Objectivation in design team conversation

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In this article we report our study of objectivation in the conversation of a design team. Objectivation is the practical work in which groups engage to produce social objects that facilitate orderly collaboration. We observed how design team members came to agree on specific details about an educational simulation they were designing, as they treated simulation features like independent social facts that could be affected by and have effects on other simulation features, and that had discrete benefits that made them an asset within the product. In our report we describe patterns of objectivation in their conversation that produced these results. We conclude by discussing how our study relates to, and enriches, the findings provided by prior design research.

A common orientation in design research has been what Sharrock and Anderson (1994b) called the taking of an "'external' representation of the design process" (p. 5). By this they meant studying design as a collection of specialized methods, where researchers "seek to achieve a formal and abstract representation of the structure of design and analyse the component activities making up the overall organization of the design task. . . . with the eyes of an 'outside observer'" (p. 5). In contrast, a growing body of research has investigated design from the perspective of the work involved as it is "organized and understood by the participants themselves" (Martin, 2012, p. 589). From this viewpoint, while it is acknowledged that design is recognizable, in part, by its methodologies, only focusing on these hides much of what it is that designers actually do to navigate their social interactions (Button & Sharrock, 2000; Fleming, 1998; Jornet & Roth, 2018; Matthews & Heinemann, 2012). This research is developing a picture of how resourceful designers can be as they cope with complex situations, without necessarily resorting to the rules or structure provided by design methods (Matthews, 2009). They improvisationally respond to what is immediately before them, taking one step at a time, and draw on whatever social resources are available as they try to answer "the practical question … [of]

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what to do next" (Garfinkel, 1967, as quoted in; Button & Sharrock, 2000, p. 47).

Our purpose in this article is to contribute towards this body of research. We report a case study of some unplanned, emergent methods a design team employed when confronted with a need to figure out what to do next, in response to an issue that arose in a project on which they were working. From an external point of view, the result was their articulation of a set of product details that as observers we could call requirements or design decisions. But the team did not arrive at that point by applying requirement definition or decision processes. Instead, as they talked about a certain feature of their product, they spoke as if it was an object that already existed, with properties that were already defined and recognizable. To help highlight these aspects of their conversation, we draw from the concept of "objectivation," a social method people employ to turn "[their] thinking or activities into *objects* that are publicly available for [them] to use for organizing the local orderliness of their affairs" (Liberman, 2018; emphasis in original). Objectivation is one of the local — and often invisible — ways that groups "get on the same page" as they are engaged in unfolding attempts to coordinate what they are doing. In our study this meant that our participants collaboratively defined details of their product and achieved agreement on the actuality and utility of those details, without explicitly referring to their need to achieve those aims. Using the pattern of objectivation described by Liberman (2018) as an interpretive lens, we focus on salient characteristics of the team's conversation that produced these results. We were therefore guided by two questions in our research. First, what patterns were revealed in the design team's conversation when examined through the lens of objectivation? Second, what did those conversational patterns accomplish in terms of addressing a project issue that arose?

1 Literature review

1.1 Studying design as situated action

We position our research in the body of literature that has investigated design from the point of view of it being "a kind of situated action. . . . [that] emerges over time, in unique circumstances, with other people, through complex, situated acts of seeing, saying, and doing" (Fleming, 1998, p. 41). This research is often conducted from an ethnomethodological (Garfinkel, 1967) or conversation analysis (Sacks, 1992) perspective. In these views, rather than assuming the order found in any social practice is a given, order is taken to be the product of participants' skillful and improvisational engagement with each other and with the world. Therefore, the organization and intelligibility of a practice is an ongoing achievement, not the result of external forces or social rules acting upon the people involved. It is based on actions — including talk — that participants deploy. As Packer (2018) summarized, "like good jazz, social action is

artfully made up on the spot from available resources rather than following pre-scribed rules" (p. 238). Therefore, if one hopes to understand a social practice, one should go beyond the level of analysis available through many methods common to the social sciences, that *a priori* presume people's behavior is the output of hidden structures or is an instantiation of abstract concepts. Instead, researchers should examine the details of the activities directly, attending to the effects or consequences they have for the people within the situation, as the means of understanding what and how a form of organization or mutual intel-ligibility was accomplished (Liberman, 2013). For more on ethnomethodology, see Heritage (1984). For more on conversation analysis see Liddicoat (2007).

From this perspective, design should be considered more than a static rule sys-tem that designers merely learn, then apply. While design certainly involves recognizable methods, such methods cannot account for the full range of ac-tivities involved when designers' *in situ* practice is analyzed (Matthews & Heinemann, 2012). Designers' interests typically lie in coping with whatever circumstance is immediately before them, above the aim of following what their methods dictate (Button & Sharrock, 2000; Sharrock & Anderson, 1994a). Further, design methods themselves often seem to be "dependent in essential ways on the same order from which the other arenas of our interac-tions with each other in daily life are built" (Matthews, 2009, p. 74). Overall, design research conducted from this perspective has argued that the "external" orientation of identifying and specifying design processes and methods as structural entities existing apart from those using them has failed to capture the richness of interaction that characterizes design as a human practice (Sharrock & Anderson, 1994b, p. 6).

Findings from this literature help illustrate the kinds of insights available when design is viewed from the perspective of those involved. Campbell et al. (2019) analyzed design team interactions to discover three "moments" that consti-tuted their decision making (p. 306). They found that "design options emerge" out of designers' conversation in a manner that "it is impossible to always identify that there is *a priori* awareness among [them] that an occasion for decision-making is upon them" (pp. 306−307). Similarly, Oak (2012) found that issues like design dilemmas are often "suggested but never fully articu-lated" in designers' conversation, allowing them to build consensus while avoiding potentially intractable problems that might arise if they were to fully explicate their predicaments (p. 643). Heinemann et al. (2012) concluded that design interactions are often structured around "an overall preference for agreement and progressivity" (p. 204), even to the extent that those with different ideas collaborate in the rejection of their own suggestions so that agreement can be maintained. Luck (2013) traced misunderstandings that arose in design meetings. She found that they shifted in-and-out of focus within designers' conversation, and were only identifiable as misunderstand-ings based on the overall patterns of talk in which meeting participants

engaged, rather than being "discrete entities" that could be clearly detected based on clear criteria (p. 163). And Jornet and Roth's (2018) analysis drew attention to how something as simple as a design insight "is not the product of conscious and deliberate" cognitive processes possessed by a single designer. Rather, it is better characterized as a previously unseen "image" that becomes visible only after participants have prepared a ground for it through their talk (p. 47); "the creative activity itself [e.g., the design conversation] is the condition for the insight" (p. 44).

