Conceptions of Work and the Materiality of the Classroom

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Abstract
Infrastructure studies have focused attention on invisible work as a topic of concern for system design, pointing to the ways important roles may be lost if they are not recognized. This paper extends this engagement with invisible work by describing how conceptions of work in the classroom are influenced by material configurations. Based on ethnographic observations and a design intervention, I consider tensions between this invisible work and a group’s shared competence, arguing that altering material configurations can reveal invisible work and challenge existing conceptions and values. In the context of the collaborative work of the classroom this can result in the surfacing of individual perspectives that must be negotiated.

Keywords: invisible work; materiality; education; design research


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1 Introduction
The work of the literature classroom begins out of sight, with students reading assigned material, making notes and performing individual research. Once in the classroom, students and instructors work from these materials to form divergent, individual responses into a discussion that meets with a shared conception of appropriate response. Students align past, invisible work with the direction enacted by class discussion in order to produce statements that are seen as valuable. As described below, valuable work in this context is seen as improvisational and as responding to the unpredictable course of discussion. In this way, there is a tension between work that occurs outside of class and work that occurs in the classroom, which is treated as if it was not the product of prior work. As such, the work of the classroom shares much with that found in other contexts, such as meetings, which often require individuals to translate prior, invisible work into on-the-spot performances that comply with group norms.

While researchers have pointed to work that is performed out of sight as a kind of invisible work (Nardi & Engeström, 1999) and discussed invisible work that occurs before a performance (Star & Strauss, 1999), there have been few empirical studies of this kind of work. Similarly, there has been little discussion of how invisible work is related to material contexts. Through an ethnographic and design research project, this paper extends understandings of materiality and invisible work by describing how conceptions of work in the classroom are influenced by material configurations.

2 Background
Below I briefly examine theories of invisible work. As the study described uses an intervention to the material configuration of the classroom, I also discuss various approaches to materiality, focusing on how constraints and affordances can be seen not just as revealing what is already defined as work but as influencing how such concepts are constructed.

2.1 Invisible Work
The study of invisible work has largely emerged from infrastructure studies that focus attention on the unseen aspects of systems that undergird work. As a tactic proposed for studying infrastructure, surfacing invisible work turns attention to the functions of actors whose unrecognized actions allow other processes to proceed (Star, 1999). For example, the work performed by a secretary to manage personal relations in an office may be invisible to those who benefit from it to do their own work.

Studies of invisible work often focus on two, non-mutually exclusive goals: to surface invisible work in order to address workplace inequalities (e.g., Goodwin & Goodwin, 1996; Luff, Heath, & Greatbatch, 1992; Star & Strauss, 1999) and to more accurately represent work in order to avoid building systems that leave out crucial but unrecognized processes. These agendas often overlap, as studies of the invisible work of telephone operators (Muller, 1999), medical secretaries (Bossen, Jensen, & Udsen, 2014), oceanographic data managers (Lindseth & Baker, 2012) and home help assistants (Westerberg, 1999) highlight the need for systems to account for and support this work.

Nardi and Engeström (1999) identify four types of invisible work: (1) work that is done out of sight, (2) routine or manual work that involves unacknowledged skills or problem solving, (3) work done by
people who are invisible because of their status, and (4) work that is not captured in formal descriptions but is still crucial.

Of particular interest for this paper are discussions of a specific subset of work that is done out of sight: work that comes prior to a performance of some kind. Star and Strauss (1999), for example, discuss the invisible, backstage work of athletes, performers and even scientists that enables them to represent their public, visible work as effortless or flawless. This backstage work is perhaps more common than has been recognized (Goffman, 1990); students reading and making notes before class and workers preparing for a meeting all ready themselves for a performance that is often more valuable if perceived as improvised. What is seen as spontaneous ingenuity is often the product of unseen hours of labor.

Central to these discussions are reminders that the invisibility of work is relative, with visibility dependent on the position of the observer (Muller, 1999; Star, 1999). The backstage work of the performer is, for example, only invisible to the audience, and Muller (1999) points out that for those studying work, the invisibility of work is dependent on method. Further, the value of surfacing invisible work is also dependent on the situation (Bishop, 1999; Nardi & Engeström, 1999). For this reason, Nardi and Engeström (1999) emphasize the importance of asking when the invisible should be made visible.

