A Tale of Two Design Contexts: Quantitative and Qualitative Explorations of Student-Instructor Interactions Amidst Ambiguity

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Abstract: Designers develop design skills and knowledge through experience and feedback – feedback from colleagues, clients, supervisors, users, stakeholders, the success or failure of a solution, and design educators. In this project, we focus on the feedback provided to mechanical engineering students completing their undergraduate studies and industrial design graduate students during design reviews. The design coaches (educators and industry clients) and design students must negotiate ambiguity in the process. The students must reduce ambiguity in the sense of providing clear details as they communicate their design work, reduce ambiguity in the coaches’ perceptions of the design work quality by providing evidence and rationales for their design approaches. However, they also maintain ambiguity in the sense of not converging on an idea too quickly in the design process, but instead considering many possibilities. We investigate the different forms of feedback provided by coaches, students’ responses to the feedback, and the ways the students and coaches navigate ambiguity. Finally, we characterize differences between the two environments in terms of the types of feedback given and students’ responses to the feedback.

Keywords: feedback, ambiguity, language, argumentation, evidence, style/approach

1. Theoretical Grounding

Students are able to develop their conceptual understandings and improve their skills when they receive feedback on their understanding and execution of skills. This feedback may occur when something does or does not work (e.g., a cake that does not rise; a kick that leads to a goal), a score on a test or assignment, through a written critique, or a conversation between a student and an educator. Typically feedback is most effective when it is provided quickly, when it is specific, and when it identifies opportunities for improvement (rather than praise for what is done well). Previous research (Diefes-Dux, Zawojewski, Hjalmarsone, & Cardella, 2012) has investigated the
different forms of feedback that instructors, as well as student peers, provide to students on open-ended mathematical modeling work, and how students respond to this feedback. The work presented in this paper builds on this prior work by considering that feedback can be positive, neutral or negative; general or specific to student work; and direct (i.e., telling students exactly what needs to be done) or guiding (i.e., posing questions to prompt students to realize what should be done to improve their work) (Collins, Brown, & Holum, 1991). Furthermore, we consider this feedback within two common genres of design feedback: the design critique and the design review.

Literature suggests that design critiques and design reviews have different foci and purposes. Sater-Black and Iversen (1994) state, “Traditionally, several design reviews are included in the design process. These reviews, performed by cross-functional groups of people, are a central activity in the design approval process; they assess the quality of the design.” In their identification of “best-practices” of US Navy contractors, Simonson, Dooley, and Anderson (1994) described design reviews very similarly: “Design reviews are usually performed with personnel from different multi-disciplinary functions with the purpose of verifying the status of a design.” Design reviews have been described in much the same way in more recent literature. For instance, Huet, Culley, McMahon, and Fortin (2007) argue that “Engineering design reviews, which take place at predetermined phases of the product development process, are fundamental elements for the evaluation and control of engineering activities.” However, Huet et al. (2007) also describe the information sharing purpose of design reviews, noting, “the knowledge generated during a design review is not as secondary as it may seem; key design decisions, design experiences, and associated rationale are frequently made explicit.” Finally, they note that the emphasis on the managing and evaluating functions of the review shift during the design process.

However, the design critique context appears to emphasize both the ability of the feedback to inform the design, as well as socialization of students into the discipline. In their paper describing a theoretical framework of design critiques, Oh, Ishizaki, Gross, and Do (2013) state that learning the design studio context takes place “[t]hrough the processes of working on and presenting their work (often publicly) and receiving feedback from the instructor and classmates, students reflect on and revise their designs.” Furthermore, Murphy, Ivarsson, & Lymer (2012) describe a formal presentation of architectural finished product to professors, fellow students and practicing architects as “a primary site for socializing students into the world of architecture as professional practice.”

These characterizations of design reviews and critiques align with a comparison by Connor (2014) of the two design genres: “Design reviews tend to be used as a means of getting everyone’s ok in order to move on to some next step in the process….Critique on the other hand is not about approval at all, it is always about improvement. The conversations that take place during a critique are not about reaching some point where it’s ok to do something else, they are about the goals and principles you’ve set out to accomplish and how well your designs address them.” These two genres of design feedback—namely, review and critique—provide different contexts in which to explore instructor and student interaction.
As educators provide guiding feedback within these contexts that does not explicitly prompt students to make a specific change to their work, ambiguity is introduced (Bradac, 2001). Students have the opportunity to interpret and make sense of the feedback in a number of ways. The ambiguity in instructors’ feedback coupled with the students’ feedback receptivity can give students freedom to consider new possibilities that the educator had not envisioned – but can also lead to student confusion or mistakes. Likewise, as students present their design work to their coaches (their instructors, teaching assistants, industry partners, and other coaches), they introduce ambiguity when they fail to describe the bigger picture (including the project background), forget to present pertinent details, do not provide rationales for their approaches, or otherwise leave things open to interpretation. As students are able to provide sound arguments for their work, or dispel ambiguity in their work, they provide information that can enable their coaches to provide feedback that aligns well with the work they have done. However, some researchers would argue that some ambiguity can be productive – in some cases, as there is some ambiguity in the students’ work, this may lead to more divergent feedback in defining and framing the problem as well as considering diverse solutions (Crismond & Adams, 2012).

This work builds on the long history of prior research investigating the role of ambiguity in design (Barley, Leonardi, & Bailey, 2012; Cardella & Lande, 2007; Constant, 1996; Stacey & Eckert, 2003), but from a specific focus of understanding design education settings as settings where ambiguity is inherent in the setting and the design (education) process. In these settings students are (a) still developing their design skills (and may be overwhelmed by ambiguity), (b) communicating with a coach who has much more familiarity with design, and (c) working to convince someone with “grade power” and other influence over them. Moreover, they may be working with someone, such as instructors who may guide the students towards several possible outcomes such as (a) reducing or eliminating ambiguity, (b) preserving or maintaining the current level of ambiguity, or (c) increasing ambiguity (e.g., through exploring new options beyond those currently under consideration). We also consider the ways that students and educators navigate the ambiguity in the design reviews through the communication-as-constitutive theory (Cooren, Kuhn, Cornelissen, & Clark, 2011) where the design reviews are an ongoing process of meaning making that is negotiated through linguistic choices, identities, and interaction.

1. Research Questions

The proposed research aims to investigate two primary questions related to the different forms of feedback that instructors from different disciplinary heritages provide and the role that ambiguity plays in design reviews:

- What kinds of approaches to giving feedback do instructors give on design work, and how do students respond to that feedback?
- How do instructors negotiate ambiguity in this process?

As we address these research questions, we operationalize ambiguity very broadly: we use ambiguity to consider moments where there is lack of certainty, lack of clarity, and lack of decision, where the ambiguity may stem from information that is unknown, imprecise communication between people, design decisions that have not been made yet, as well as futures that are unknown. Additionally, we consider that the site and source of ambiguity shifts moment
by moment. Ambiguity is an agent both for the instructor and the student, where the instructor uncovers ambiguity purposefully and the student responds in different ways.

This paper is structured to present quantitative and qualitative analyses that are complementary to each other. The quantitative analysis includes coding transcript data deductively and inductively and frequency counts of the codes. From the quantitative analysis, we make four claims to compare and contrast two different contexts of feedback between instructors and students. The qualitative analysis expands on the coding scheme by digging deeply into one segment of the transcript. This qualitative analysis supports the claims from the quantitative analysis and raises additional insights.

2. Approach

To investigate these questions, we examined the video recordings, transcripts and artifacts for 3 groups of Mechanical Engineering students and 5 Industrial Design graduate students from the DTRS10 dataset (Adams & Siddiqui, 2013). We selected these groups to examine the possible differences in approaches to giving feedback and responses to feedback that might emerge in two different design contexts; our choices were particularly informed by the literature suggesting that the environment and approach of an engineering design review is very different from the environment and approach of an industrial design critique (see Purzer, Fila, & Dick, 2014). For the Mechanical Engineering students, we focused our analysis on the conceptual design review data, a design review. For the Industrial Design graduate students, we focused our analysis on the Concept Review data, a design critique. We selected these cases in order to examine design reviews/critiques at a point in the students’ process where the design was still evolving – where there was still ample room for the students to change their designs based on the feedback they received.