Common to these findings is a sense of difficulty involved in fully capturing design through static description or analysis. It comes about both as the result of designers' efforts to design as well as their attempts to cope with other factors that may be unrelated to their immediate assignment (Sharrock & Anderson, 1994a). But this does not mean design is a random process, or that it is without organization or structure. Research also shows how designers' social interactions can be "seamless and elegant" as they engage with a task at hand (Ikeya et al., 2012, p. 626). Designers are skilled in drawing upon a range of social resources, and in a real way make design out of whatever interactions are available to them in a particular moment of a particular circumstance—both those provided by design methods as well as from their everyday forms of social life (Button & Sharrock, 2000; Matthews, 2009).

1.2 Objectivation in social interactions

Our aim in this study is to contribute towards the literature of design as situated action. To do this, we draw from the ethnomethodological concept of objectivation. Objectivation refers to patterns of interaction in which groups engage to create social facts out of their conversation. It is "the work of turning our thinking or activities into *objects* that are publicly available for people to use for organizing the local orderliness of their affairs" (Liberman, 2018; emphasis in original). Objectivation is important because the objects that result can be "shared, retained, and communicated" by a practice community, providing them "a means for coordinating their actions." Sometimes the objects they create are physical, such as models, diagrams, rule books, or maps. In this sense, the products of objectivation function much like boundary objects (Fox, 2011), although they are not confined to facilitating communication across groups but are equally important within a group. In design contexts this type of objectivation could include sketching or other forms of design representation (Menezes & Lawson, 2006; Schembri et al., 2015; van der Lugt, 2005). Objectivation can also result in what Liberman (2013) called a "social object" (p. 215), or a nonphysical entity that emerges out of a group's collaboration that they can use to create or maintain the particularities of a social order. Examples might include the name of an abstract concept, or a rule that provides guidance through ambiguous situations. In design these

types of entities could also include the talk used to define product features (Jornet & Roth, 2018) or mark the boundaries of a design dilemma (Oak, 2012). In our study, when we refer to objectivation we will typically mean it in this second sense of a nonphysical, social fact.

In studies of objectivation, using the term *object* to describe the nonphysical results of people's collaboration is not an analogy or metaphor. Even if there are differences when compared to physical objects (e.g., they cannot be touched or held), social objects still "have a materiality" about them, as Liberman (2018) noted, "permitting parties to use them as focal points for their collaborative attention, i.e. for getting everyone together on the same page so they can commence the work of making their affairs orderly." They are "objective … social facts" (Garfinkel, 1988, p. 103), and can be affected by, and have an effect on, the group's actions and interactions. As Heritage (1984) said, "actors treat such accounts as real by acting on them — in this way making them real in their consequences" (p. 23). So, the actuality of a social object does not depend upon its tangibility. For instance, once a group agrees on a name for a vague concept, they can use that name to draw their collective attention towards certain details of it, much like they might with a map of an unfamiliar location.

Liberman (2018) provided a general pattern for recognizing objectivating actions in which a group engages. However, he cautioned this pattern should not be taken as a social law that structures interactions or is otherwise sufficient by itself to explain group activities. He developed it to encourage researchers to pay attention to aspects of a group's "local work of … coordinating their actions" that they might otherwise miss. The pattern is useful to the extent that it enables clearer understanding of a group's actual activities. It begins with two phenomena common in ethnomethodological research: (a) group members offering accounts of their action or thinking; and (b) those accounts being confirmed, or ratified, by others who are present. These stages lay the groundwork for later objectivation by demonstrating that an account has been adopted by the group, or that what has been communicated by one or more members is considered legitimate. As this occurs, group members often then (c) treat the account as a fact that exists apart from their own efforts. This could take place through the language they use to talk about it. They could give it a name, describe it in terms of properties or structure, or imply its objective existence using metaphor or analogy. Finally, groups frequently (d) disengage from their objectivated account, meaning they treat the account as if they are "unaware that the 'facts' they have adopted emerged within … social processes in which they just had a hand." This may occur as they speak about it a manner that disassociates it from themselves as situational actors, or treats it as having independent authority with which they must comply.

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Prior design research includes findings that seem reflective of the objectivating activities Liberman described. Matthews and Heinemann (2012) found designers considering design options "in indirect ways, such as through claims of the way the world 'is'" (p. 665). They also found designers using abstractions, such as concepts of value, as objective forces that facilitated their negotiation. Roth and Jornet (2018) traced the emergence of design features in designers' conversation as they labeled, named, or used gestures to give discrete identities to product features, or to set one feature apart from others. But Roth and Jornet also showed the fluidity of these activities; the same label or descriptor could take different functions, and play different roles in the conversation, depending on whatever issue the group was immediately facing. Similar conversational patterns can be seen in Button and Sharrock (2000), Ikeya et al. (2012), Martin (2012), and Oak (2012). Given the evidence of these patterns in prior research, our study attempts to extend what other scholars have found by intentionally examining objectivating activities in a design team's conversation.

2 Method

2.1 Case selection

This paper is a case study of how a design team responded to an issue that arose during a project, drawing on the concept of objectivation as an interpretive framework. Our case is drawn from ethnographic data we have gathered in our long-term study of a team designing educational simulations to teach teamwork in the context of STEM disciplines. This team, distributed across three universities (two R1 and one R2 institutions), and collaborating through video conferencing technology, was researching the effectiveness of their simulations as part of an NSF grant. It consisted of eight professors (including this paper's lead author), and a number of graduate and undergraduate students (including the two co-authors) whose participation ranged from a few weeks to a year or more. Over nearly two years we have collected dozens of interviews and video observations of team interactions, and hundreds of artifacts the team produced for various purposes (internal communication, prototypes, external reports, etc.).