2.2 Materiality

While approaches to materiality vary widely across a range of fields, they share an interest in countering the idealist notion that words and ideas can fully represent objects in the world. Instead, materialist accounts focus on the material properties of objects and how they shape interaction. In computer-supported collaborative work, for example, researchers interested in materiality have looked to the ways objects afford certain interactions and enable communication. For example, Luff et al. (1992) investigate the materiality of paper documents, describing how their properties afford certain actions. A doctor can scan a paper chart for notes in her own handwriting, read the chart silently or position it so that the patient has access to the information as well. Similarly, Bowers et al. (1995) describe how the introduction of a workflow system in a print shop changed the affordances that allowed workers to communicate with each other and smoothly execute tasks.

Jacucci and Wagner (2007), however, argue that materiality does not just afford action but is also experienced through the senses and temporally. In this conception of materiality, objects are evocative and persuasive, communicating ideas in ways that are not possible in words. Further, Jacucci and Wagner point to the way relationships between individuals and materials emerge temporally. This concept of materiality shares much with Rosner’s (2012) recent work, in which she focuses on the ways that bookbinders interact with the material properties of string and leather, as well as the way these interactions structure the temporal flow of the workspace.

A similar approach to materiality is found in Latour and Woolgar’s (1986) description of the material configuration of the laboratory. Rather than focusing on how actions are afforded by material conditions or the unfolding experience of interacting with objects, Latour and Woolgar describe the ways in which the phenomena studied do not exist independently but are produced by the specific material configuration of the laboratory. In the context of how individuals coordinate and perform work, these descriptions of materiality suggest that specific actions do not exist, waiting to be afforded, but instead emerge through the interactions of people and objects. A similar approach is found in Jackson’s (2013) discussion of the role of material configurations in shaping vocations. In this account, a vocation, such as that of ecologists, is formed in relation to the material objects—trees, computers and other ecologists—that surround work. This work shares much with Barad’s (2003) theory of performative materiality, in which the boundaries between entities are not constituted prior to but always through engagement with the material world.

These performative theories of materiality do not entail a refutation of work on affordances. If material configurations provide the possibility conditions under which actions emerge as possible, materiality can be seen not just as constraining what actions can be taken but also how conceptual entities can be defined. A paper medical chart constrains the actions a doctor can take in communicating with a patient. But it is also through interaction with the chart’s materiality that the possibility conditions emerge for drawing the boundaries that delineate concepts like doctor, patient and even medical care.

Following these accounts, this paper approaches invisible work as a phenomenon that emerges through the contact of individuals and their material surroundings. While affordances play an important role in this process, I look to them not just as constraining what actions may be taken but also as setting conditions for how work is defined and made visible.
3 Method

To study the relationship between material configurations and invisible work, I conducted a study based on ethnographic and design research methods.

3.1 Ethnography

The ethnographic aspect of the study follows previous work that argues for the importance of this method in revealing invisible work and material practices that may be inaccessible to more formal descriptions of work (Blomberg & Karasti, 2013). Star (1999) also argues for the need for ethnographic engagement for the study of infrastructures that undergird actions the effects of which individuals may be unable to recognize. Similarly, the ways that materials influence conceptions of work are likely invisible to those embedded in the context.

The literature class I observed met three times a week. Each meeting was attended by between 15 and 24 students and one instructor. The students enrolled included a range of levels and majors: sophomores and seniors, literature and biology majors. I observed twelve class meetings over two months and interviewed five students about their experiences in and out of the classroom. Following Adler and Adler (1987), during observations I took the role of a complete observer. From a seat at the back of the room, I could watch students’ interactions before, during and after class, but I did not participate in discussions. Because this role prevented me from gaining insight based on the experience of participation, I triangulated my observations with interviews and the design research discussed in the next section.

3.2 Design Research

Design research, a method sometimes used in HCI and related design fields offers a unique way to study how materials influence work and the values that surround it. Fallman (2007) differentiates between design leading to new products and design leading to new knowledge. Related to the latter, a variety of approaches have been proposed, from those that see the act of making as directly offering insights into systems (Ratto, 2011) to those that rely on users’ reactions to a designed object placed in a context (Bardzell, Bardzell, Forlizzi, Zimmerman, & Antanitis, 2012). Gaver and Martin (2000), for example, describe how design proposals can be used to learn about alternative values related to product use without attempting to create an ideal product. Of particular interest for the current study is Odom et al.’s (2012) description of user-enactments. Adopted in order to understand how radical transformations of technological contexts might be received, user-enactments assume that material contexts and social identities and values are mutually constitutive. By creating situations in which participants can interact with a changed material context, researchers are able to gain insights into the consequences of adopting such a system on a larger scale.