We first analyzed all eight video recordings and transcripts using a Verbal Analysis approach, primarily to answer our first research question as well as to identify the larger patterns across the Mechanical Engineering design reviews and the patterns across the Industrial Design reviews. We also analyzed a subset of this data (one Industrial Design and one Mechanical Engineering review) from an analytical lens informed by the Communicative Constitution of Organizations (CCO) perspective (Putnam & Nicotera, 2009; Robichaud & Cooren, 2011) in order to develop a richer account for the type of feedback given and the types of responses that students exhibited, as well as to examine the way that ambiguity played a role in the design conversations. In this section we first present more details about the Verbal Analysis as well as our findings from the Verbal Analysis, and then present more details about the analysis grounded in the CCO perspective and the findings from that analysis.

3. Verbal Analysis

We first analyzed the eight transcripts (three from Mechanical Engineering during the Conceptual Design Review phase and the eight from Industrial Design during the Concept Review phase) using a Verbal Analysis approach (Chi, 1997) in order to (a) characterize the types of feedback that were given by each of the two instructors and (b) characterize the types of responses given by the students. Verbal Analysis has been used previously in design thinking...
research (e.g., Cardella & Lande, 2007), and it bears similarities to Verbal Protocol Analysis (Ericsson, 1992), which has also been used commonly within the design thinking community (Atman & Bursic, 1998; Cross, Christiaans & Dorst 1996). A key distinction between the two approaches is that Verbal Protocol Analysis is used to analyze protocols collected from research participants who were asked to think aloud, while Verbal Analysis is applied to conversations amongst multiple people. In each case, audio recordings are transcribed, transcripts are segmented, segments are coded, and the coded segments are used to identify patterns. Typically quantitative analyses are conducted to determine amounts or percentages of time/ of segments associated with each code. In our analysis, each sentence within the transcript was treated as a segment, and each segment was coded by at least one coder. Once coding was completed, we calculated percentages for each transcript in order to investigate patterns in the two different classroom environments that were created by the instructors. Our analysis suggests that there were distinct patterns in terms of the way feedback was given in the two different classroom environments, and that the students’ responses also followed two different patterns – there was a unique pattern of student response in each classroom environment.

3.1. Coding Frameworks

Data were analyzed using two different coding frameworks: one for the instructors or people conducting the review, and a separate coding scheme for the student responses. The following details our iterative process for determining the coding schemes for our data, developed through cycles of applying existing coding schemes, reflecting on how the existing coding scheme fit this dataset, and at types developing new codes (which emerged from the data).

Drawing from our previous experience, two team members first applied Marbouti, Cardella, and Diefes-Dux’s (2014) feedback framework to review the ID-G-2-Mylie and the ME-Cap-FDR transcripts. However, Marbouti et al.’s coding scheme was developed to be used to characterize written student feedback to each other on design projects in a course, so the applicability to this context was limited by itself. In particular, the “Level of Specificity” codes did not characterize the different approaches that were identified in the data (see Table 1). After discussing these concerns with two other members of the research team, the two coders then explored additional coding options.
Table 1. Marbouti, Cardella, & Diefes-Dux’s framework for analyzing feedback on design work  
(From Marbouti, Cardella, & Diefes-Dux, 2014)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance</td>
<td>Communication</td>
<td>Feedback refers to writing or presentation of the design work.</td>
</tr>
<tr>
<td></td>
<td>Design concepts</td>
<td>Feedback explicitly refers to one of the design concepts taught in class by</td>
</tr>
<tr>
<td></td>
<td></td>
<td>using terminology taught in class.</td>
</tr>
<tr>
<td></td>
<td>Design ideas</td>
<td>Feedback refers to design ideas specific to this team’s project work, using</td>
</tr>
<tr>
<td></td>
<td></td>
<td>terminology that is specific to the problem this team chose to work on.</td>
</tr>
<tr>
<td></td>
<td>No code</td>
<td>Does not fit in any of the above codes.</td>
</tr>
<tr>
<td>Level of Specificity</td>
<td>Generic</td>
<td>Feedback refers to the whole design work without any focus described in the first domain.</td>
</tr>
<tr>
<td>Focus of Feedback</td>
<td>Strengths</td>
<td>Feedback refers to strengths of the design work or complementing the team or design work, and does not imply change.</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>Feedback states a fact without any explicit evaluation of work or need for change.</td>
</tr>
<tr>
<td></td>
<td>Weaknesses</td>
<td>Feedback refers to weaknesses of the design work or implies the design work needs to be changed.</td>
</tr>
</tbody>
</table>

To capture aspects of the critique, the two coders next applied the feedback typology coding developed by Dannels and Martin (2008) to characterize the nature of feedback in design critiques. This typology consisted of nine different categories as described below (pp. 143-147):

- **Judgment**: when critics reacted to what they saw and rendered some assessment of its quality
- **Process oriented**: when critics made statements or asked questions about the student’s design approach or process as process-oriented feedback
- **Brainstorming**: when critics essentially asked questions or made statements about future imagined possibilities for the design
- **Interpretation**: when critics reacted to what they saw and tried to make sense of the concept or product
- **Direct recommendation**: when critics gave specific advice about a particular aspect of design
- **Investigation**: when critics requested information
- **Free association**: when critics made reactive, associative statements about the design
- **Comparison**: when critics contrasted the design or design process with something else
- **Identity invoking**: when critics made statements or asked questions to suggest that students consider the larger picture of themselves as designers in a future professional community

This typology was applied to both the ME-Cap-FDR and ID-G-2-Mylie and compared to Marbouti et al.’s feedback coding scheme. The two coders shared the results of their coding process and their comparison of the two coding schemes with two other members of the research team, and the team considered how the two different typologies could be integrated. The merged coding scheme that was used to examine the feedback provided by the instructor (or other students) is presented in Table 2.
Table 2. Our coding framework for analyzing feedback on student work (based on (Marbhouti et al., 2014) and (Dannels & Martin, 2008)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Form</td>
<td>Answers the question “what is it?” typically a noun and could be an analogy to describe the feature</td>
</tr>
<tr>
<td>Focus</td>
<td>Function</td>
<td>Answers the question “will it work”. Can typically be identified by verbs. Could also be identified by calculations and feasibility</td>
</tr>
<tr>
<td>Focus</td>
<td>Representation</td>
<td>Feedback refers to writing and presentation of the design work</td>
</tr>
<tr>
<td>Focus</td>
<td>No Code</td>
<td>Does not fit in any of the above sub-categories</td>
</tr>
<tr>
<td>Type</td>
<td>Judgment</td>
<td>when critics reacted to what they saw and rendered some assessment of its quality</td>
</tr>
<tr>
<td>Type</td>
<td>Process Oriented</td>
<td>when critics made statements or asked questions about the student’s design approach or process as process-oriented feedback</td>
</tr>
<tr>
<td>Type</td>
<td>Brainstorming</td>
<td>when critics essentially asked questions or made statements about future imagined possibilities for the design</td>
</tr>
<tr>
<td>Type</td>
<td>Interpretation</td>
<td>when critics reacted to what they saw and tried to make sense of the concept or product</td>
</tr>
<tr>
<td>Type</td>
<td>Direct Recommendation – Visual</td>
<td>when critics gave specific advice about a particular aspect of design using sketching or other visual means</td>
</tr>
<tr>
<td>Type</td>
<td>Direct Recommendation – Verbal</td>
<td>when critics gave specific advice about a particular aspect of design verbally</td>
</tr>
<tr>
<td>Type</td>
<td>Investigation</td>
<td>when critics requested information</td>
</tr>
<tr>
<td>Type</td>
<td>Free Association</td>
<td>when critics made reactive, associative statements about the design</td>
</tr>
<tr>
<td>Type</td>
<td>Comparison</td>
<td>when critics contrasted the design or design process with something else</td>
</tr>
<tr>
<td>Type</td>
<td>Identity Invoking</td>
<td>when critics made statements or asked questions to suggest that students consider the larger picture of themselves as designers in a future professional community</td>
</tr>
<tr>
<td>Tone</td>
<td>Positive</td>
<td>Praise and no suggestion for change. Feedback complimenting the team or design work</td>
</tr>
<tr>
<td>Tone</td>
<td>Neutral</td>
<td>Feedback states a fact without any explicit evaluation of work or need for change.</td>
</tr>
<tr>
<td>Tone</td>
<td>Negative</td>
<td>Feedback implies the design work needs to be changed</td>
</tr>
</tbody>
</table>

When merging the coding frameworks, we considered whether “Process” should fit under “Type” or under “Focus”, and decided to include it under “Type” (to an extent, “Process” is similar to “Design Concept” from the Marbouti et al., 2014, framework).