For this study we report our analysis of segments taken from one, 75-min design meeting, recorded using video conference software. The meeting was attended by four team members who were designing part of the simulation's narrative structure. We will refer to them with the pseudonyms of Alex, Carol, Heather, and Mary. Mary was an undergraduate student studying information technology. Her primary role was the simulation's software development. The other participants were professors. Carol and Heather were from departments of information technology, with particular emphasis in human−computer interaction and user experience design. Alex was from

the college of humanities and was provided creative writing expertise. Carol was participating from one university and Alex, Heather, and Mary at another. None of the authors of this paper were meeting participants; we relied on the video recording for our analysis.

Instead of being a randomly selected case, this is what Flyvbjerg (2001) called an "extreme" case study (p. 78). Extreme cases are not meant to test a hypothesis. Rather, they are scoped to yield "the greatest possible amount of information on a given problem or phenomenon" (p. 77). They can also be used "for getting a point across in an especially dramatic way" (p. 78), and so are often useful precisely because of their uniqueness. Extreme cases provide a different view from which to understand a phenomenon, one that can reveal fresh insights about common things (Packer, 2018). Our judgment that this case is extreme is based on the depth of conversation our participants had around a single issue – what were the consequences for the simulation narrative if students failed to complete an assigned task – and how quickly this issue was translated from being an abstract point of discussion to a social object to which our participants attributed discrete properties and benefits. This suggested the case would be a rich data source that approached Flyvbjerg's ideal of providing large amounts of information about our phenomenon of interest.

2.2 Data analysis

Our data analysis used conversation analysis techniques (Atkinson & Heritage, 2006), supplemented by techniques for analyzing non-verbal interactions (Norris, 2004). We started with a transcript of the meeting (generated through automatic transcription software then corrected by the lead author using the video as a reference), that we segmented into speaker lines and annotated using a subset of Jefferson's transcript notation (see Appendix). We also analyzed the video to identify visual traces (posture, gazes, actions, etc.) of the team's conversation. To do this we documented the timestamp, took a screenshot, and briefly described what we observed. Our next step was to document the patterns of objectivation that occurred as participants spoke or otherwise interacted with each other. We inspected how group members responded to each other in the conversation, recording both how they took up and built upon the statements of their predecessors, along with what conversational features provided them material for the moves they made. We did not attempt to document participants' intent in their talk, but the effects that talk had on other team members, as made observable through their replies and reactions. Finally, using this material we organized our analysis into a narrative of the team's objectivated decision making. This primarily consisted of quotes and verbal descriptions of action, supplemented by selected screenshots (treated in our report with an illustration-style filter to help highlight relevant details). Our report takes the form of a narrative account of our analysis (Newkirk, 1992). The result is not a framework or theory of objectivation in design

conversation, but a story of the objectivation methods our participants used when confronted with a project issue.

2.3 *Limitations*

This was a single case study. As such, the objectivating patterns our participants employed, and the results those patterns had in their conversation, will not necessarily be universal to all design teams. Additionally, the context of our study was higher education; teams in other industries may have adopted other patterns of objectivation than did the one we studied. We recommend future research investigate other aspects of design teams' objectivating work, including as it takes place in other industries. Finally, our method does not allow us to make claims about whether our participants' conversation was more or less effective than other means by which they might have responded to the issue they were addressing. Our interest lay in the objectivating patterns they employed, as those patterns unfolded. It was beyond our scope to evaluate the quality of either their design process or the resulting product.

3 *Findings*

During the meeting segments we analyzed, Alex, Carol, Heather, and Mary identified distinct elements of the simulation they were designing, described specific details and configurations of those elements, and agreed on their inclusion in the product. All these focused around an aspect of the simulation's storyline that we will refer to as student failure, or the consequences that followed if students failed to complete an assigned task. However, what our participants were doing was not a result of applying requirement specification processes, forms of negotiation to reconcile competing views, or methods of decision making. The details and agreement they created emerged through unplanned, in-the-moment responses to a question one of them raised, when she was surprised by another question asked by a colleague. Our report analyzes how the team treated student failure like an object that was already available to be examined, and as they did this they also came to agree about what properties it possessed (see Table 1).

3.1 *Background*

As a preface to our analysis, to provide context we summarize the team's discussion that led to the segments we studied. The team was designing a simulation set in a city that, unknown to students, would shortly experience a cybersecurity attack. It began with students being formed into groups and given an assignment to review the city's IT infrastructure. They then worked together to address any weaknesses they discovered. The meeting we analyzed took place shortly after this sequence had been decided. It was a discussion about how to transition students from the initial phase into responding to the cybersecurity attack itself. As the meeting started, participants began discussing the transition as consisting of two parts: hackers first attacked the

Table 1 Summary of student failure's emergence in the team's conversation

What the team did	What the conversation accomplished
Accepted student failure as a necessity, then described its properties and structure as already observable facts.	An early articulation of how students would experience the simulation's story.
Described, then agreed, how student failure affected the form taken by other simulation features, as well as how it was affected by yet other features.	Further articulation of the simulation and its story, accomplished as they expressed a structure for failure that produced the effects to which they were agreeing.
Described positive results failure had for students using the simulation.	Added legitimacy that student failure was a useful element of the simulation's story.

city's utility billing system, then shortly after launched a new attack against the wastewater treatment facility to dump waste into the city's drinking water supply. Responding to the idea, Mary asked if the first attack was meant to prepare students for the second, like an initial battle in a video game that both unlocked and prepared players for the battle with the final boss, "cuz they did the billing cycle thing now they can access the wastewater? Is billing cycle more, like, this is your warm-up round?" Carol clarified that dual attacks were a realistic scenario a city could actually face; it was not merely a convenient game mechanic.