The design research described here relies on the idea of enactments as a way to study the consequences of transforming a material context. While ethnographic methods are often used to reveal invisible work, in this study they are combined with a design intervention to additionally understand the interaction between invisible work and materiality. The design intervention, then, acts as a focus or a mechanism for surfacing conceptual issues of interest. For this reason, the booklet described below was not created to solve a problem or to lead to design implications but instead to elicit responses that could be used to deepen the study’s engagement with materiality.

Prior to observing the literature class, I designed a booklet based on a series of poems that were to be assigned in the class. The poems, by Gertrude Stein, are considered to be particularly difficult and open to a variety of responses. While my motivations for designing the booklet were in part to give students alternative ways to engage with the text, this goal quickly led to an interest in form, materiality and interaction, concepts that became central to the design of the booklet as well as to my ethnographic work in the classroom.

The booklet differs from a traditional book in combining text with puzzle-like prompts that ask users to fill in blanks or choose answers from several possibilities. While the students read the majority of their assignments from a large anthology that includes formal introductions and notes on the text, the pocket-sized booklet was designed to change both the material experience of reading as well as the interactions that occur in the classroom. By introducing shared tasks that were performed prior to participating in class, the booklet experimented with one method of creating the common ground needed for discussion. While similar tasks are used in other classroom settings—problem sets in math classes, for example—the booklet introduced tasks that were unfamiliar, at least in this form, in the literature classroom. In response to this unfamiliar intervention, I hoped to observe changed conceptions and values enacted by students.
The instructor distributed the booklet during my last week of observations and asked students to complete a portion of it. I observed the following class meeting’s discussion of the booklet and collected the completed booklets for analysis.

Figure 1. A page from a student’s completed booklet.

4  Work in the Classroom

When I arrived for my first observation, the instructor had written on the board a quotation about the poet John Donne: that “for not being understood [he] would perish.” This seemed at first a challenge to the students in the room and suggests one of the ways that work in the classroom can be viewed. In this view, literary texts like poems are seen as having a meaning that the students and instructor will work together to better understand.

However, because a poem can be understood in many different ways, this progression toward a shared account requires that students align their individual perspectives, coming to a consensus about what aspects of a text should be discussed and how. This requirement of consensus provides a second way that the work of the classroom can be viewed: not as a conquest over the meaning of a text but as the construction of a shared way of talking about texts. Culler (1980) describes this shared way of talking as a literary competence—a set of rules that express what attitude should be taken toward a text and what responses are acceptable within a given institution. In the classroom, the development of a shared competence requires that the students and instructor develop, over time, an understanding of how they will approach and talk about assigned texts. As described below, this negotiation is not completely balanced (as the instructor has a certain amount of power in assigning value to statements). Similarly, the material configuration of the classroom influences how a concept like shared competence can be defined.

Interviews with students support this description of the classroom as working toward shared competence. One student described the feeling of reading assignments before class, pointing to the
function of the classroom as revealing and aligning her to possibilities that she did not previously recognize:

It's almost like the feeling, like, you know there's things that you should be feeling, that you should be understanding. You don't know what those things are, you feel like you don't have a way of finding out what those things are, and it's just, like, very frustrating.

Another student described this process of attending class and coming to understand what might be pursued in relation to playing a sport for the first time:

Going into sports the first day or the first week of doing it and not having any reference for the sport in general, going in and asking myself, like, am I doing it right, am I doing it right, am I doing it right, and then, like, slowly understanding, OK, OK, this is how everyone else does it, this is how I'm going to do it.

The classroom becomes a space, then, where students must develop an understanding of competence based on the propositions put forward, evaluating and modifying the perspective they developed during prior work. The goal of the classroom can be seen as a progression toward understanding, but this understanding is less of the text in question and more of the rules that are developed in the class.

As the students' descriptions above indicate, the construction of shared competence begins before students enter the classroom. Beyond reading and thinking about the assigned texts, interviews suggest that students also discuss them with peers and research experts' opinions through online summaries and other sources. Once in the classroom, the general progression, established within the first few meetings, was to begin with broad reactions to the assigned material and then to move on to a discussion of the basic plot, the "what happens," of a given poem. This often included the instructor asking what certain obscure words mean, the purpose being to establish a consistent base on which further discussion could build. From this point, a more exploratory discussion of the poem would proceed, signaled by a question from the instructor such as, "How can we parse this?" Students then proposed ways of looking at the poem (e.g., that it is about love) or debated others' choices ("I'm more inclined to a different interpretation because... "). The instructor would write representative fragments of their responses on the board, creating a kind of sanctioned list of possibilities in relation to which discussions could take place. For students, progress appeared as the movement of statements onto the board, with the notes written there serving as examples of acceptable responses and representations of a developing shared competence.

