Reflective Inquiry in Design Reviews:
The Role of Question-Asking During Exchanges of Peer Feedback

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Abstract

Design reviews are common educational practice in domains engaged in project-based learning approaches. This is the 'learning space' where students meet with instructors, their peers and other stakeholders to discuss the progress of their work. A number of research studies have looked into various phenomena taking place during design reviews. In this study, we adopt an inquiry-driven framework to investigate how question-asking influences the quality of the feedback exchanged between peers working in different teams during design review meetings. Building on previous work, specifically in design research, we extend previous contributions not only on the role of questions as influencing the design thinking process, but also on their perceived value (by the respondents) and thus their general benefit for constructing valuable feedback in design reviews. We find that high performing student teams provide *more* and *better* feedback during peer-to-peer design reviews. Further, deep reasoning and generative design questions are perceived as more valuable than low-level questions.

Keywords: design reviews, feedback, question-asking, value.

1. Introduction

"The quality of our thinking […] is determined by the quality of our questions, for questions are the engine, the driving force behind thinking."[1]

Idea generation during designing 'should' take place when designers have a reasonable understanding of the problem at hand and are able to make sense of possible directions to pursue. In practice, the separation between *problem framing* (i.e. recognizing and defining problems) and *idea generation* is not so distinct. And thus, early design phases are continually shifting between analysis, evaluation, synthesis, decision making and feedback between partially defined problem and solution spaces. This iterative tension between problem and solution spaces has been defined as a *co-evolution* in the design process [2]. Throughout the design process, especially in educational settings, *design reviews* (also called *crits*, from *critique*) play an essential role in the development of the work being done. These reviews are common practice in design disciplines, such as architecture, engineering design, industrial design and graphic design [3]. The number of people involved in these encounters vary, though often these include students meeting, individually or in groups, with their instructors and or clients to discuss the progress of a given design project. The level of discussion in design reviews can range from informal conversations about clarification of different issues, to more formal presentations where critical decisions are made about the project direction and more objective (evaluative) feedback is obtained. *Feedback* is central to these encounters and thus students expect that such reviews cover these type of information exchanges in sufficient depth. Intertwined within

these feedback conversations, there is often an array of different types of *questions* that play a role in how design thinking might unfold. Questions can originate from different actors involved in the design process. Question-asking can also facilitate communication and function as a catalyst for encouraging participants to revisit and rethink their actions, approaches and decisions made during design activity [4].

Thus, we posit that question-asking is a particularly useful lens for examining design reviews and, particularly, the amount and quality of *feedback* being exchanged. More specifically, we propose that following (and analyzing) the questions formulated during design review meetings, centered on the exchange of peer feedback, allows us to monitor salient aspects of the cognitive processes of designers. We are particularly interested in attaining a better understanding of the context in which questions emerge, are formulated, answered/not answered, perceived, considered and/or discarded, as well as how they relate to overall feedback quality and how they might trigger changes in (design) decision-making processes. Therefore, the following questions guide this research:

1. How does the articulation of feedback and perception of received feedback relate to students' performance in the design project?
2. How are questions perceived, valued, and considered/discarded during peer-to-peer design reviews?
3. How does question-asking during peer-to-peer design reviews relate to students' performance in the design project?

The remainder of this paper is organized as follows. Section 2 provides a brief overview of previous research on *design reviews*, *feedback* and *question-asking* in design education research. Section 3 presents our research approach and Section 4 the results from our analysis. Section 5 presents our discussion on the observed events and Section 6 concludes the paper with potential implications of this study and future directions.

2. Background

2.1 Design Reviews

Design reviews are universally known and accepted approaches for communicating and evaluating the state of design evolution to stakeholders both in practice and in educational settings, and take several meaningful and legitimate forms [5, 6]. In practice, design reviews may be required as part of company standard processes, a binding contract, or, as in the case for the development of medical devices, to be conducted as part of the regulatory regime [7]. They are a control on the design process to ensure that the needs of different stakeholder are met, intended uses and applications attained, and specified requirements followed [8]. Hallmarks of an effective review are that all potential non-conformances and risks have been identified and a plan made to address them, and that the review conduct was held in a positive and constructive tone [5].