We also considered whether the feedback “Type” codes were approaches for negotiating ambiguity. At the time of this paper, we decided to focus on the forms of feedback that were provided without coding for source of or response to ambiguity. We assume that ambiguity is inherent wherever there is an interaction between the person providing feedback and the person responding to the feedback. Through the CCO analysis in the next section of the paper, we examine the role of ambiguity more closely.

Using this integrated coding scheme, the two primary coders recoded the ME-Cap-FDR and ID-G-2-Mylie data, applying a focus code, type code, and tone code to each “chunk”, which at this point was defined by a continuous speaker utterance. As each speaker took turns, each utterance was considered a new “chunk” and coded. In addition, we recognized that we had focused our attention to just the instructors’ utterances, and when the two coders tried to apply our current coding scheme, it did not align well with the student responses. To address this, the two coders along with a third member of the research team began to analyze the student responses using open-coding, allowing the codes to emerge from the data itself versus using an established
framework. Initial codes that were identified included: clarify, argue, acknowledge, agree, defend, and ignore. This set of codes was shared with a fourth member of the research team, at which point and after discussion, the team decided to adopt these codes as well as non-verbal responses (e.g., notetaking, nodding). The addition of the non-verbal responses elevated the need to code the videos, not just the transcripts. Furthermore, the team recognized that the silence itself could have several different meanings and purposes (e.g., self-reservation, acquiescence, or not paying attention), that it is ambiguous, and is more often misinterpreted than verbal responses. Table 3 below shows the coding scheme for the student responses in this dataset.

Table 3. Student response codes that emerged from this dataset

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask</td>
<td>clarifying questions</td>
</tr>
<tr>
<td>Restate</td>
<td>student restates the information from the person providing the feedback</td>
</tr>
<tr>
<td>Acknowledge</td>
<td>indication of active listening e.g. OK</td>
</tr>
<tr>
<td>Agree</td>
<td>“yes” “ok I will do that”</td>
</tr>
<tr>
<td>Defend</td>
<td>in contrast to feedback provided; opposite of agree</td>
</tr>
<tr>
<td>Ignore</td>
<td>intentional change of subject without resolution for the feedback, not solely a lack of response</td>
</tr>
<tr>
<td>Denial</td>
<td>reject the existence of the need for feedback</td>
</tr>
<tr>
<td>Report</td>
<td>explaining a feature or the design</td>
</tr>
<tr>
<td>Compensation</td>
<td>attempt to provide an alternate representation of the feature to counter the feedback</td>
</tr>
<tr>
<td>Silence</td>
<td>following an instructor’s a) direct recommendation or b) investigation, by the student to whom the feedback is directed</td>
</tr>
<tr>
<td>Note-taking</td>
<td>typically by the student receiving feedback, (only visible within-frame of video)</td>
</tr>
<tr>
<td>Nodding</td>
<td>physical response to any type of feedback</td>
</tr>
</tbody>
</table>

At the end of this process, we shared the coding schemes and the rationales for adopting the coding schemes with the final member of the research team. Because this member did not participate in the generative conversations regarding the selection and development of the coding schemes, she was able to provide an external perspective to be able to evaluate our chain of logic. After we presented the four coding schemes (three for examining feedback, one for responses to feedback), our “external perspective” team member agreed that the choices made sense.

Using the different coding schemes for the instructors and the students, our two primary coders analyzed eight transcripts (three from Mechanical Engineering during the Conceptual Design Review phase and the eight from Industrial Design during the Concept Review phase). The two coders went through two training rounds, where they each independently coded one transcript, met to discuss the differences in their coding and then reach consensus on the final coding, and then went through this process with a second transcript. After the two rounds of training they independently coded the remaining transcripts. The findings of these analyses are given below.

3.2. Findings from Verbal Analysis

From the verbal analysis, we identified four major patterns that suggest that the way that the Mechanical Engineering instructor approached the design reviews differed from the Industrial Design instructor approach the design reviews. There were three major differences in the types of feedback given by each instructor, and one pattern speaking to the differences between the types of responses that the Mechanical Engineering students exhibited in contrast to the responses of the Industrial Design students. These patterns are based on percentages of segments.
that had a particular code applied to them. All percentages are calculated as a fraction of the total number of sentences in each transcript.

**Claim 1**

The Industrial Design instructor explicitly encouraged other students to provide feedback. However, he often took over the conversation. In comparison, the Mechanical Engineering instructor almost exclusively provided the feedback and the students’ classmates rarely provided feedback at the end of the presentation during the question and answer time (see Table 4).

Table 4. Number of statements made by the instructor, the target student(s), and other students (those providing peer feedback)

<table>
<thead>
<tr>
<th></th>
<th>Industrial Design</th>
<th>Mechanical Engineering</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Allison</td>
<td>Eva</td>
<td>Mylie</td>
</tr>
<tr>
<td>Instructor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target Student(s)</td>
<td>35</td>
<td>19</td>
<td>33</td>
</tr>
<tr>
<td>Other Students</td>
<td>33</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Walter’s review session was excluded from the table because it (a) was considerable longer and (b) followed a different pattern. In this case, Walter spoke during 261 of the segments and the instructor spoke for 402.

**Claim 2**

At this phase of the design process, the Industrial Design instructor focuses on interpreting the representations of the ideas that the students have created. In comparison, the Mechanical Engineering instructor at this phase of the design process speaks the most about Function (see Table 5).

Table 5. Number and percent of statements made by the instructor for each “Focus” area

<table>
<thead>
<tr>
<th></th>
<th>Form</th>
<th>Function</th>
<th>Representation</th>
<th>No Code</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>0</td>
<td>0</td>
<td>87 (100%)</td>
<td>0</td>
<td>87</td>
</tr>
<tr>
<td>Eva</td>
<td>3 (3%)</td>
<td>25 (21%)</td>
<td>70 (58%)</td>
<td>22 (18%)</td>
<td>120</td>
</tr>
<tr>
<td>Mylie</td>
<td>50 (37%)</td>
<td>0</td>
<td>67 (50%)</td>
<td>17 (13%)</td>
<td>134</td>
</tr>
<tr>
<td>Sydney</td>
<td>0</td>
<td>17 (23%)</td>
<td>53 (71%)</td>
<td>5 (7%)</td>
<td>75</td>
</tr>
<tr>
<td>Walter</td>
<td>39 (10%)</td>
<td>117 (29%)</td>
<td>195 (49%)</td>
<td>51 (13%)</td>
<td>402</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cap</td>
<td>3 (5%)</td>
<td>27 (48%)</td>
<td>23 (41%)</td>
<td>3 (5%)</td>
<td>56</td>
</tr>
<tr>
<td>Robot Fish</td>
<td>35 (23%)</td>
<td>99 (64%)</td>
<td>5 (3%)</td>
<td>16 (10%)</td>
<td>155</td>
</tr>
<tr>
<td>Prop</td>
<td>0</td>
<td>25 (47%)</td>
<td>8 (15%)</td>
<td>20 (38%)</td>
<td>53  (19%)</td>
</tr>
</tbody>
</table>