While students may be only peripherally aware of the goal of constructing a shared competence, implicitly shaping their responses to fit with norms that they are coming to understand, for the instructor this shared competence is a primary goal that is explicitly worked toward. The nature of this work is foregrounded in moments when class discussions moved especially far from this goal, requiring more overt corrections from the instructor. During one meeting, the students were excited and distracted—they were eager to discuss the assigned poems but also not completely interested in doing so in the way that the class had established as appropriate. When asked for interpretations of a poem, the students repeatedly gave responses that focused on their immediate reactions to the text or the characters' motivations. One student said that he liked the poem because it was "simple but nicely written," in response to which the instructor encouraged him to "try to think of critical or analytic things to say." Following this, another student suggested that a character was "a flake and, like, BSing." Again, the instructor discouraged a personal reaction—"I see that this poem is touching personal chords with many of you"—and went on to explicitly tell the class that they needed to "elevate their critical vocabulary." A third instance on the same class day makes the instructor's goals clear. In this case, a student proposed that a character in the poem was suffering from Stockholm syndrome. Here the instructor rejected Stockholm syndrome but suggested that in its place they talk about the more academically appropriate concept of Freudian repression.

Importantly, none of the students' rejected comments came to be represented on the board. If the cooperative work of the classroom relies on the construction of a shared competence, the instructor can influence this process by controlling which responses are made available for further debate and discussion. In rejecting statements that deal with personal reactions or statements about characters' motivations, the instructor reveals his goal of encouraging conversation that connects the poem in question to larger themes or issues. Following Bourdieu's (1984) analysis of education, class and taste, the instructor can, unsurprisingly, be seen as encouraging reactions to art that characterize the highly educated: exhibiting a personal distance from the object and connecting it with other movements and styles.
The work of the classroom, then, centers on the construction of a shared competence, a set of rules about how texts will be responded to and discussed. The following sections use this description as a background to understand the role invisible work plays in this context and the ways the work's material surroundings influence conceptions of work, visibility and competence.

4.1 Invisible Work in the Traditional Classroom

An interesting aspect of the interaction described above is that work students perform outside of class is almost never referenced in class. This is especially surprising in the case of two students who explained to me during separate interviews that they lived together and would read and discuss the assigned readings together. These students sat next to each other in class and actively participated. However, they never referenced their prior discussions; instead, their comments were made as individuals speaking on the spot. Indeed, several students interviewed downplayed the work that they did before coming to class, suggesting that they weren't skilled enough to make valuable contributions in the classroom:

It can be, like, numbing, if I do it too late at night or if I do it, like, after I did, like, math homework or something, it can be kind of like, like it's just like, you know you, like, read it so many times and you're just not breaking the ice through it. It's just like, ugh.

Another student describes her prior work in relation to the work of the rest of the class:

The thing that I think about probably the most is where I am in respect to everyone else in class reading it. … When I'm reading it at home or where I am, what they're thinking when they read it as well. Do they understand this as little as I do, or are they, like, way above me? Because I tend to think that's the case.

Work, for students in this context, is conceived as actions that take place in the classroom and in relation to the work of others. This conception is influenced by the material surroundings of the work. Chalkboards and notebooks do more than provide affordances for revealing or hiding work; the students' conceptions of work are constructed through contact with these objects. The boundaries between what counts as work and what does not—or what is visible as work and what is not—are not drawn prior to contact with material objects. Instead, the configuration of these objects influences what it means to perform work.

I focus here on two elements of the classroom observed: (1) materials such as books, laptops and notebooks that are brought to class and (2) the chalkboard at the front of the room. These materials form two ends of a sequence of activities. On one end, the materials student bring into the classroom contain traces of the work performed previously: notes written in margins, websites opened in web browsers. On the other end, the chalkboard displays the statements that are used to build a shared competence and assign value to individual students' actions.

Interestingly, despite the close proximity of students in the classroom, I never observed sharing of notes or computer screens. While students often looked at relevant websites during class or consulted their notes, these materials were rarely acknowledged in discussion. Viewed in relation to the functioning of the classroom as a whole, the process of bringing materials to class but not making them public is comprehensible on two levels. First, it supports an understanding of the primary work of the classroom as constructing a shared competence so that discussion can proceed. In this way, much prior work may become irrelevant, as it is found to not meet with the developing rules or as the discussion takes on unanticipated trajectories.