While the main purpose of design reviews in professional practice is to evolve and critique the design (outcomes), the primary purpose of such reviews in education is for learning and formative assessment. Also, design reviews in education are meant to follow closely the design process itself, and not just produced outcomes. In many respects, the design review paradigm is a derivative of the centuries old mentor-apprenticeship model of working and learning [9], and leverages experiential learning principles put forward by Dewey [10], Kolb [11] and others. A secondary purpose of design reviews is to evaluate the state of the design to the specified requirements and to find potential areas for improvement. In the discipline of design, learning from failure may be considered a deeper learning result than learning from success; and this can be at odds with the traditional assessment systems that tend to penalize failure. Experienced design faculty know that reviews in engineering education are opportunities to facilitate learning of design, and therefore require a different approach to question-asking and dialogue. External examiners and clients tend to *short-circuit* student learning during reviews by *divulging the answer or approach* to students, rather than leading the students along to self-discovery [12]. It is thus important to distinguish the primary purposes of design reviews in professional practice and design education. And, ultimately, the importance and role that feedback and question-asking have in these different, yet equally important, contexts.

2.2 Feedback

Shute [13] defines formative feedback as *"information communicated to the learner that is intended to modify his or her thinking or behaviour for the purpose of improving learning"* [p. 154]. Feedback forms an essential element of the design review, and must be effective for student learning in the cognitive, affective and motivational domains of learning [14]. It must also be effective in evolving the design, evaluating it against requirements, identifying errors and applying lessons-learned knowledge from previous project experiences [15]. Feedback can be provided by many stakeholders in the design project and learning endeavour, including students, instructors, clients/partners, and experienced professionals acting as guest reviewers. As such, there have been recent efforts to try to characterize feedback in design reviews [16, 17].

Feedback given by design review participants has been characterized in the recent literature as comprising of components of *focus* and *substance* [18]. Others have proposed that feedback consists of an *evaluative* or *verification* component, as well as an *informational* or *elaboration* component, the former assessing the quality of the information given, and the latter providing direction for progress [13, 19]. Ellis [20] makes a distinction between feedback that is *direct* - i.e. identifying the problem and how to address it, and feedback that is *indirect* - i.e. identifying that an error exists without providing corrective advice. Feedback has also been characterized in terms of *helpfulness* [21], and in terms of *length* and *complexity* [22].

Another approach has been to categorize feedback according to whether it encourages students to take *convergent* or *divergent* paths. A study of feedback across the disciplines of dance choreography, mechanical engineering and industrial design found that, in all three disciplines, feedback that facilitated *convergent* pathways and actions was more prevalent than feedback that triggered *divergent* pathways, which promote exploration in design [23].

More recently, Hurst and Nespoli [16] proposed a typology of feedback that comprised two dimensions: *topic* and *function*. The *topic* dimension describes the focus of the given feedback, whether it pertains to the *design*, its *communication*, or its *management*. The *function* dimension identifies the intended purpose of the feedback - whether it is to *comprehend* or *evaluate* what is presented, or to *recommend* an advancement of the design to a future improved state. The *comprehension* function in particular is further sub-categorized into different classes and categories of questions, as described in Section 2.3.