**Claim 3**

The Industrial Design instructor provides more direct and more instant feedback than the Mechanical Engineering instructor does while the Mechanical Engineering instructor appears to indicate lack of clarity or recommend change indirectly by simply posing a question. Most of the points raised by the Industrial Design instructor focus around his interpretations of the design, while the questions raised by the Mechanical Engineering instructor are investigations where he is requesting additional information (see Table 6).
Table 6. Number and percent of statements made by the instructor for each “Type” of feedback

<table>
<thead>
<tr>
<th></th>
<th>Judgment</th>
<th>Percent</th>
<th>Process oriented</th>
<th>Percent</th>
<th>Brainstorming</th>
<th>Percent</th>
<th>Interpretation</th>
<th>Percent</th>
<th>Direct Recommendation Visual</th>
<th>Percent</th>
<th>Direct Recommendation Verbal</th>
<th>Percent</th>
<th>Investigation</th>
<th>Percent</th>
<th>Free Association</th>
<th>Percent</th>
<th>Comparison</th>
<th>Percent</th>
<th>Identity Invoking</th>
<th>Percent</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison</td>
<td>19</td>
<td>22</td>
<td>8</td>
<td>9</td>
<td>16</td>
<td>18</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>9</td>
<td>14</td>
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**Claim 4**

The Industrial Design graduate students had a tendency to indicate they were actively listening, that they were restating what the instructor said, or that they agreed to comply with the feedback the instructor provided. In comparison, the Mechanical Engineering students reported and defended their ideas (see Table 7).
Table 7. Number and percent of statements made by the student/student team for each “Response”

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4. Constituting Feedback and Ambiguity in Design Critique: A Qualitative Analysis

The first analysis of design data provided insights into a set of claims responsive to questions related to the different types of feedback provided in design reviews and critiques and students’ responses to the feedback. Because our research also is interested in how participants in design reviews and critiques negotiate ambiguity in feedback processes as well as how these design contexts encourage particular communicative processes by different participants, we also approach our data through a constitutive lens to provide an alternative view on the research questions. Grounded in the Communicative Constitution of Organizations (CCO) perspective (Putnam & Nicotera, 2009; Robichaud & Cooren, 2012), we show how designers (re)produce and (co)produce feedback communicatively with design agents (e.g., review standards, artifacts, classroom policies, disciplinary cultural norms, instructors, and students (Brummans, Cooren, Robichaud, & Taylor, 2014). In CCO as a data analytic lens, communication is defined as “the ongoing, situated, and embodied process whereby human and non-human agencies interpenetrate ideation and materiality toward meanings that are tangible and axial to organizational existence.
and organizing phenomena” (Ashcraft, Kuhn, & Cooren, 2009, p. 39). In explicating the constitutive nature of communication, Kuhn portrays communication as “constitutive of social realities” with a focus on the production of meanings in social action; “seeing organizations not as containers for communication, not merely settings inside of which communication occurs, but intrinsically as communication”; “staying in the realm of communicational events both conceptually and methodologically” with mindfulness that communication is always contextually, politically, and materially situated; and “eradicating simplistic assumptions about meaning convergence as the telos of communication” while embracing the ambiguities, contradictions, and logics of difference in which order and disorder co-influence each other and operate as significant analytical frames (Ashcraft et al., 2009, pp. 548-550).

In design review and critique contexts, taking a constitutive approach means examining how people make sense of their meanings of work, being professional, co-orienting toward people and material conditions, and performing work itself in the here and now with consideration of institutional or structural bases (Barley et al., 2012; Cheney & Ashcraft, 2007; Lammers & Garcia, 2009). In blending organizational communication’s CCO focus on talk-in-interaction (“discourses”) as a site in which cultural formations (“Discourses”) are produced and shift and professional communication’s focus on the textual and multimodal materials whereby professions and professionals are created and sustained through documents, logics and arguments, and identity formations through design documents, reports, websites, accreditation compliance acts, certifications, policies, and other discourses and materialities (Cheng & Kong, 2009), communication becomes the contested site in which design is constructed.

The constitution of and struggles over meanings take place within design cultures that can be distinguished by locale specific and occupational logics and factors. These cultures are performed through discourses that, through processes of iteration or Discourses, are cultivated and manifested by agents and artifacts that perpetuate occupations and design genres such as review and critique (Alvesson & Karreman, 2000). Thus, the characteristics and meanings of artifacts are taken-for-granted and co-constructed in mundane interactions such as norms, gestures, ways of talking, and objects. For instance, objects and non-human actors or agents (e.g., memos, reports, signs) have the ability to inform (e.g., memos inform office personnel about important events), deny (e.g., reports deny an organization’s participation in an act), and indicate (e.g., a sign that warns of a security system and cameras on the premises; (F. Cooren, 2004). Values, norms, and people give weight to what is said, positioning themselves vis-à-vis a given situation with objects or figures animating, authorizing, legitimizing, and resisting particular constructions (François Cooren, Matte, Benoit-Barné, & Brummans, 2013).

In these ways, the constitutive approach to organizing bridges micro-mezo-macro level analysis and theorizing, human and nonhuman agents, everyday talk and cultural formations, discourse and materialities, process and structure, and creativity and disciplinary stabilities. Ambiguity in the recorded design reviews viewed through the communication-as-constitutive lens situates design review and critique as ongoing processes of meaning making that are negotiated through linguistic choices, identities, and interaction in context. To apply the communication-as-constitutive approach, we examine how people talk and interact in ways that construct their realities from one speech act to the next and by incorporating the materialities of the design reviews (Cooren et al., 2011).
4.1. Method used for the Qualitative Analysis

The primary data for this analysis are the “2-ID-G Mylie Concept Review” (10:59 minutes) and its transcription. Although this segment is the focus, the surrounding materials and particularly other Mylie episodes and design documentation in an Industrial Design setting, are incorporated, and contrasted with Mechanical Engineering interactions and review materials. The focus is design feedback and critique in its ambiguities, emergence, and situated nature. We chose to focus on this particular Mylie segment because a mid-critique of student design thinking and documents “provides an intense view of the feedback genre—faculty and students perceived the mid-critique as having the most impact on the design—so the feedback in this critique is critical” (Dannels & Martin, 2008, p. 141); for critique sessions as the primary professional socialization site, see (Murphy et al., 2012). For the CCO analysis of design review and critique data, we position ourselves as researchers engaged in “passing organizational ethnography” (Cooren, Brummans, & Charrieras, 2008), in which the limited exposures to design videos and artifacts spatially and temporally are acknowledged. We acknowledge that we do not know what happens in non-recorded episodes. We delve into the discourses and semantic patterns extracted through inductive-deductive analyses by which researchers’ backgrounds and positionalities become implicated seamlessly in interpretations, the tensions, ambiguities, and contradictions in design can be surfaced (see Charmaz, 2000; 2006).

4.2. Findings from the Qualitative Analysis

To establish the context, we (a) describe the physical site and human interactants, as well as the (b) orientation of the interactions and the non-human agents. We engage in this description and analysis because “discourse is meaningful only within the material, political context within which it occurs” (Ashcraft, K. & Mumby, 2004, p. 25). Commonplace objects organize, invoke, and perhaps disorganize the norms, expectations, particular rationalities of the situation. These different discourses and materialities set up expectations for the profession and the members within (e.g., who, what they do, how they fit within profession and how they can enhance fit through language, behavior, engagement with material objects; see also McDonnell, 2014). The classroom situation also establishes meanings for discourse and materialities. Throughout our discussion, we focus on the Mylie design critique episode. After this analysis, we couch our findings within (c) comparisons to and contrasts with other Mylie and Industrial Design critique materials as well as Mechanical Engineering design review episodes. By doing so, we can display how human and non-human or material objects act as agents/actors in particular design critique contexts, and how these critique sessions differ from particular ME design reviews. In this analysis, the communicative construction of design critique and review offer insights into the ambiguities, power relations, and feedback processes that relate to professorial and student actions.