Second, the lack of reference made to materials brought to class supports a conception of work as individual and unmediated. Like notes to a performance that are left behind when a performer walks on stage, these materials that are treated as private give the classroom an improvised feel. Indeed, the performance is less like one in which all the actors have rehearsed the same script and more like one in which they have all agreed to a certain theme and must arrive ready to reformulate their plans and notes in relation to the action that occurs. While preparation is crucial to the performance, many of the actors' notes will be left unused; others will have to be skillfully worked into the ongoing action, leaving the audience with the impression that nothing was planned.

Like the materials brought to class, the chalkboard at the front of the room contributes to a conception of work as individual and occurring in the classroom. As the discussion progresses, the instructor makes notes on the board, keeping a partial record of what is said but also filtering, condensing and revising students' statements into an appropriate form. This representation serves the broad goal of constructing a shared competence, providing a record of appropriate ideas that can be responded to. The board also serves to reward students whose statements are recorded there. While some statements are recorded and responded to, others disappear and are not referenced again.
The interaction of private notes, public statements and an instructor-controlled board encourages students to conceive of work as a kind of casual performance. Because prepared notes may become irrelevant in relation to the trajectory of the class discussion, they come to be seen as without significant value and, as a consequence, may be less likely to be referenced in discussion. And because public statements are treated as improvised performances, they appear as the product of on-the-spot thinking. Statements are made valuable, then, as they are moved onto the board and used as reference points, exemplars of the shared competence being built. Valuable work, in connection with this material configuration, comes to be seen as something that happens not just in the classroom but in a specific moment, as the reaction of an individual to an ongoing discussion. While work that happens outside the classroom certainly contributes to the statements made during class discussions, it becomes invisible in this context.

4.2 Changing the Material Configuration of the Classroom

If students’ conceptions of work and value are formed through contact with the material configuration of the classroom, then it makes sense that disrupting that material configuration would prompt discomfort or confusion. Following Odom et al. (2012), these reactions can reveal values and identities and suggest implications for system design.

At the end of a class meeting during my last week of observations, the instructor told the students that he would be handing out “workbooks” or “puzzlebooks” for the next class and asked them to complete a portion of the pages. As the students flipped through the booklets, they began to ask the instructor questions: What was this thing? Where did it come from? Who made it? One student called the assignment “weird instructions on a Monday.” Another expressed that it made his head hurt.

While prompts are not uncommon in the classroom, the materiality surrounding the booklet and the interactions it encouraged were unfamiliar and strange. In the following, I describe how the introduction of the workbook changed the nature of the students’ work, encouraging work outside the classroom to be made visible and disrupting the students’ abilities to perform in ways that aligned with the class’s developed shared competence.

On the class meeting after the booklets had been assigned, students arrived in the room and sat as they usually do, but none took out their completed workbooks until asked to do so by the instructor. As the class began discussing the booklet, one student noted, “I wrote in ‘croissant’ for the crescent part,” referring to a question that asked, “What is a food that is a crescent?” The instructor asked how many students wrote “croissant” in response to that prompt, and seven raised their hands.

This interaction represents one way of responding to or approaching the text. Rather than a shared competence constructed over time, the booklet created a situation in which the rules of appropriate response were to some extent declared explicitly. In a way that was not possible in the traditional classroom, each individual could share what he or she wrote in response to the same question. Previously, prior work that did not align with a conception of shared competence would be discarded, encouraging this work to be seen as without value. In ensuring that students considered a consistent set of topics prior to coming to class, the booklet created a context in which alignment between prior work and an ongoing discussion could be assumed. However, it did not necessarily encourage this work to be seen as valuable.

Another student described her reaction to the booklet as a whole:

I just felt like it was an unnecessary intermediary. I like working really closely with the text itself and not reading any critiques beforehand. Because it messes with my experience of the thing.

Viewed in relation to a conception of valuable work as individual, spontaneous and performed in relation to an ongoing discussion, the booklet certainly does “mess with the experience” of the classroom. Most importantly, it reveals work performed outside of the classroom by serving as a common point of reference that all students share. Rather than aligning themselves to a discussion that discourages direct reference to work performed outside the classroom, the students wrote answers to a consistent set of prompts, the responses to which could be compared. Questions such as how many students responded in a certain way make visible work performed outside the classroom, but they also reduce the students’ agency, preventing the kinds of answers discussed above. Instead of off-the-cuff, improvised statements that could be treated casually (as with the “out of left field” statement), the booklet created a context in which statements were revealed as not without effort.