Alex then summarized the proposed narrative again: hackers would attack the billing system to see if they could penetrate the network, while also drawing attention away from their ultimate goal of contaminating the city's drinking water. He then verbalized a detail about the first attack that had only been implied in earlier comments, "students aren't able to stop that one," meaning the outcome of the attack on the billing system was fixed. Students would need to cope with the results but could not change them. Alex then asked a question about the second attack: should its outcome also be fixed? Would students always be required to stop it before moving to future challenges? Or would the simulation include "a scenario in which students don't cooperate [to stop the attack] and the wastewater treatment center does pollute the water supply?" Carol was surprised by the suggestion, "so there could be an everybody die situation, is that what you're saying?" Although likely unknown to our participants at the time, Carol's question set up the next few minutes of their conversation. It is at this point our analysis began.

3.2 Student failure as an observable object

Following Carol's question, our participants entered a round of conversation that ended with them agreeing that student failure was part of the simulation, and that it already possessed certain properties. This emerged as they talked about failure as an object with an existence at least somewhat independent of themselves as situational actors. Drawing from Liberman's (2018) analysis of how groups produce social objects, in what follows we highlight three

objectivating features of their conversation that accomplished this. First, Alex asserted that failure was necessary component of the simulation. Next, other participants accepted his position, resulting in its adoption by the team. Finally, they talked about failure as a distinct entity, describing its details and structure as being observed facts rather than options they were exploring. As they described and agreed to these details, they started to define how students would experience the simulation's story, without resorting to forms of requirement specification or decision making. We illustrate this through our analysis of the segment found in Figure 1.

The segment began with a transition phase, where the team quickly moved from Carol's original question to accepting that failure was an entity that should actually exist. This started when Alex asked again, "can [students] lose" (line 30)? He then immediately answered the question himself, "I feel like they should be able to lose the game" (line 31). Posing the question and

Line	Speaker	Transcript
28	ALEX	so so my question is if if they don't cut the <u>right</u> network
29		(1.2)
30		like they don't figure it out (.) can they lose?=
31		=>cause I feel like they should be able< to lose [the game.
32	HEATHER	[I feel ↑like they <u>should</u> ↓be able to lose.
33	ALEX	[cause if nothing's on the li::ne-]
34	CAROL	[yeah yeah ()]
35		we all should be able to- yeah yeah I think they- I I think that's a good point is that they should be able-
36	HEATHER	AND LIKE it's not like losing as in: the city is now shut down.
37	ALEX	no::
38	HEATHER	it's losing as in you didn't solve the problem we brought someone else to solve the problem [you're in prison you <u>failed.</u>
39	ALEX	[in the time in the time >alot- alot- allotted to you [right?<=
40	HEATHER	[yeah.
41	ALEX	=they have 59 minutes to solve the problem .hh they kept trying different no:des it didn't wo:rk and they lost.
42	HEATHER	it's like-
43	ALEX	[<u>I think</u> it should be hard enough that maybe <u>half</u> the teams fail.
44	CAROL	[yeah.
45	HEATHER	I go-
46	ALEX	<u>because</u> then you can play it again: [to figure it out.
47	HEATHER	[yeah.

Figure 1 Meeting segment: 03:03−03:42

immediately answering it without pause indicated that Alex was inviting his colleagues to indicate whether they agreed with him, more than he was setting up an open-ended discussion about what they should do. In reply, the other professors did respond in the invited manner, and accepted Alex's position rather than raising any alternatives. Heather agreed first, even before Alex had finished speaking (line 32). Alex then started to justify his position but did not finish as Carol also interjected her own agreement (lines 33–35). These steps settled the issue. From this point forward the existence of student failure was taken as a given, although we note that the team had not yet specified many details related to what it was that failure meant.

Leaving this phase, our participants next articulated a more detailed, but still not complete, description of what student failure was in context of the narrative. But instead of deliberating about possible ways that they could consider failure, presenting pros and cons of different alternatives, or otherwise exploring what course they should take, they started describing failure like it was an actual entity with at least an implied set of existing properties. Heather started, declaring that failure was "not like … the city is now shut down" (line 36), but is like, "we brought in someone else to solve the problem" (line 38). Alex added that failure occurred if students could not complete their investigation "in the time … allotted to [them]" (line 39). He also offered other details, "they have 59 minutes to solve the problem" (line 41), and "half the teams [should] fail" (line 43) so students "can play it again to figure it out" (line 46). Accompanying each of these were expressions of agreement without debate or discussion: Alex in line 37; Heather in line 40; Carol in line 44; and Heather again in line 47.

Our participants' adoption of these details was not only a matter of their assent to individual statements; Alex also linked the details about failure into a structure, to which others agreed with as well. This started while Heather was offering her account of failure (lines 36, 38). While she was describing the two states, Alex was at the whiteboard, sketching a clock (Figure 2). Even before she finished speaking, Alex pointed to the clock and added his detail that failure occurred if students exceeded a time limit (line 39). Heather's account, then, became the foundation for Alex's description; he assumed it was correct and added another property to it. In addition to his earlier agreement with what Heather said (line 37), relying on her statement for his own contribution acknowledged Heather's view as authoritative. It was no longer her individual preference, but something owned by the group, since for Alex's statement to be true Heather's needed to remain true. Similarly, after Heather agreed with Alex's account (line 40), he extended the growing structure by adding in the other details: the specific time limit (line 41), and level of difficulty (line 43). Together, as these statements were approved by others the entire structure took on a durability that went beyond the agreement offered to any individual account, since not only was each detail accepted on its own,

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Figure 2 Alex sketching a clock and using it in his account of time limits

but within the structure some had been agreed to as expansions or explanations of others, while some had been agreed to as justification for others.