2.3 Question Asking

Question asking is a fundamental mechanism in design cognition [24] and thus a key element in design review meetings and feedback exchanges. Questions can, for instance, be used to elicit information, opinions, test someone's knowledge, or challenge one's mindset to explore new directions and gaps in existing knowledge. The role of questions has been studied in different domains such as philosophy, logic, linguistics, artificial intelligence and cognitive psychology [25]. More recently, in the field of engineering design, Eris [4] developed a question-driven design thinking model, which builds on the work of Lehnert [26], and Graesser and McMahen [27]. Some of Eris' key findings include the observation that the incidence of high-level questions by engineering designers was shown to correlate with better design performance in a design task carried out in the laboratory [4]. Following Eris' research, the role of questions has also been studied in student-instructor interactions during *design reviews* in industrial design settings [12]. In that study, researchers suggested that instructors ended up giving a number of directives to students, instead of exploring (self-discovery) learning opportunities where question-asking could have been used to challenge students to articulate and further analyse their behavior while designing. Similarly, a recent study found that, compared to student peers, instructors give more direct assessment and recommendations to students [16]. On another study, this time on the impact of question-asking during *design activity* [28], researchers identified a sequence of *cognitive moves* triggered by reflection on dissatisfaction (about the current design situation), and in turn, facilitated by the formulation of high-level questions that steered the discourse into new creative design directions, these were named *inflection moments*.

In this study, we use Eris' [4] question-driven design thinking model as the primary lens through which we explore the role of inquiry in design reviews and respective feedback interactions. The model makes a distinction between three classes of questions that are asked in design discourse (including design activity and design reviews):

- *Low-Level Questions* (LLQs) – leading to primarily clarification on missing or incomplete information during communication. This class of questions is subdivided into nine categories: *verification*, *disjunctive*, *definition*, *example*, *feature specification*, *concept completion*, *quantification*, *comparison* and *judgemental*. An example of such question would be: *What did they use to build the final design model?* This particular example is denominated as a *concept completion* question where the questioner wants to know a missing piece of information about a specific situation. A possible (fictitious) answer would be: *"They used balsa wood."* Low-Level questions are essential in design communication when different actors are talking about aspects of their process or about design content. Questions in this class facilitate *convergent* thinking processes by relying on the premise that a specific answer, or set of answers, exists. Thus, there is an expectation that Low-Level questions hold truth-value, because the questioner assumes the respondents believe their answers to be true.
- High-level *Deep Reasoning Questions* (DRQs) – leading to causal explanations of a phenomenon under discussion. This class of questions is subdivided into: *interpretation*, *goal orientation*, *causal antecedent*, *causal consequence*, *expectational*, *procedural* and *enablement*. An example would be: "*Why do we always have to use brainstorming as an idea generation method?"* This particular example is denominated *goal orientation* where the questioner wants to know the motives or goals leading to the decision of using a particular approach. Similar to Low-Level questions, Deep Reasoning questions prompt *convergent* thinking towards existing answers (already) in someone's mind.
- High-level *Generative Design Questions* (GDQs) – leading to reframing and conceptual explorations of problem and solution spaces. This class of questions is subdivided into: *proposal-negotiation*, *method generation*, *scenario creation*, *ideation* and *enablement* (a slightly different variation of *enablement* in the Deep Reasoning class). A couple of examples would be: "*What else can we use instead of fabric for this product?"*; "*What might be a really new kind of material?"* These specific examples fall under the *ideation* category with the questioner trying to encourage others to move away from the facts to the possibilities that can be generated from them. Such questions are characteristic of *divergent* thinking, under the premise that there might be multiple alternative known and unknown answers, regardless of being true or false.

Deep Reasoning Questions and *Generative Design Questions* are seen as *high-level questions*, as they entail a type of cognitive effort that relates to higher level educational objectives from a Bloom's taxonomy perspective [29]. *Generative Design Questions,* particularly, trigger thinking about possible answers that have not yet been conceived and are thus unknown at the time they are being formulated. Nevertheless, *Low-Level Questions* should not be perceived as "less important", as they play an essential role in (design) communication and without them it would not be possible to engage in High-Level Questions.

3. Research method

We performed the present study in a fourth-year management engineering capstone design course at a large North American university. The program is interdisciplinary in nature combining applied operations research, information systems, analytics, and behavioural science. This breadth is reflected in the variety of the types of design projects students undertake, with most falling under two (sometimes overlapping) general categories. In the first category of projects - Operations Research (OR), students design improvements to the operations of an external client, using descriptive, predictive, and prescriptive analytics. Projects that fall in the second category - Information Systems (IS), are software systems that typically improve or automate an existing process.

