible explanation of how a scenario might play out.

In this first segment, Paul is discussing how training about post-traumatic stress disorder (PTSD) during troop re-integration may allow them closer access to resources that can help them cope. Emily has already set this conversation in motion, and is supportive as Paul works through the details of whether this scenario is important to the overall design problem he is attempting to address.

> *Paul: You are, this is an emotional subject—[joking] but I think that might be the thing that—that it would offer is not necessarily like the end all be all solution of like getting these soldiers to tell their stories. Sometimes it might just be that knowledge that there's something out there that people are coping with this.*
>
> *Emily: Yeah*
>
> *Paul: Um, whereas for other people it would be that sense of I—I need to like get assistance with this, and I need to tell somebody, because maybe I can't tell it to anybody here. So what's—*
>
> *Emily: Right*
>
> *Paul: I just need to put it out there.*
>
> *Emily: Yeah. So it does kind of—the motivation does have to be kind of (.) self made—*
>
> *Paul: Yeah, yeah*

In this second segment, Lisa is discussing how her concept could conceivably be used on more devices than just an iPad. This conversation began when Jiao asked about an alternative problem space beyond the iPad, prompting additional reflection from Lisa on how this might work.

> *Lisa: I think it would be easy to make this something that could go across multiple platforms. And like, that's a good idea, because I mean especially the people at home, like I think it's more logical for it to be on a tablet for somebody on the plane—*
>
> *Jiao: Right*
>
> *Lisa: On a ship, but at home. But I don't know, I think you're more likely to have your phone taking pictures of things—*
>
> *Jiao: Right*
>
> *Lisa: You want to send back or like using a laptop, so yeah, we could—I think having it go across multiple platforms wouldn't be that difficult. Like—*

LIMITATIONS OF THIS STUDY

This study is based on relatively small sample of students within a specific design discipline. Results from this study cannot be generalized to students in other design disciplines, or even future cohorts of this specific design program. Future studies are necessary to evaluate the applicability of these discursive structures

in other educational contexts, especially in design disciplines where a culture of formal critique is more substantially implemented in the pedagogy.

The nature of the researcher-paired dyads and self-selection of design artefacts also limits the applicability of results in a studio environment. While dyads were selected within a single design program and the critiques were carried out in a portion of the design studio space, a fully naturalistic view of interactions without researcher involvement was not captured in this study. Additional research is needed to determine how students interact and critique in a studio environment without formal structures imposed by a researcher. Critique embedded in interactions between peers while collaborating on a shared design project may also indicate different discursive structures than those found in this study.

IMPLICATIONS FOR FUTURE RESEARCH

Based on the findings in this study, future research is needed to solidify the mechanisms of informal critique—both in design education and practice. In viewing critique outside of the lens of formal academic evaluation, the importance of documenting design conversations and the way these conversations affect the on-going iteration and development of artefacts can be seen as a significant issue in education and practice.

Within education—particularly in the context of HCI design—greater attention to the informal structures of critique could serve as a less high-stakes form of evaluation, while also fostering a sense of practice community on which the studio is based. The strategies and frameworks used to critique are also vitally important, as they seem to draw equally on foundational design methods/techniques (e.g., scenarios, personas, prototype walkthroughs) and major concepts in design thinking (e.g., problem space, user research). Additional research is needed in each of these areas to understand the space of critique in education, as well as the tools and frameworks needed to explore this space in the act of critique.

There are also significant research implications for the practice of interaction design, as professional practice is judged on the ability to communicate the purpose and use of a design (Morton & O'Brien 2006). Based on this exploratory research on informal critique in a design studio, parallels can be drawn between the cultural practices of the studio and professional practice in the communication of design ideas. Research is needed within practice communities to understand how design knowledge is communicated, critiqued, and changed, and how the tacit knowledge invoked in these situations is activated and made explicit.

CONCLUSION

I propose that this study into informal, peer critique is an avenue to understanding the communication of tacit design knowledge in a broader sense. Lawson & Dorst (2009) note that as higher levels of expertise are attained as a designer, many design decisions move from the explicit to tacit dimension—from externalized to internalized. As such, studying design students closer to the level of beginning designer, or students in transitional stages of design expertise may provide valuable insights on design thinking, and greater access to tacit design knowledge (Lawson & Dorst 2009).

One of the most important contributions from this study is a more explicit understanding of how designers—or practitioners in training—talk through their design decisions and consider or investigate potential avenues for change. As Schön envisioned design thinking as a conversation with the design artefact—*reflection-in-action*—understanding the explicit dimensions of design thinking, and externalizing more tacit knowledge and decisions may serve to improve current and future design practice. A more complete investigation of *knowing-in-action*, and how the externalization of tacit knowledge can be encouraged, is an important line of research, and this study proposes some beginning frameworks for observing and understanding how this externalization may occur.

This study also implies a need for more research on how critique can reveal patterns of implicit design judgment. Because there is a strong divide in academia between formal critique (which has been studied extensively) and informal critique (which has not been studied explicitly), recognition of what constitutes this divide in terms of content and outcomes is an important next step. In addition, this study suggests parallels to design practice. Informal critique may be closely matched by water cooler talk or organic conversations in the design space, while formal critique could include high-stakes client or stakeholder pitches.

Ultimately, greater awareness of how tacit knowledge is productively externalized and shared with others will result in more efficient communication between designers. This awareness also leads to a greater reflective quality around communication of design issues, increasing the verbalization of key issues at stake for designers and non-designers alike.

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