4.3. Physical Site and Human Interactants

First, the physical site, material objects, and human interactants present an image of layered spatio-temporal systems in which a core group interacts, a secondary group occasionally interacts and has voice, and third group operates at the periphery, observing what is happening
but neither approaching nor affecting the interactants. The primary and secondary groups of interactants function with permeable boundaries but the peripheral interactants do not cross boundaries to enter into the design critique space.

The room in which interactions take place appears to be a computer lab with tables and chairs located in the center. The main participants are situated around a utilitarian-looking table that serves as a space on which books, pencils, and other materials are located and used. This table provides the means by which human agents can orient toward an artifact and be co-located in close proximity although interactants do not touch each other and cannot all sit at the table because it is not large enough to accommodate the entire group. On one side of this table are Simon (the instructor), Mylie (female student), bearded male student; and on the other side of the table are three female students. There are three other participants—male and two females—who move in and out of the video frame and who are included in the instructor’s eye gaze and verbal commentary. The women stand behind Mylie but the male sits. The women occasionally talk to each other and move around. They are included in the circle of talk when the instructor looks directly at them. In the yellowish-beige room there are brown cork boards above desktop computers, and other people who appear to be students and who occasionally look at the instructor and his class across the space that separates Simon and his students from these other people. In other words, other people can observe and hear what is happening during Simon’s design critiques with his students but they do not interact directly with the main human actors.

Thus, the Mylie episode begins when Simon informs others that he has limited time to review their assignments but he wants to “kind of talk ‘em out” and to begin with one that is “problematic”, whereby he frames this interaction in terms of intent and action. Throughout, Simon is highly animated—lots of eye contact, smiling and other facial expressions, with an open bodily orientation (no crossed arms or legs, full face toward participants and the camera)—as he talks about the design. Simon says:

I’m not gonna – we’re not gonna be able to take time to do everybody’s, but, um, throw one out that’s problematic. Okay. Either one of yours or somebody else’s where it’s like yeah, this needs some help. What can we do with it? No one needs any help. That one?

Tree pack.

In these lines, he has shifted everyone’s gaze and attention to a particular artifact created by Mylie, has noted the resource constraints in which they are operating, and presents the decision criteria of “problematic… this needs some help…” He names the design as “tree pack”. He has not clarified why and how this particular artifact is “problematic”—thus surfacing and sustaining ambiguity—but simply begins with his overall assessment. He then draws attention to particular design elements: the positioning of tree rack in 2D space in paper design document; the need for shading to enable viewer to understand what is in foreground and background (i.e., for Simon, lack of shadowing causes ambiguity in the document itself and to which he calls students’ attention). He voices confusion about the setting or context in which the tree rack is positioned: “weird reference because I see someone sitting in a – in a living room underneath a tree,” surfacing ambiguity as he moves from the center (tree rack) to the periphery (context) of the design representation. In this opening, students are interpellated as docile subjects, disciplined by the design critique format, Simon’s orientation to the document and to the session itself, and by
the spatio-temporal constraints of little time in a constricted setting. Simon’s focus on the representation of the tree rack in this episode also provides one specific example of claim #2 from the quantitative analysis, “the Industrial Design instructor focuses on interpreting the representations of the ideas that the students have created.”

4.4. Orientation of the Interactions and the Non-Human Agents

Second, the orientation of the interaction is established when the instructor (Simon) directs students’ attention to the work that they are doing by putting a set of papers on the desk in front of him and between Mylie and the male student. He refers directly to “the class” thus establishing the professional and power relationships among participants. Through directing his talk to and his bodily orientation toward all of the members of the immediate scene, he includes them in his design critique. Attired casually in sweater and jeans, he often is the only one talking to the group. He stands above the primary student interactants and leans in to the object or artifact that functions as a non-human agent, namely the documents/artifacts that he has placed on the table. He also and secondarily orients to and toward Mylie, a women student designer, in his talk, bodily orientation, and eye gaze. After a short while, he grabs a chair and sits, positioning his body as open to the entire group but mainly facing Mylie. He focuses on the document and on Mylie. He uses a lot of gestures to direct Mylie’s and other students’ attention to specific aspects on the document/artifact. With the object functioning as the focal point for human interactants’, especially Simon’s, bodily orientations, gestures, and talk, the document becomes the agent for and of critique.

The table, document, and design representation captured on paper function as non-material agents. Thus, there are non-human and human agents or actors interacting in this Mylie episode. In CCO, material objects “force” humans to act in particular ways, just as humans choose particular functions and orientations toward the objects. In the case of this Mylie episode, the table establishes a spatial configuration whereby there is a physical place to locate documents between and among participants. However, the table is not large enough to include everyone so some students are at the periphery. In this way, the table exerts power and control over who can be more directly involved in the interaction and who would need to be invited into or would be discursively and materially closed off. Because the table is a solid flat surface, Simon and Mylie are able to point to aspects of the design representation and orient their bodies (e.g., posture, eye gaze) to the document. The document is not only the material repository for the design, or work of this group of individuals, but also is representative of ID emphases on aesthetics and is the focal point for interaction by driving talk in particular ways.

In ID and other areas of aesthetics, the term often but does not necessarily need to align only with beauty. Instead, aesthetics aligns with preferred ways of representing work, with proportion, and senses. The design is on paper that has sensual qualities by which humans interact with the object and representation. Objects are not self-evident artifacts—there are different meanings, interests, and ways in which people are called to perform different subjectivities like design critic

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1 In this episode, students, mostly Mylie, have 33 lines of response that are usually one or two words in a line. Students comment less than 20% of the time (i.e., 19.5 of the coverage). Simon had 105-106 lines of talk or 80.5% of the coverage.
and designer or creator of representations. Also, objects and the discourses surrounding them are context-dependent. Rather than white board, chalk boards, iPads, or other possibilities for design representations, the ID class creates representations on paper. Paper has permanence, texture, touch, smell, and portability—the choice of paper is neither arbitrary nor unchangeable. Colors, shadings, feel of the paper, and other aspects evoke feelings and can direct humans to perform in particular ways and have embodied relations with objects like documents. There also is a feminine aspect insofar as the ID instructor and students touch up designs, shade areas, add nuance and color to create desirable appearances. There is less emphasis on functionality.

For example, the opening recorded segments show Simon entering into the document/artifact and the design representation. He explicitly notes that he is reading the design (“tells me”; “I read things”; “When I read this”), meaning that he is relating what the non-human agent is telling him. The artifact animates the critique. Simon asks Mylie a question because he needs to know what the main representation in the design is (i.e., he needs to see 3D rather than 2D to check orientation of main embedded artifact in the design context). He provides a recommendation to get the effect of relief or bas relief (“if you grayed this out I think you would let this come forward”). Simon continues by saying: “Okay. Shadow. The way that the shadow is cast on the wall tells -- me it’s relief as opposed to full 3D.” Simon surfaces ambiguity in the design, he needs to make sense of what kind of figure this is. Simon engages in sensemaking in a talk aloud type of format. He explains that he is getting “size and reference”.

He then looks at other objects and their orientation to each other and in the setting in the design (“someone sitting in a— in a living room under a tree”). Mylie articulates her concept of bringing the outdoors indoors. Simon then questions Mylie—he needs to know if the confusing aspect is an “idea” or a “product” then there is back-and-forth as Simon challenges and confirms the design:

“Oh. I thought you were designing a bag that hangs in a tree. That’s like a hamper, okay. So I misunderstood your concept. Now I see it’s a dress. Not a bag that’s a hamper hanging in a tree. It’s a – like a tree that I hang my clothes in. Okay.

Simon engages in addressing others, opening up the conversation to others by asking a rhetorical question and focusing on him as the design reviewer/evaluator and Mylie’s need to anticipate his stance, knowledge level. He is requesting that others’ design be unambiguous with the site of ambiguity being both the design and the reviewers, and in the interaction and context.