In the course, 15 student teams participated in three design review meetings, each 90 minutes in length, that were centered on the *exchange of peer feedback*. For the purposes of these meetings, the 15 teams were clustered into five larger groups of three teams each. Each cluster of three teams, named "super-groups", were brought together

because of the similarity of their project type. Before each review meeting, all three teams in the same *super-group* exchanged their most recent draft of the project report and any other produced artifacts or evidence of progress. The purpose of this exchange was to familiarize teams with the design projects of other teams in their super-group. During the review meetings, teams took turns briefly summarizing their progress in the project, for about 15 minutes each. In the remaining time, they received feedback from the other two teams in attendance, primarily in the form of questions. The role of the instructor and/or the teaching assistant was to facilitate and observe; they did not provide feedback to the teams during the meetings. After each review meeting, teams submitted a reflection document in which they detailed all feedback exactly as they received from each of the other two teams in their super group, and rated its overall quality on a 5-point (non-linear) scale: 0 (Unsatisfactory), 1 (Marginal), 1.5 (Satisfactory), 1.75 (Very Good), 2 (Excellent). In addition, they were asked to identify the most valuable feedback (i.e., specific comments/questions) received and explain in writing why they were judged to be valuable.

While asking students to submit a reflection on their review meetings is not a new feature, asking them to rate the *value* of the questions and feedback they were asked/given and explain *why* has, as far as we can ascertain, not been done before. This brings a new research perspective to the study of the role of inquiry in design, by allowing us to look into the perceived *value* of questions formulated in design discourse as seen from the students' standpoint.

To perform our analysis, we collected the following data:

- Evaluation of each team's quality of feedback provided in review meetings, as assessed by the teams on the receiving end - hereon referred to as "feedback score";
- Each team's grade in the project, as an approximate indicator of the team's design quality - hereon referred to as "design score";
- All questions and feedback comments provided by each team, as captured by the teams on the receiving end;
- A record of which questions and feedback comments (from the above) where evaluated as "valuable" by the receiving teams.

Using data from all 15 teams, we first performed a correlation analysis between these variables: 1) feedback scores, 2) design scores of teams giving and receiving feedback; 3) quantity of feedback; and 4) quantity of feedback identified as "valuable". Given that each of the 15 teams receives feedback from two other teams, three times in the term, this allowed for a maximum of 90 permutations.

In the second stage of the analysis, we used the question-asking taxonomy (Section 2.3) to categorize each question. We coded all design review meetings by extracting all of the verbal questions from the captured written discourse. Primarily, we defined a question as: *"a verbal utterance related to the design tasks at hand that demands an explicit verbal and/or nonverbal response"* [4, p. 36]. Design tasks in this context include content as well as process-related questions.

At this stage, we only used data from the review meetings in which seven of the fifteen projects (all in the Operations Research - OR category) were being reviewed. The reason for choosing a subset of the data was because the content of the feedback in a review meeting can depend considerably on the type of project under review, especially when comparing projects in the OR and IS categories. For example, a great number of the feedback that students give their peers working on IS projects is related to new product features. This type of feedback is not common in the OR projects.

Each question/comment was independently coded by two of the authors. Both authors involved in the coding are quite familiar with the taxonomies being used, having used those in the analysis of previous data sets from design reviews and design activity. Prior to coding this data, both authors went through a few coding iterations (involving detailed discussion on many instances) of other subsets of the data not used in this paper. This was meant to increase the likelihood of achieving acceptable levels of agreement when coding the data independently. The agreement level between the two coders was substantial (Cohen's $k = 0.65$) at the broader-level when we consider the three main

classes of the questions – Low-Level/Deep Reasoning/Generative Design Questions; and moderate (Cohen's k = 0.55) at the more granular-level when the specific labelling of questions within each of these broader classes is used.

4. Results

A tabulation of all *completed* records of a team receiving feedback (including being asked a number of questions) from another team resulted in 88 such instances. Each team directed an average of 6.52 questions/comments to each of the other teams in its super-group (of three teams each) during each review meeting. On average, 2.36 of those questions were identified as valuable by the receiver. The average feedback score received by each team was 1.79 (and thus between 1.75 – Very Good and 2 – Excellent, see Section 3).