While the changed material configuration encouraged a different relationship to the visibility of work, it did not seem to change the ways work was valued. Merely repeating an answer to a prompt lacks the intellectual flare of conjuring an on-the-spot comment that weaves itself into the flow of discussion and
is approved of by the instructor, who translates it onto the board. Indeed, the chalkboard showed, at the end of class, only one note that was the direct product of a student’s comment.

By explicitly describing ways of responding to the text, the booklet presented a version of appropriate response that was not consistent with that developed during previous class meetings. Patterns of discussion and interaction with materials that had become consistent aspects of the classroom conflicted with the kinds of responses elicited by the booklet. While students could raise their hands to indicate their similar response to a prompt, the functioning of the classroom didn’t always provide avenues for this response to progress down.

A comparison of notes made on the chalkboard from an early class meeting and the meeting on which the booklet was discussed makes clear this disjunction (figure 2). While the earlier board shows many statements that were made by students and that aligned with the shared competence developed, the board from the meeting on which the booklet was discussed is sparse and shows few statements that originated from students. While the students and instructor had plenty to say about the booklet, the kinds of responses provoked did not align with their previously established shared competence and the patterns of interaction that support it.

Figure 2. Representations of the chalkboard from a class early in the semester (left) and from the meeting during which the booklet was discussed (right). The underlined text was written by the instructor in direct response to students’ comments.

Thus, while the rules of appropriate response set out by the booklet did create a common ground on which class discussion could proceed, it also revealed aspects of the classroom that were in tension with this prescribed competence. By surfacing invisible work that failed to meet with the classroom’s values and by encouraging responses that did not align with the group’s previously established shared competence, the design intervention reveals how shared competencies are developed over time and become ingrained in material configurations.

The following section uses this description as a background to consider the relationship between shared competence, invisible work and ideation, drawing connections between this study and others that are interested in encouraging new ideas and perspectives.

5 Discussion

One of the potential consequences to revealing invisible work that supports cooperative work is a challenge to shared competence that has developed over time and in a specific material context. This study suggests that this threat may be especially linked to prompts and other activities that specify the nature of response. Because the booklet asked students to reveal work that did not align with the group’s shared competence, it forced them to reveal their perspectives and the effort put into them. Further, it created a need for these perspectives to be explicitly considered. The board from the meeting when the booklet was discussed (figure 2) reveals a discussion that was less about the text and more about how the text could be approached. The only note on the board that originated from a student supports this, referring to the process of completing the booklet as a “creative exercise in itself.” Another student said, during class, that she “like[d] working with the book when [she] disassociate[d] it from the poem.” Another compared the booklet to “riddles or puzzles that are challenging you to do your own exercises.”

In response to a changed material configuration, these statements reveal and experiment with a range of perspectives that do not necessarily align with the previously established shared competence. Indeed, they can be seen as beginning to redefine the shared competence of the classroom, creating a new set of rules for approaching and talking about texts. This is not always undesirable. Indeed, for
creative professions, new perspectives are often seen as a source of valuable ideas (e.g., Faste, Rachmel, Essary, & Sheehan, 2013). Similarly, in a project described by Halpern et al. (2013), social scientists and designers were brought together to propose solutions in a neighborhood. While the participants were diverse and lacked a shared competence, the prompts and tasks given to them by project organizers were productive in surfacing perspectives that could then become the basis of collaborative work.

Another suggestion of this study is that over time shared competencies become sunk into material surroundings, encouraging their own perpetuation. In this way, the need to renegotiate shared competencies fades, as does the need to explicitly reference work performed prior to group work. For example, jazz musicians do not need to discuss how they practice at home unless they’re attempting to create a composition or style of playing that is original and new. However, once the new shared competency is ingrained in the performers and their surroundings, the need (and desirability) to discuss prior work might disappear.

6 Conclusion
This essay contributes to an understanding of how conceptions of work are influenced by material surroundings. In the classroom, how work is seen and valued is dependent on chalkboards and the materials students bring to class. Altering this material configuration can, then, reveal invisible work and challenge existing conceptions and values. In the context of the collaborative work of the classroom, this can result in the surfacing of individual perspectives that must be negotiated.

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