Simon breaks from his pattern of engaging with the design document and the originator of this particular design, Mylie, to ask class members (consistent with claim #1, “The Industrial Design instructor explicitly encouraged other students to provide feedback. However, he often took over the conversation”):

So what does she need to change? She needs to change me so I read things better? No. You have to assume I’m stupid. Right? And I’m not gonna read these things right away. So how do you make sure that people understand that this is in the house? It’s not the couch outside and so does she need more of the house? ‘Cause this says in the house.
When I read this, I read, “in the house”, but then I didn’t see the room. I didn’t see the corner or the ceiling. So possibly like a, a – if this is going here, you –

Here, Simon is articulating his sensemaking, he is voicing what he finds to be ambiguous. It is the ambiguity inherent in the discourses and materialities that animate the design critique process and content. When Simon reiterates, “I read… I see…”, he is not simply sensemaking or talking aloud but is asserting authority and narrativizing the design—in doing so, students are directed toward what he says (i.e., signaling his authority and their needs to pay attention).

Simon then talks about perspectives, lines, spaces, before adding lines and making changes in the document (consistent with claim #3 from the quantitative analysis, “The Industrial Design instructor provides more direct and more instant feedback”):

throw off a perspective line there to show a corner of a room so it’s ceiling off there and the ceiling line up back there. Now it’s in the space. So just a couple extra lines would define that as it’s in the house.

Simon has the legitimate power but perhaps not authorial and artistic power to make changes in Mylie’s design. He may be acknowledging the authorship of the design and the establishment of the context before making the changes so that students know how and why additions are being made to the document/artifact. Simon’s feedback becomes more specific as he shifts from the aesthetics and concept to the functionality. He is honing in on making the drawing more product-like: “make it look more product like”. He asks students what Mylie can do to make it more product-like but the question is rhetorical insofar as he then just continues—he holds the floor, does not concede the floor. He moves into discussion of functionality (“drying racks” and constraints: “you’re in the house”) and aesthetics (“ugly”) and his ambivalent feelings about or reactions to the idea: “I – and I like that concept, but it’s sort of feeling not product enough.” The ambivalence offers space for students to exert agency in the designing process.

Simon talks about how to improve the elements of the document (again, exemplifying claim #3): “put some part lines on it so that it starts looking like it’s a mechanized tree instead of a real tree.” He becomes very practical about manufacturing and uses analogies to get his points across: depends on how you manufacture it. The branches could have part lines where they like attach in. Sorta’ like, ya’ know, the Christmas trees where you saw the – see the branches sorta’ -- sticking into it. Um, take a look at, um, the British designer – help me out -- who’s the real famous British designer that did the Oh chair, O-H chair.

Simon shifts from the design representation speaking through him as he reads the document aloud to the students to his own explanations of materials. In this shift, the primary agent changes from document/artifact with its design representation to himself. Simon explains more about part lines (as observers, it is difficult to know if this discussion simply interests him or perhaps he saw confusion on students’ faces).

But he pulls out his smart phone to show them what he is talking about. Other students interact based on the discussion of the designer in this episode, he is invoking the authority of the designer—this move establishes his legitimacy as expert in this area of design (Brummans,
Hwang, & Cheong, 2013), legitimacy by association through invocation, and also through the 
expert knowledge to pinpoint exactly—with a few virtual detours—by engaging in this 
individual then collective invocation, students share in the expertise construction and also reduce 
ambiguity about meaning and values of knowing about designers and particular terminology. On 
one hand, this episode looks like a diversion, side conversation, nested instructional tidbit, or 
mini-lecture; on the other hand, this could be invocation of authority, values, and mindfulness 
that the details and being able to show what you mean and associate the point with a particular 
designer might be useful and is part of learning how to do design.

In this invocation, Simon makes fun of and talks to himself as he authors the episode. In this 
sense he is engaged in what Brummans et al. call Buddhist mindful organizing that improves the 
well-being of members by cultivating awareness of positive emotions. In authoring an 
organization, they draw upon prior work: Hence, authority is “a fundamental feature of our 
human capacity to act in concert, whether with regard to the basis of government, the 
establishment of social bonds, the process of organizing, or the sustenance of communal life 
through rhetoric (Benoit-Barné & Cooren, 2009, p. 6)” (p. 349). Authority establishes the 
negotiated order or structure of things and is accomplished through discourse that establishes 
hierarchy by performing hierarchy. Influence then is an effect that is accomplished over and over 
again rather than something that resides in people or artifacts. People, like students and Simon, 
negotiate and reaffirm order collectively. They embody the values of design and the value of 
drawing upon multiple sources to create good design.

In contrast to Brummans et al.’s work, Simon does not seem motivated by the desire to liberate 
himself from selfness/self-focus but Simon does seem to fully immerse himself into an activity 
that he performs with enthusiasm and pleasure in the moment. As professionals, students should 
be aware of broader knowledge, kinds of evidence and source… authority is established in 
conversation. The construction of authority is a dynamic process that enables students to learn 
how to manage these struggles for legitimacy and for creating their own design space (see 
Robichaud & Cooren, 2011).

The document as the primary non-human agent, along with the primary human agent (Simon, 
instructor) drives interaction through narrativizing authority, presentification, and ventriloquism. Just as organization and organizing are authored into being and into having a particular identity, Simon authors the design by narrativizing and by directing others’ roles in this process (see Robichaud & Cooren, 2011). Narrativizing feedback authors the design and its identity. As Robichaud and Cooren (2011, pp. 1-2) explain,

The establishment of organizational authority thus supposes an interplay of text (that 
which is to be authored) and conversation (where the authority of the organization’s text, 
as well as those of its members, is negotiated). It emerges in a search for a narrative that 
can transcend the particular interests of members and their communities, by incorporating 
the latter into a tolerable meta-narrative.

Communication enables and displays this negotiation process; though communication collective 
authorization of design critique takes place. Students engage in narrativizing by engaging in 
consent and dissent, with Myolie offering points of tension the unitary voice (Simon) and the
occasional voice (disruption) of others. In this process, the continual surfacing of ambiguities during feedback coupled by contestation of textual authority and contradictions between representation, functionality, and reference to idealized or iconic objects are built into the feedback flow. Simon says,

Oh. I thought you were designing a bag that hangs in a tree. That’s like a hamper, okay. So I misunderstood your concept. Now I see it’s a dress. Not a bag that’s a hamper hanging in a tree. It’s a – like a tree that I hang my clothes in. Okay. So what does she need to change? She needs to change me so I read things better? No. You have to assume I’m stupid. Right? And I’m not gonna read these things right away. So how do you make sure that people understand that this is in the house? It’s not the couch outside and so does she need more of the house? ‘Cause this says in the house. When I read this, I read, ‘in the house’, but then I didn’t see the room. I didn’t see the corner or the ceiling. So possibly like a, a – if this is going here, you –

The surfacing of ambiguities is a key characteristic of Simon’s feedback and authority as well as the thread of coherence in narrativizing. This process of surfacing ambiguities also is enabled through presentification by which “someone or something is made present [‘real-ized” discursively and materially] through the actions of various human and nonhuman agents” (F. Cooren et al., 2008, p. 1364) and ventriloqualism by which figures other than human beings, such as objects, norms, and values, invite and compel expression by others (François Cooren et al., 2013).