Next, we performed a Spearman Rank-Order Correlation analysis between the following variables: 1) the design scores of the teams giving and receiving feedback; 2) the quantity of overall feedback given; 3) the quantity of "valuable" feedback given; and, 4) the feedback scores. A correlation matrix between these variables is presented in Table 1.

Table 1: Spearman's Rank-Order Correlations between feedback attributes and design scores

	Design Scores - Feedback Giver	Quantity - **All** Feedback	Quantity – **Valuable** Feedback	Feedback Score
Design Scores – Feedback Receiver	-0.28*	-0.04	-0.22*	0.02
Design Scores – Feedback Giver		0.46***	0.30**	0.21*
Quantity – **All** Feedback			0.60***	0.45***
Quantity – **Valuable** Feedback				0.31**

*$p < .05$; ** $p < .01$; *** $p < .001$

First, we found that: *high performing teams provided more feedback and more valuable feedback within their "super-group"*. The correlation between the *design scores* of such a team and the *quantity of <u>all</u> feedback* they provided to others is moderate and significant ($r(86) = 0.46$, $p < .001$). There is also a weak but significant correlation between the *design scores* of a team and *quantity of <u>valuable</u> feedback* they provide others ($r(86) = 0.30$, $p < .01$). This means that high performing teams provided a higher quantity of feedback that is specifically identified as valuable by teams receiving that feedback.

Second, we found that: *more feedback results in more valuable feedback and better feedback scores*. The correlation between the *quantity of <u>all</u> feedback* and the *quantity of <u>valuable</u> feedback* a team provides another team is strong and significant ($r(86) = 0.60$, $p < .001$). In other words, the more feedback a team provides, the larger the number of feedback comments/questions that are specifically identified as valuable by the team receiving the feedback. Similarly, there is a moderate and significant correlation between the *quantity of <u>all</u> feedback* a team provides and the *feedback <u>scores</u> received* on that feedback ($r(86) = 0.45$, $p < .001$). That is, the more feedback a team provides, the higher score overall they get on that feedback. Finally, there is weak but significant correlation between the *quantity of valuable <u>feedback</u>* a team provides and the overall *feedback <u>scores</u>* they receive ($r(86) = 0.31$, $p < .01$). Thus, the higher the number of feedback comments/questions that a team provides that were specifically identified as *valuable* by the receiving team, the higher the overall *score* that team's feedback receives.

Given that high performing teams provide more feedback and more feedback leads to better design scores, it is no surprise that there is a significant correlation between the *design scores* of a team and the *feedback scores* they received on their feedback ($r(86) = 0.21$, $p < .05$). This suggests that the stronger the team providing the feedback, the higher their feedback is rated by the receiving team. Finally, there is a (negative) weak but significant correlation between the *design scores* of the team that receives the feedback and the *quantity of feedback received they note as valuable* ($r(86) = -0.22$, $p < .05$). In other words, the weaker the team, the fewer the number of questions or other feedback comments they receive that they identify as valuable to them.

The remainder of the analysis focuses on investigating how feedback that is deemed *valuable* compares to the rest of received feedback. The objective was to determine if there was a relationship between the type of questions (Low-Level versus High-Level) and their likelihood of being perceived as valuable by the recipients. Further, of interest was the relationship between the teams' performance (design scores) and the quantity of High-Level questions asked.

The reviews of the seven projects that were chosen for this analysis had a combined total of 309 questions and feedback comments. Figure 1 shows the distribution of feedback in two dimensions: its categorization, and, whether it was identified as valuable. Of the 309 total feedback utterances, 35 (11%) were not posed as questions (labelled "n/a"). The remaining 274 (89%) were either clearly recorded as questions or the original question could be feasibly inferred, from the written comments. These utterances were further categorized as Low-Level questions (70% of the total 274), and High-Level questions in the Deep Reasoning (19%) and Generative Design (11%) question categories. The most common types of questions were *verification*, *concept completion*, and *judgemental* in the Low-Level category; *procedural* in the High-Level DRQs category, and *proposal/negotiation* and *method generation* in the High-Level GDQs classes.