These twin methods of talk resulted in an initial answer to the question Carol originally raised. Two participants contributed details to the articulation of student failure, and three (the ones with the most situational authority) agreed to the shape it took. They did this without deliberation, negotiation, or otherwise articulating that they were the creators of what was being talked about. There was also a sense of momentum in their conversation. Team members agreed with each other rapidly, sometimes even interjecting agreement before another's statement was complete. They built upon one another's statements, one providing a foundation for the next. Further, they often sounded as if they were verbalizing attributes of an already existing thing. There was no indication of anyone claiming a decision, nor were there clear moments where a decision could be identified as having been made. The description they ended with depended on all the discrete statements as well as the collection of confirmations and linking efforts. Yet it could not be reduced to any clear question of: is this what we want to do? nor a declaration of: these are choices we are making. Borrowing from Liberman (2018), they described failure as an objective aspect of their world, "plac[ing] the facticity of the matter out of the hands of any of the individual actors."

3.3 Student failure's relationship to other simulation features

The team then turned towards another aspect of Carol's question. They had already addressed whether failure existed; now they talked about whether it was an "everybody die situation," as Carol had framed it. They did this by articulating consequences arising from the type of failure to which they had agreed. This was reminiscent of Liberman's (2018) description of how objectivation helps facilitate people's understanding of what they are talking about; when they "objectivate [a] notion," they often start to "observe what that objectivated notion accomplishes" as a means of articulating more about what they have agreed upon. In our study, team members did this as they observed how one of failure's "accomplishments" was changes it triggered in the plot of the simulation narrative. They also observed how other simulation features

impacted the way failure emerged within the story. In this part of their conversation, the team added additional details to failure's meaning, still without planning them as requirements or specifications. While they were describing how failure affected, or was affected by, other simulation features they were indirectly creating a structure that could deliver those results. We illustrate this through our analysis of the segment found in Figure 3.

The segment started with the team agreeing that students' failure to stop the wastewater attack would not end the simulation, a conclusion that may have reasonably been assumed in their earlier conversation. This emerged as Heather compared the simulation narrative to an escape room (line 48). In the escape room, failure was not that "you … die or anything but you didn't figure it out and it's a different scenario than if you succeed" (lines 52–54). Similarly, to Heather the consequence of failure was that students would branch into an alternative version of the storyline that accounted for the fact that they did not stop the attack. Alex accepted Heather's statement in two ways, first by explicitly agreeing with it (line 55), and then extending it, "you can still move to phase three," and, "you can still figure out who did it even if you fail" (lines 59, 61). Carol likewise agreed with these additional details (line 62). So here the team set up a new storyline, triggered as an outcome of failure. But they did not do this by explicitly raising the possibility of an alternative narrative, then discussing whether it was an option they preferred. Like their earlier conversation, they talked as if it were an obvious fact that was set in motion when failure occurred. The same was evident as Carol added other details, such as, "the mayor will be really upset," (line 66) — details to which Alex also readily agreed (line 68).

This method of adding to the narrative was indirect, and seemingly unplanned. Team members were not engaged in a structured attempt to define failure, or the story, more fully, but instead built upon each other's immediately preceding statements, sometimes in a manner that suggested they were verbalizing ideas as those ideas occurred to them. The plot details that emerged were the result of their observations about the relationship between failure and the phase three narrative. They did not talk as if they were purposefully considering whether such a plot was a better option than others. It simply was the case that failure triggered a new story, and that story had certain properties.

Our participants also talked as if failure could be affected by other objects within the simulation. In contrast to much of our previous analysis, at this point some team members did more explicitly reference their own ability to choose, or to their personal views on various simulation features. Yet when doing this, they also referred to those features as already having certain properties that produced specific results related to student failure. So, in the end, they still did not define the connection between failure and other parts of the simulation by weighing the pros and cons of alternatives, negotiating to

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Line	Speaker	Transcript
48	HEATHER	I go back to the idea of the escape room just because they do have that scen[ario built in.
49	ALEX	............[yeah.
50	HEATHER	where
51		(0.3)
52		if you fa:il like you don't
53		(0.3)
54		die or anything but you didn't figure it out and it's a different [scenario than if you succeed.
55	ALEX	[yeah.
56	HEATHER	and you can still
57		(0.3)
58		have the [exit interview-
59	ALEX	.........[you can still move to phase three=
60	HEATHER	[yeah.
61	ALEX	=[you can still figure out who did [it even if you fail.
62	CAROL	.................................[yup yup yup
63		(0.4)
64		exactly yeah I think so too I think it will make the challenge
65		(0.2)
66		more meaningful and then they can play it again if they can lose.=and you know and then (.) in- instead of you know just like Flint Mi- Michigan it'll be really bad and the mayor will be really (.) upset but we'll bring (.) bottled water in or something.
67	HEATHER	how it's [like-
68	ALEX	.........[no that's good I like it I like it
69	HEATHER	the thing is with (.) with the different tie:rs they could pick?=that could influence what their to::ols be too.=so they might be able to play it [smarter next time.
70	MARY	.........................[() whether we wanted the [(.) to:ols we choose to impact what comes next=
71	ALEX	....[I lo:ve it.
72	MARY	=because that cha::nges some things that-
73	HEATHER	I THINK
74		(0.3)
75		in my mind this is how I viewed it.=the to::ols impact the:: (.) [scope of what they can see=
76	MARY	[()
77	HEATHER	=[so it gives them different [clues to figure out the puzzle.=
78	ALEX	[yeah ....[yeah
79	HEATHER	=so some tools will give them (.) [be:tter clues to figure out the puzzles than others.
80	ALEX	................................[yeah.

Figure 3 Meeting segment: 03:43−04:37

resolve competing interests, or deciding one course was more advantageous than another. They talked as if they were describing a course that was practically unavoidable, given the affordances of the situation.

We observed this as Heather and Mary started to tie student failure to a set of network analysis tools that students purchased earlier in the simulation (during the phase where they were addressing infrastructure weaknesses). Heather started by recalling that students had a choice about what kind of tools they bought, what she called "different tiers that … influence what their tools [were]" (line 69). She implied that if students failed, the next time they played they could purchase other tools that improved their ability to stop the wastewater attack, or as she said it, "they might be able to play it smarter next time" (line 69). Then, in one of the only times where the team's ability to choose was explicitly acknowledged, Mary wondered, "whether we wanted the tools that we choose to impact what comes next" (line 70). She also added, "because that changes some things" (line 72), as if she was going to describe how the tool feature would need to be adjusted to accommodate what Heather said. But even so, the form of Mary's contribution did not indicate that she was attempting to start a discussion to resolve the issue.[1] She was raising a point for consideration, or identifying a potential cost that should be considered, so any need for decision implicit in her observation was expressed indirectly, in a way that continued to orient the conversation away from explicit deliberation. Her oblique approach was more comparable to saying: keep this in mind, than it was: we need to stop and solve a problem.