The surfacing, critiquing, and resolving ambiguities is a prime location to demonstrate the mutually constitutive nature of human discourses and materialities. Simon talks about how he cannot read or see what is being represented and how it functions in the overall context of Mylie’s design document. In these moves of questioning, hesitations, and discursive openings that are quickly closed, Simon makes present the lack of convergence in the construction and sensemaking of meaning. Because he is the mechanism through which the design representation is expressed and because he smiles and laughs during the critiques (especially his self deprecating humor that displays his comfort with the context and lack of concern about expertise assumptions made by others, see Martin et al., 2004), Simon creates a design critique environment in which the most potentially ego-threatening critique can be voiced. By making the design ambiguities apparent (presentification) through the design telling him offer a (authoritative) text that he reads for others (ventriloquism), Simon is messenger. In other words, the CCO analysis illuminates an interesting discursive and material turn that enables Simon to provide objectively harsh feedback with him as sole speaker in what could be perceived as a highly face threatening situation for students (e.g., see excerpt below when Simon does not read a design element as a “dress”). Cooren, Brummans, Benoit-Barné, and Matte (2013) note:

Using the metaphor of ventriloquism, this performative view of culture allows us to show that interactants constantly and iteratively make specific figures speak in their conversations or documents (interestingly, “figure” is the term ventriloquists sometimes use to refer to the dummies they manipulate). Conversely, these ventriloquial effects may be reversed to the extent that if interactants are indeed ventriloquists, it is also because the figures they ventriloquize make them say particular things in particular ways. In other words, these figures animate them. Ventriloquizing a specific value that we happen to
cultivate in our conversations (equity or effectiveness, for instance) presupposes that it is also this value that, ceteris paribus, animates us, leading us to say what we say or do what we do. If we ventriloquize specific values or norms, it is therefore also because they ventriloquize us.

This ventriloqual “implies numerous staging activities that take place in discourse and conversation” by which speakers establish authority and also distance themselves from harm by their being “forced” to speak in certain ways (Brummans et al., 2013; Cooren et al., 2013). Through use of these processes, the surfacing, sustaining, and resolving, albeit temporarily, of ambiguities to constitute critique becomes a recurring pattern in the Mylie episode, as demonstrated through an excerpt toward the end of the recorded session when Simon is ready to be finished with Mylie (“I’ve torn into you enough”)—he is trying to exit the feedback episode—but then she opens another line of conversation:

Simon: So, okay. I’ve torn into you enough. Sorry.
Mylie: No, no, no. It’s great. Should I redo the dress?
Simon: Um, I didn’t read it as a dress. I read it as a bag.
Mylie: Mm-hmm.

Simon provides specific feedback to make a document detail more obvious and “iconic”:

Simon: That the. And part of it is that it was kind of getting – I’ve seen dresses like that now, but I did read it as a bag hanging in the tree as opposed to a dress. See, if you made it a more tailored dress, ya’ know, gave it a waistline, even though, ya’ know, with an A – what is it called an A-style or whatever where you got that waist and then the flare out. It’ll be more definite. I know this is a modern style dress and the other is more of a 50s style dress, but maybe that would emphasize by putting a waistline in it and having it flare.”
Mylie: Mm-hmm.
Simon: Is it --?
Mylie: No, no, it makes sense though –
Simon: Just to, to, to be more iconic with it, with the idea of it’s a dress.

Throughout, students are oriented to Simon, to the design representation within the document/object, and to the Simon-Mylie interaction. Mylie occasionally takes notes. He asks students a question multiple times but no one responds. He looks around to “pick on one” and says in the end that Mylie’s design was not problematic, which could be perceived directly contradicting his opening statements. However, Simon says, “Hers had no troubles. I just tore into it and found troubles,” meaning that he—as a human agent—did not see problems, but the design/object/non-material agent spoke through him and made problems apparent. In the end, Simon and the non-material agent seem to be trying to get students to make their designs immediately understandable for anyone who picks up a sketch.

4.5. Comparisons To and Contrasts with Other ID Critique and ME Review Episodes

This section provides a brief overview of other Mylie and Industrial Design materials as well as some Mechanical Engineering episodes. Using the CCO lens of the ID episodes, communication
of ambiguity offers both critique of design and opportunities for professional socialization and formative evaluation for improvement (feedback forward). Using this lens for ME episodes provides a counterpoint of design feedback that offers evaluative feedback of functionality.

To summarize the CCO analysis of the Mylie episode, the individual providing critique (Simon, instructor) narrativizes and ventriloquizes the design content so that the design itself becomes present in ways that promote the design document as the primary agent or driving force for feedback sessions. The material agent encourages critique patterned around surfacing ambiguities by “reading” what the design elements tell the ventriloquist/Simon, and offering recommendations that are conceptually and aesthetically based with a nod toward functionality. Within the Mylie episode, the design document and Simon verbalize criticisms and ways of improving the design (feedback forward; formative evaluation of students’ conceptual design). Because it is the design itself that is directing both the critique commentary of declarations, questions, rejoinders with little input from students and the ventriloquist’s embodiment of improvements to make sense of ambiguities and enhance aesthetic appeal (by shading, gesturing to indicate student actions), the potential harshness of critique is lessened. There is one section that breaks this pattern of critique and that is when Simon sits down and pushes himself back from the table and design document to use his smart phone to find a particular designer and concept. Here, he exhibits concern that students do not know some basic information that could improve the 3D look of their designs. This nested episode provides an example of professional socialization.

Professional socialization also occurs in other episodes and in different ways. Throughout these other ID recorded episodes, questions about ambiguities that are aesthetically oriented (i.e., how one sees, feels, and experiences the design)—very specific and actionable feedback—create a space for design critique. This space is conceptual rather than product-oriented except for a few lines of the Mylie episode and the client review of ID students’ work. The distinctions between critique and review for functionality are apparent in other ID episodes. Simon breaks from his critique and interactions with students to directly address Robin Adams while she is recording the sessions and offer her as counterpoint to what Industrial designers do (“engineers hate us because …”). Yet, in the 2-ID-G-Concept Review with Walter, when Walter indicates that he

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2 Consistent with the communicative constitution of critique focusing on ambiguity and material agents performing critique through and with human agents, Simon often does not encourage comments. Although he may ask a question, he readily supplies an answer. As such, he engages in discursive closure which is achieved when certain discourses and interests (e.g., aesthetically pleasing and readily understood design concept) are privileged over those of others. At times closure operates at the level at which particular macrodiscourses or cultural formations such as technological and economic concerns (or aesthetic interests in the case of Industrial Design) take precedence over other interests in particular context. On more micodiscursive levels, discursive closure is accomplished through certain moves, or routinized micropractices whereby certain behaviors or norms, such as expertise and professional qualifications, become normalized and prioritized. These moves include disqualification, naturalization, neutralization, topic avoidance, subjectification of experience, pacification, meaning denial, legitimation (Deetz, 1992, pp. 189-198) whereby technical expertise and occupational logics are required and only one interpretation is admissible, with little about the basis for this interpretation provided.

3 In a different ID segment, Walter, a student, had an idea of a washer dryer tumbler design. Walter provided gear information etc. in concept reduction part. Simon said earlier that Walter needed to test his concept so Walter did so with empty coke bottles—providing evidence of impact on proof of concept and next steps.
does not know how to control the water flow (“I’m confused about how to control the water. I have no idea how to control water. I got the idea but I don’t know how to do that.”), Simon explains:

If it’s going into an existing one it’s not gonna work ‘cause the, the agitators – well, the ones that tumble don’t have the agitator in there. They just tumble. Frontloading might work.

Throughout this episode, Simon indicates that he does not understand, does not “get” the concept, did not “read” the design as Walter is describing the concepts and functions. Simon and Walter have an interactive give and take about concepts such as pets doing laundry, different compartments for laundry, and other design features. Simon engages in abductive reasoning by analogy patterns similar to that performed in architectural design critiques for providing negative feedback: critic initiation of feedback on a flawed observable detail in student’s work, and critic reliance on “embodied form of action to draw visible connections, rather than relying solely on linguistic choices (Murphy et al., 2012, p. 550). Simon sums up what works as those “rendering” of concepts that are not “hard to communicate”. In the interests of communicating concepts, socializing students, and adding some humor to interactions, throughout episodes, Simon explains Americanism (e.g., “beating a dead horse”, “short end of the stick”, and difference between “concept” and “conception”).