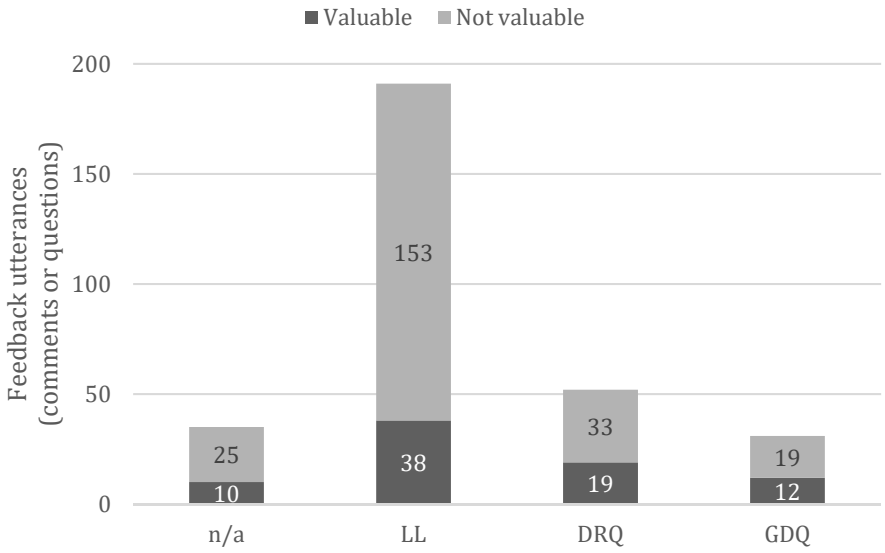

Figure 1: Distribution of feedback according to type and value

Focusing on questions alone, we first sought to determine if the distribution of questions by question type would be different for questions identified as valuable compared to the rest. We constructed a 2x2 contingency table to investigate the association between the class of questions, Low-Level versus High-Level (DRQs and GDQs), and its perceived value (identified as valuable vs. not valuable). A chi-squared test with Yates correction reveals that there is a significant association between high-level questions and questions regarded as valuable (X^2 (1, N=274) = 9.355, $p < .01$). That is, *High-Level questions were more likely to be perceived as valuable.*

We then looked to determine if there was a relationship between the distribution of questions by question type and the design scores of both the question askers and receivers. We ran a Spearman's Rank-Order Correlation and found no significant correlations between the proportion of High-Level questions (relative to all questions) and both the design scores of the team that asked the questions ($r(7) = 0.41$, $p > .05$), and the design scores of the team that received the questions ($r(5)= 0.52$, $p = .229$).

5. Discussion

As above mentioned (Section 3), our contribution to research on the role of *inquiry* in design reviews and respective *feedback exchanges* lies primarily on having students thoroughly reflecting on the *value* they attribute to such type of interactions in design discourse.

The first findings relate to the relationship between the *quantity* of feedback teams provide and how that feedback is *valued* by the receiving teams, as formulated by research question 1:

1. How does the articulation of feedback and perception of received feedback relate to students' performance?

We found that high performing teams (i.e., those with higher design scores) provide more feedback to their peers. This result is in line with a previous study that investigated this relationship in a similar context [16]. In addition, high performing teams provide a *higher quantity of valuable* feedback, as evaluated by the recipients. These results are quite plausible - all things being equal, more feedback should increase the quantity of more valuable feedback. However, this also raises the issue of whether this is the best approach to feedback, and if targeted' feedback - asking fewer but more valuable questions- would be something to strive for. Finally, the more feedback a team provided, the higher the score they received from the team on the receiving end. This is not a surprising result. We would expect that a team that is providing a large amount of feedback is highly engaged in the review of another team's project. Therefore, their feedback would be viewed positively by the receiving team. In summary, there is some evidence to suggest that *high performing teams provided not only more but also better (or more valuable) feedback,* and were recognized for this behaviour by the receivers with higher feedback scores.