Heather's reply equally avoided a deliberative mode. She described the tools as if they already had the effects that were relevant for the point she made earlier. "[They] impact the scope of what [students] can see," and, "[they give] them different clues to figure out the puzzle" (lines 75, 77). Although she was not dogmatic about it, starting off by saying, "I think," and continuing with, "in my mind this is how I viewed it" (lines 73, 75), she was still implying that it merely was the case that students' tool choice had an effect that they as designers had to accommodate; tools already "impact the scope," and "[give] them different clues." Heather did not justify her position in terms of it being a more preferable option than alternatives. Her reply indicated her disengagement from student failure as a fact she had helped create; she treated it and the tools as already being in a certain relationship to each other. It was that relationship that defined what the team should do, and not that they, as a team, saw advantage to something and so specified a feature that could accommodate it. Different tools gave different clues, and different clues meant failure was either more or less likely to occur. Alex agreed with Heather's explanation, acknowledging her views as authoritative (lines 78, 80). Thereby, further details about failure's fit within the overall simulation structure had been accepted in a similarly indirect manner as those about the narrative changes that failure introduced.

3.4 Student failure's effects on students

At certain moments within their conversation, our participants pointed out some positive results that failure produced for their students. But like their

original articulations of failure, and the narrative details that supported it, they talked as if they were confirming that they had described failure and its effects in a factually correct manner, and not that they had made good decisions about its fit in the simulation story. Implicit in their descriptions was a sense that failure already had the results they were vocalizing. These seemed to function as an indirect way of lending legitimacy to what they were in the process of accepting about failure's place in the narrative. Along with their explicit statements of assent, they were pointing out why this version of failure was valuable. So simultaneous to them describing failure and its associated effects as essentially inevitable, they were also describing it as something desirable. It was something they could welcome instead of something to which they had to simply acquiesce. We explore this by analyzing the segment found in Figure 4, where the team returned to their discussion of failure after a brief diversion onto an unrelated topic. We also highlight some of the same conversational features found in Figure 3.

The segment began with Alex summarizing much of the team's earlier conversation (lines 98−102). While doing this he also introduced a benefit of the type of failure our participants had been discussing, "essentially [students] can still have a positive learning experience," even if they failed (line 102). Heather accepted Alex's statement by adding a detail that he only partially articulated, but that had been explicitly established earlier, "they can still figure out who did it" (line 103). Both of them seemed to treat "figur[ing] out who did it," and "positive learning" as equivalent statements. Carol also indicated her agreement both through an explicit, "yeah," and also by drawing an analogy, somewhat unclear, but apparently comparing the simulation storyline to a mystery where, "you can find out who killed somebody" (line 107), and in doing so "save … lives" (line 109). Her point seemed to be that it was important to give students a sense of resolution even if they failed; good mysteries reveal who it was that committed the crime. Explicating these results served a function in the team's conversation. They were stating the value that failure added to the simulation, or that failure had a productive purpose. Yet they did this in a disengaged, indirect manner, as if these were natural consequences of failure rather than being the outcome of decisions they had initiated.

These statements of value were not isolated to this segment of the conversation. Returning to the segment found in Figure 3, there the team also highlighted some of failure's positive results. When Carol explained that failure would "make the challenge more meaningful [because students] can play it again" (lines 64−66), she was not claiming that failure imbued the narrative itself with some abstract sense of meaning. She was pointing towards the way that students would experience it. They would interpret the challenge as being more meaningful in light of the effects failure had on them. And when Heather said that after failing, students "might be able to play [the simulation]

Line	Speaker	Transcript
98	ALEX	but all all I'm saying is if they don't know how to cut which wire they try a bunch and the time runs out
99		(0.3)
100		they lo:se
101		(0.3)
102		but they still go on to phase three right=and they still fig- and they can still figure out they- and essentially they can still have a <po:sitive learning experience.>
103	HEATHER	they can still figure out [who did it.
104	ALEX	[because they can
105		(.)
106		[figure out who did it.
107	CAROL	[yeah (you have to find it) yeah you can find out who kil::led somebody right?
108		(.)
109		[so:: () save their lives (.) yeah
110	ALEX	[everybody everybody
111	MARY	[((laughs))
112	ALEX	everybody finds that out.
113		(0.3)
114	HEATHER	∘yes∘
115	ALEX	is that true?
116		(.)
117		everybody is able to lo:cate who's the the person responsible.
118	HEATHER	so the-
119	ALEX	because we want like ↓some happy ending.

Figure 4 Meeting segment: 04:59–05:28

smarter next time" (line 69), she was specifying another of failure's positive results. Upon a second playthrough the memory of their failure could prompt students to apply different evaluative criteria towards the network tools they selected. Smarter play meant smarter purchasing, at least in part. If students played the simulation again, they had the chance to choose better tools. If they chose better tools, they would find "better clues" (line 79), and hopefully succeed in their next attempt.

Specifying these results — positive learning, a sense of resolution, more meaningful challenges, and smarter playing — further added legitimacy to the type of failure the team had described. Not only had they accepted detailed descriptions of it, along with descriptions of the relationships it had other simulation objects, but they had also acknowledged that it led to worthwhile outcomes for their students.