With regard to ME design review “Cap Team” episodes, Nelson (instructor) constitutes interactions as technical feedback on functionality and the presentation of project-based work to reviewers (e.g., show me how this is going to work, how it’s going to fit), and assessment (e.g., you moved to B from F grade) (for more on disciplinary design feedback differences, see Purzer et al., 2014). In the ME sessions, the review is for approval for next steps. Rather than requesting information to surface ambiguity and improve concepts, when Nelson requests information, he has a concern. Typically, Nelson asks, gets a response, then says no more. Simon takes a pen and shows how to shade in the design rendering to make the concept appear 3D. Like Simon, Nelson also is concerned about professional socialization, such as adherence to project planning (e.g., when Nelson asked why did you wait until now to obtain a battery, this comment was both design feedback as well as overall project planning commentary). Finally, ambiguity in ME segments is situated in whether the execution of the design would work, whether data for functionality are reliable and valid, why something is not working and how to proceed. By default ambiguity exists by the very fact that they are having a conversation. Nelson fails to confirm and deny with the interactional pattern being that if some issue is raised, then it requires action.

5. Discussion

From the Verbal Analysis we were able to identify the main patterns of feedback provided by each instructor across multiple student projects, and noted that the two instructors provided different review environments (a design review environment in the case of mechanical engineering, and a design critique environment in the case of industrial design) based on the different types of feedback they provided. The CCO analysis provided us with an enriched understanding of these two environments and enabled us to examine the role of ambiguity in the
review process. Generally, we noted differences between the two environments in: (1) who gave the feedback – just the educator, or the educator and students? (2) the focus of the feedback—on the form vs. function vs. representation; (3) the type of feedback – and how direct it was or was not; and (4) the ways students responded to the feedback.

McNair, Paretti, & Groen (2014) also noted a difference in the environments in terms of the types of artifacts that the students presented to their instructors, where students gave more formal presentations with PowerPoint slides in the Mechanical Engineering design reviews while the industrial design students presented sketches in the design critiques. The artifacts presented by the students were influenced by their instructors’ expectations, but in turn influenced the types of feedback the students received (McNair et al., 2014).

The Mechanical Engineering instructor generally provided feedback on function of the design concept in the form of “Investigation” of whether or not students had considered every design detail. This approach to providing feedback led to his students responding in “Defend” manner, in the case of Cap, or by continuing to “Report” (or make their case) in the cases of Robot Fish and Prop. This is similar to findings from Yilmaz and Daly (2014) in their analysis of this data, framed around divergent/convergent questions; they found that the Mechanical Engineering instructor asked clarification questions and prompted students to justify decisions. This instructor’s approach to feedback, and his classroom environment are consistent with a review genre. In this environment, the instructor and the students focused on resolving and eliminating ambiguity; the students strove to convince the instructor and their other audiences that they had developed a series of robust design decisions before they presented their work to their instructor and they had response to every question about their design work. Mann and Araci (2014) also note in their paper that the mechanical engineering students are expected to demonstrate that they have already resolved the possible questions they might be asked, and suggest that there is not much learning in these classes. However, it may be instead that these students are still learning, but are learning different skills than students in other design contexts.

In contrast, the Industrial Design instructor generally provided feedback primarily on the representation of the design, and in the forms of judgment, interpretation of the design, and comparisons to other design work. This approach to providing feedback led to his students to respond in a variety of manners, where the two most common were restating what the instructor had said and acknowledging what the instructor had said. This instructor’s approach to feedback, and his classroom environment are consistent with a critique genre. In this environment, the instructor facilitated a process of cycles of creating and reducing ambiguity. At times the instructor pushed the students to reach design decisions, while at other times the instructor introduced ambiguity by prompting the students to think in a new way. Goldschmidt and her colleagues (2014) and Lande and Oplinger (2014) also note that the Industrial Design instructor emphasizes the emotional aspects of the design, including how a design can be “fun” or “cool.” These additional dimensions of design can introduce additional ambiguity (particularly in considering how different people may have different emotional reactions to a design concept) beyond the technical details considered by the mechanical engineers in their work.

The instructor also introduced ambiguity in the process of including other students in the review process. For the students providing the review, the process of adopting this role was a process of
navigating a series of questions (is the instructor really asking me to provide my input, or is he just pausing? What types of things should I look for as I try to provide input to my classmate? How will my classmate receive the feedback I provide?) For the student receiving the peer feedback, the process was also one of navigating ambiguity related to the other student’s ability to provide the feedback (My peer is another classmate; is the feedback they provide going to contradict what my instructor thinks? How helpful will it be?).

6. Limitations

The analysis we have presented is based on only a single educator for each discipline, is based on a single point in the semester (a single point in the design process) and is based on a small number of student interactions. Further analysis could be done to determine if the types of feedback and types of feedback responses we observed were consistent throughout the semester or unique to this particular point in the design projects.

7. Contributions

7.1. For the research community

From this study we were able to identify different patterns in feedback given and patterns of responses to feedback, and how the two are related. To accomplish this, we created a new analytical framework for looking at students’ responses to feedback. In the two contexts, we also examined the role of ambiguity in the review sessions, where students learned to resolve and eliminate ambiguity in the mechanical engineering classroom and students learned design skills through cycles of increasing, preserving and resolving ambiguity in the industrial design setting.

Examining the feedback process through the ambiguity lens also provided new insights into how students respond to peer feedback. Other literature documents students’ discomfort with ambiguity while it is also documented that students often under-value the feedback they receive from their peers. The inherent ambiguity in peer feedback offers a new explanation for why students do not value or respond to peer feedback the same way that they value and respond to feedback from instructors.

7.2. For the design education community

By better understanding how various forms of feedback impact student design work, and the ways that students respond to feedback on design work, we as a design education community can learn how to better provide feedback to elicit the types of responses from students that are consistent with our learning objectives for them. These learning objectives include (a) understanding of specific design concepts (b) development of specific design skills (e.g. ideation), (c) ability to make revisions in order to improve work—i.e. changes to a specific artifact, and (d) argumentation skills (i.e. the ability to present and defend design decisions). Our study suggests that the first two learning objectives are supported by environments that are more consistent with the critique genre, while a review environment best provides the space for students to demonstrate argumentation skills. As instructors, therefore, we might reflect on which types of environments we are currently creating in our classroom spaces, and how we manage a process of creating different spaces for students to develop these different skills.
Rather than providing solely a design review environment or a design critique environment within our classes, we might consider how to create both environments, for example by providing design critique experiences early in the term and design review experiences later in the term. Adams, Forin, Chua, & Radcliffe (2014) provide additional suggestions as to how different environments and instructional strategies can support student learning.

As instructors we might also consider the ways that we work to either reduce or make space for ambiguity in our students design work. While some amount of ambiguity is inherent in design, and some forms of ambiguity may be more productive than others, there is also evidence in this data of the ways that ambiguity can provide space for students to consider new ideas. Additionally, if we ask our students questions that allow them to explore the ambiguity in the design, we might be able to support higher-level thinking abilities (as students must consider and reconcile different perspectives (e.g. feedback from instructor as well as peers and clients) and different facets of the design (technical and well as emotional). At the same time, as instructors we must be cognizant of students’ abilities to respond to ambiguity to ensure that the ambiguity does not become overwhelming. We might reduce some ambiguity by discussing with our students our expectations for the design reviews or design critiques we conduct, as Oak and Lloyd (2014) suggest in their paper. We must also consider how we can help students develop the skills they need to be able to appropriately respond to other forms of ambiguity they are likely to encounter in their design work.

Finally, in considering the industrial design instructor, who provided feedback primarily on the representation of the design rather than the form or function of the design itself, we might further consider a pointed raised by Cardoso and colleagues in their paper (2014) that design instructors should challenge students more to engage in higher levels of reasoning during design reviews.

7.3. For future work

This study examined the feedback environments created by one mechanical engineering instructor and one industrial design instructor. While the mechanical engineering environment resembled a review setting and the industrial design environment resembled a critique setting, future research would need to determine whether this is characteristic of those fields more broadly or whether this was characteristic solely of these two particular instructors. The study does, however, give us insights into materials that could be developed to equip new design educators as they learn how to provide feedback on design work. These materials might help new design educators to consider different styles of review/critique sessions and the types of student learning that different environments support. Finally, this study can inform the development of materials to help students understand how to respond to the feedback they receive and to navigate the ambiguity in different review/critique settings.

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