We also investigated the questions asked in the review meetings and whether there was a relationship between the class of questions formulated and whether they were perceived as valuable. This relates to research question 2:

2. How are questions perceived, valued, considered/discarded during peer-to-peer design reviews?

Overall, the majority of questions asked (70%) were of the Low-Level type, while the remaining 30% were High-Level Questions. We observed that *high-level questions are more likely to be perceived as valuable*. This is logical. Low-Level questions are asked primarily for the benefit of the questioner who might be seeking to clarify, or complement, gaps in information about aspects of the designs generated. Deep Reasoning questions (generally speaking, the 'why' questions), may be asked for both the benefit of the questioner and receiver, as they are more prone to trigger some level of dialogue about the rationale behind certain actions and decisions during the design process. Lastly, Generative Design questions are those more likely to have a tangible impact in the receiver's way of thinking and ongoing work by challenging the consideration of new perspectives. In summary, Low-Level questions are essential in facilitating (design) communication, but they are perceived as having a lower value for learning [25], in part because the receiver knows the answers. In contrast, the more 'sophisticated' High-Level inquiries [4], require a sharp articulation of the reasons behind events during the design process or the cognitive engagement in the challenging space of (yet) unknown answers - both potentially instrumental in students' learning process.

We also investigated the relationship between the proportion of High-Level Questions and the design scores of both the feedback givers and the receivers, prompted by research question 3:

3. How does question-asking during peer-to-peer design reviews relate to students' performance in the design project?

We found no significant correlations. However, the proportion of High-Level Questions correlated more strongly with the design scores of the feedback *receiver* than that of the *giver*. A related finding is that there is a significant

negative correlation between the design scores of the feedback receiver and the quantity of feedback they identify as valuable. In summary, *low performing teams elicit less valuable feedback*. Although they are generally paired with stronger teams, proven by a significant negative correlation between their respective design scores, this does not result in them being asked more High-Level questions by the high performing teams. This is surprising, as we would expect low performing teams to be an 'easy target/recipient' for valuable feedback facilitated by challenging High-Level questions. Interestingly, this perceived reception of less valuable feedback is not an oversight on the low performing team's side, but rather a communication problem. It appears that high performing teams are forced to ask more Low-Level questions of the low performing teams (they are paired with) since the latter are not effective in communicating background details about their project - both through the pre-meeting report and the in-meeting presentation. As explained above, this requires the feedback givers to spend more time asking questions that facilitate the communication/clarification of design issues, which end up being perceived as of little value to the respondents.

6. Conclusions

Our work opens up a new area of inquiry where we have asked design review participants to rate the value of questions and feedback they received from their peers. The main two findings of our study are that: (1) high performing teams provide *more* and *better* feedback during peer-to-peer design reviews, and (2) High-Level questions are perceived as more valuable than Low-Level questions.

Yet, it is high performing teams that are also the beneficiaries of receiving more High-Level questions. Low performing teams, who receive more Low-Level questions, are then more likely to rate the overall feedback received as less-valuable. A likely explanation is that low performing teams might have been unaware of their poor communication skills. Such shortcomings resulted in a hindrance to them being asked more challenging, and yet potentially useful, High-Level questions that could have furthered their design work.

High-Level questions facilitate feedback exchanges that are aimed at challenging ways of thinking and behaving with a view to improve learning. However, in a more holistic perspective, it is also important to consider that Low-level questions are quite often a precondition for High-level questions to emerge, and thus they also play a crucial role on the whole process. Therefore, and especially in educational settings, whereas one might strive for asking 'good questions' (which might primarily be associated with high-level questions), Low-level questions might be necessary to avoid misinformation and wrong assumptions about the problems and contexts under consideration.

Overall our findings support the importance of question-asking skills in design education, specifically, emphasizing the importance of High-Level questions and the relationship to team performance. A future study might ask: *"How does one learn to ask good questions?"*; and, *"How does one teach the asking of good questions?"*.

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