Objectivation in design conversation

In the latter half of the segment, Alex explicitly asked whether others agreed with the position he had laid out about what failure meant in the simulation story. However, the way he did this still guided the team away from responding through direct expressions of decision or reference to themselves as decision makers. First, he restated one of the core features of failure in a declarative manner, "everybody finds that out," meaning everybody finds out who perpetrated the wastewater attack (line 112). He then asked, "is that true" (line 115)? His question was not: is this a good decision? Instead, he asked if his statement was true, as in: is it a factually correct statement that everyone finds out the hacker's identity? Alex's question was inviting conformation that he was correct in asserting this detail of the simulation narrative. The way he spoke seemed to assume the simulation already unfolded in this way, even though they had only just agreed to it; "everybody *finds* that out," and, "*is* that true" (emphasis added). This continued to produce an effect that failure was something that already existed. Alex disengaged from it by talking as if the team's role was to describe it and its benefits accurately, rather than to decide whether it was something they should create.

By the time Alex asked the question Heather had already agreed, having taken his factual statement as an invitation to confirm his account (line 114). Then, in a final declaration, Alex described another value arising from failure, "because we want … some happy ending" (line 119). While it was ironic statement, Alex seemed to be confirming again that failure was not terminal; in contrast to a scenario where failure brought the simulation to an end, this form of failure was a happy ending, at least comparatively speaking. In this final justification, Alex continued to point back to failure's benefits. Identifying the hacker was needed because of the ending it provided. The conversation concluded at this point, with Alex having indicated that failure, and the narrative that supported it, was not merely an outcome they had to accept, but was one the team could also consider desirable.

4 Discussion and implications

We have highlighted how our participants came to agree to specific details about student failure's place in the simulation story as they objectivated it into an independent social fact, that could be affected by and have effects on other simulation features, and that had discrete benefits that made it an asset within the narrative. These details emerged as responses to Carol's surprise about a story possibility that Alex raised, and not as intentional attempts to generate design specifications. But this does not mean the results were arbitrary. Participants did seem to have at least some preexisting ideas about the story that shaped what they discussed, as did other simulation features they had already defined. But even so, what they agreed to was improvised, based on moment-by-moment responses to conversational affordances. What failure became depended on how the team felt their way through a

murky space, where the step they would take next was not defined, and where even if some participants had previously thought about an option others appeared to be proposing ideas more spontaneously, and often indirectly (cf. Matthews & Heinemann, 2012; Sharrock & Anderson, 1994b). Failure's definition was not the result of deliberation, weighing alternatives, or (with one possible exception) considering repercussions of their choices. Most of the time they did not act like they were making choices at all. Our argument has been that these aspects of the team's conversation are clarified when viewed through the lens of objectivation. While we do not generalize our findings to claim that every design interaction will, or should, reflect the patterns in which our participants engaged, we do recognize the applicability of our report for design research and practice more broadly.

First, we discuss how our report can enrich understanding of related findings found in design research literature. We do this by reviewing how easily agreement emerged in our participants' conversation. There was only one clear moment when agreement was not immediately offered, when Mary alluded to implications of tying failure to the network analysis tools. But in general, agreement was rapid, often offered before a detail had been completely articulated. Early in the conversation this even meant that the team agreed to failure's necessity before they had fully specified what it actually was. This was reminiscent of Liberman's (2018) observation (that he attributed to Garfinkel), "agreements can occur before people understand just what they mean; but despite the blind into which a cohort is willing to enter headfirst,. . . [the] account *is binding* upon everyone, even before its sense and reference has been fully determined" (emphasis in original). Whether our participants held any unstated reservations about what they agreed to is irrelevant; the fact is they did agree, and each agreement led to them adding, and adopting, still other details that served to fix their earlier approvals into place.

The ease of reaching agreement in our study was consistent with prior research, such as that conducted by Heinemann et al. (2012), who studied agreement in design conversations and concluded that, "preferences in conversation for agreement and progressivity run deep, and are not easily overcome" (p. 211). While there are many ways a bias for agreement could manifest itself, it seems reasonable that the work of objectivation does facilitate it. It is likely easier to agree with what appears to be factual descriptions of entities outside of anyone's control, than it is to draw attention to differences of opinion, or to try and reconcile conflicting beliefs (cf. Matthews & Heinemann, 2012, pp. 665−666; Oak, 2012, p. 643). So, we suggest that understanding patterns of objectivation can provide additional insight into what might be going on in cases where design teams are found quickly and easily agreeing with each other.

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This leads to a practical implication of studying objectivation in design conversations. We do not assume the results of the conversation we studied were better or worse than the narrative details the team might have generated if they had used rational requirement specification or decision processes. Given that objectivation is a normal part of everyday social life (Liberman, 2018), there is no *a priori* reason to judge that what our participants did was either effective or ineffective in achieving the ends which brought them together. Nevertheless, it is easy to imagine cases where designers are unsatisfied with what results when they quickly assent to improvised descriptions of what they took to be objective, social facts, as much as it is to imagine cases of satisfaction. So, awareness of the kinds of interactions that produce objectivated accounts could serve as a diagnostic tool if designers are attempting to analyze what went wrong on a project. It can draw their attention towards moments where they might have conformed too much to their social facts instead of taking more intentional control over what they were designing. Understanding objectivation might also serve as an aid to the design process, giving designers a conceptual tool that prompts them to pause at moments where an objectivated account emerges so they can more purposefully fine tune its details to match their aims. We recommend further research to explore these possibilities.

We also comment on how our study of objectivation contributes to prior research that has argued against a view of design that reduces it to a set of unique processes or methods, as well as how it offers new insights about the kinds of logic designers might employ instead. In retrospect, talking about what failure meant in context of the simulation does not seem unreasonable, given the meeting's purpose was to address how students should respond to the simulation's core challenge. Yet from the transcripts it appears that at least some of the attendees did not anticipate they would take this particular turn. Even so, their discussion still proceeded at a quick pace, indicating that participants adapted to what started to emerge. While there were some pauses, these were typically short, with only one extending beyond four-tenths of a second. In context many seemed to be moments where participants were choosing a word or emphasizing a point, more than a sign that they were truly uncertain about what to say next. And the whole conversation — including the diversion we did not analyze — unfolded in less than 2 ½ minutes. Yet in this brief period the team agreed to some key details about the narrative that shaped several their efforts moving forward. Further, team members made whatever content they offered each other useful in maintaining this trajectory. Ideas, details, analogies, even Mary's possible concern, were taken in ways relevant to articulating what failure looked like, along with what it meant for other simulation features, even though formally doing so was not their explicit aim.

These factors lent a sense of richness to the conversation we analyzed. On the surface, what transpired could be characterized as somewhat unremarkable; team members described a few story details, and for the most part agreed with each

other. Yet such a description masks the lasting effects this short exchange had on the simulation going forward. It also does not do justice to the intricacies of the team's interactions, that wove details about failure together into a coherent pattern even though they had no agenda or plan for doing so. While it is possible that they would have also found formal specification methods useful, such were not required; the conversational patterns we have outlined were fully suitable. Further, according to Matthews (2009), it is unlikely that even if they had a method that it would have replaced all interactions we observed, but instead would have become another resource which team members could deploy to cope with their task. "Methods come to be of use to designers, to the extent they are deemed by participants to have local relevance for [their] actions" (p. 75).

All this suggests the difficulty of accounting for our participants' *in situ* design process in terms of discrete design events. Student failure emerged out of ordinary interactions like expressing a preference, describing a fact, agreeing with another, or observing an effect. While it is possible to map this objectivating work to design practices like framing, specifying, making decisions or judgments, and so on, such terms imply a type of intentionality and deliberateness that was not evident in our participants' actual interactions. Restating the particularities of their objectivating interactions so those interactions fit into theoretical design frameworks conceals too much of the practical work that went into how they produced student failure and its effects. We have already mentioned that we recognize it may be true that if the team had followed more intentional design methods they would have experienced outcomes that could have been considered better, in some sense. While we are sympathetic to this possibility, we do not believe it impacts our findings or their implications. Partly this is due to our simultaneous recognition that what the team accomplished may also have been perfectly adequate. As we have also mentioned, *a priori* judgement that the team must have been ineffective because they did not employ a certain method is not warranted without direct evidence, and so the argument circularly presumes its own conclusion. We also agree with Liberman (2013), who argued that researchers tend to dismiss too quickly the ordinary methods people use in their social interactions, because they evaluate those methods using frameworks that were partly designed to overlook the everydayness of what people typically do to create even distinctive forms of social order.

We therefore encourage researchers to be willing to find design wherever it happens, and describe it as it happens, rather than assuming it will only or dominantly take place through certain kinds of designerly interactions. Of course, designers will also be found engaging in explicit, designerly conversations about requirements, alternatives, and so on (in fact, we observed such cases in other team meetings with our same participants). But researchers should not be so focused on looking for design methods they expect to see, or even methods they have already observed being used by designers they are studying, that they miss other methods being employed at the same

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time. Our intent in analyzing design from the perspective of objectivation has not been to replace existing design frameworks with a new theory built around social objects; however, highlighting these less noticed patterns of objectivation, while also illustrating the accomplishments such patterns can achieve, helps substantiate that design is a more intricate phenomenon than what is customarily expressed about it from analytic perspectives (cf. Sharrock & Anderson, 1994b). In saying this, we recognize that our study alone only provides partial evidence for this conclusion. So we acknowledge other scholars whose collective body of research also helps demonstrate ways that design exceeds the abstract conceptions specified by design models (Abildgaard, 2020; Button & Sharrock, 2000; Campbell et al., 2019; Fleming, 1998; Ikeya et al., 2012; Jornet & Roth, 2018; Martin, 2012; Matthews, 2009; Sharrock & Anderson, 1994a). The contribution we hope this study of objectivation provides is to illustrate another form of logic that designers might employ to hang their interactions together into a distinctive form of social order.

5 Conclusion

Our purpose in this study has been to explore some of the unplanned, emergent methods a design team employed to respond to a project issue, using the concept of objectivation as an interpretive lens. We observed members of the team treat student failure as a configurable object in the narrative of an educational simulation they were designing, that could be affected by and have effects on other simulation features, and that had discrete benefits that made it an asset to the simulation. The contribution this study provides is to highlight conversational patterns of objectivation that design teams might use to respond to each other in intelligible ways, and how these patterns help illustrate how design can emerge out of even ordinary social interactions.

In conclusion, we recommend continued study of design as a "situated action" (Fleming, 1998, p. 41). Liberman (2013) argued that there is a "creative range of practical reasoning" people regularly exhibit, and an "ordinary expertise that is required [for them] to make sense of the world." But this is missed when their reasoning and expertise is "tamed" so that it can be better represented "by [scholars'] theoretical models" (p. 45). Our study of objectivation in design conversations is only one small glimpse into what design practice looks like when one resists the tendency to tame it. But we can only provide a trace of the practical reasoning that is evident in how designers actually accomplish the aims they are pursuing. So, we call on other researchers to contribute towards this growing body of literature, looking for the resourceful, but often delicate and subtle, ways that designers engage in meaningful, social interactions. This will develop a richer view of the activities that actually constitute design practice, and provide a more accurate depiction of the skillful ways that designers address the unpredictablity and uncertainty that they inevitably face.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Transcription Conventions

Character(s)	Function
[...]	Overlapping speech; open bracket placed where speakers began overlapping; closed bracket placed as needed to mark the end of simultaneous speech.
=	Latched talk, indicating speaker continued with no pause.
(x.x)	Pause, in tenths of seconds.
(.)	Pause, less than one-tenth second.
underline	Speaker-emphasized words or phrases.
:::	Lengthening of the preceding sound.
-	Speaker cut off (either by self or another).
?	Rising intonation.
.	Falling intonation.
↑ ↓	Rising or falling pitch.
CAPITALIZE	Higher volume compared to surrounding talk.
O O	Lower volume compared to surrounding talk.
> <	Quicker pace than surrounding talk.
< >	Slower pace than surrounding talk.
.hh	Audible in-breath.
(....)	Unintelligible talk.
(uncertain)	Transcriber's uncertainty about a word or phrase.
((description))	Description of non-verbal action.

Notes

1. We thank one of our anonymous reviewers for pointing out this aspect of what Mary said.

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