Designerly Tools, Sketching, and Instructional Designers and the Guarantors of Design

Elizabeth Boling and Colin M. Gray

Abstract Sketching can be a means to visualize learning objects and experiences differently than is possible in text-based representations. In particular, the experiential qualities of designed experiences can be explored using sketching as a tool and may not be accessible to designers via other means. If designers are to assume appropriate responsibility for our designs, to be the *guarantors of design*, our toolkit must expand. Examples are given of the ways in which sketching, as a flexible skill, may be used to represent designs for learning, together with discussion of how instructional designers would need to be able to think about these sketches in order to use them as tools.

Keywords Instructional design • Sketching • Visualization • Design representation • Guarantor of design

Introduction

Whether we have active awareness of it or not, as instructional designers we create, or specify, learning experiences—not simply the materials, reports, scripts, blueprints, storyboards, or any of the other objects whereby those experiences are enacted. These learning experiences are not equivalent to the "learning objectives" guiding them, just as they are not equivalent to the materials supporting them. These experiences are felt by the learners (and by instructors when they are present) as complex, situated events, with both learners and instructors taking an active role in shaping them—whether the experience appears outwardly to be heavily constrained by the instructional design or not (Parrish, 2008). The designer has to be aware, therefore, of the concrete reality of experiences that will result from the abstract

E. Boling (✉)
Indiana University, Bloomington, IN, USA
e-mail: eboling@indiana.edu

C.M. Gray
Iowa State University, Ames, IA, USA
e-mail: cmgray@iastate.edu

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specifications of a design (e.g., written objectives, content sequences, verbal descriptions of activities) and the real-time use of materials. Parrish (2008) and Hokanson (2008) have argued respectively, and convincingly, that our tools do not reflect concern for the experiential qualities of learning experiences and that the open-ended ability to sketch would be a useful tool for instructional designers. In this chapter we bring these positions together to demonstrate, via examples, that sketching may be used effectively by instructional designers as a tool to consider the experiential qualities of their designs. We argue further that the ability to visualize learning objects and experiences in the form of sketching is an important step in viewing the instructional designer as a *guarantor of design* (Nelson & Stolterman, 2012).

Learning Experiences

A traditional conception of the experiential dimension of instruction may be understood to be based on the level to which students become active agents in the learning process (Ertmer & Newby, 1993). While active agency is, no doubt, important, it does not encompass the hedonic qualities of a learner having an aesthetic learning experience (Parrish, 2005, 2009) or the utility of aesthetics in promoting transformational learning experiences (Parrish, 2014; Parrish, Wilson, & Dunlap, 2011). Likewise, the learning experience seems to be considered something that we expect to create, or determine in advance, and not a potential for experience that we hope to shape using naturally occurring and not entirely manageable phenomenon. Our models and theories do not address how to provide for learners' experiences outside of the roles we envision for them (Gray, this book). Some paradigms of instruction, such as constructivism and problem/project-based learning, attempt to engage in this space, but there are still numerous challenges in learning how to design adequately for open-ended situations in which learners—and instructors—shape their experiences actively, making the experiential dimension of the instruction inescapably important (e.g., Ertmer & Simons, 2006; Tobias & Duffy, 2009).

Guarantor of Design

Nelson and Stolterman (2012) discuss the idea that the point of responsibility for the appropriateness of a design and for its consequences—the *guarantor of design*—cannot be located in, or limited to, the design process, but must actually be taken on by the designer. If this responsibility *is* viewed incorrectly as being located in the design process, the assumption is made—implicitly or explicitly—that designers should use the "right" process and carry out all the steps of it conscientiously, and further that the resulting design will be as it should be. When there are problems with the design, those who view the process as the guarantor of design will assume that some step of the process was carried out incorrectly, was skimped on, or was

overlooked. In our observation, and strongly implied in the foundational literature of our field (Smith, 2008), these are, in fact, the assumptions of many who practice and teach instructional design. In other words, many in the field view the responsibility for appropriate design as residing *outside* the designer. To illustrate, we offer the following story:

> Several years ago the first author was teaching a project-based course in basic instructional design. While the course did not rely exclusively on one model of instructional design, student teams did work through a structure of traditional deliverables: needs and learner analysis reports; a design document covering learning objectives; content sequencing, instructional strategies, activities, and materials; a formative evaluation plan and an evaluation report.
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> One group spent the semester designing, developing, and implementing a training module intended to support non-native speakers in buying a second-hand vehicle in the United States. They finished the module, an epitome preceded by the introduction of prerequisite concepts and followed by increasingly difficult examples and non-examples, with realistic activities engaging the learners with one another to discuss how they would carry out the process of purchasing a second-hand car.
>
> When the team tested the module with students from the target learner population, however, they realized that something was wrong. Even though they had followed all of the required steps correctly to design the module, observed no confusion or technical problems to report from the trial run, and noted a learning gain, they also perceived that the instruction as experienced was repetitive, boring, and unpleasant for the learners—who were simply, and quite evidently, too polite to complain about it. They had done a good job according to the view of design, which places the guarantor of design within the process of designing; a view which holds that if you follow the process correctly, the result will be acceptable and effective. But they had not produced an acceptable experience, and they questioned whether it would have been effective under real world conditions if the learners had been less compliant.

For those who see the process as responsible for appropriate design outcomes, it is tempting to conclude, as seems to be the norm communicated by our casebooks (Ertmer & Quinn, 2007; Ertmer, Quinn, & Glazewski, 2014), or at least the typical uses of them, that the students did not follow prescribed processes, and that this accounted for the problems they observed in the resulting experience they had designed. But they *did* carry out the process well; their deliverables were thoughtful, and they created a learning intervention that was, on paper, aligned with existing instructional design (ID) theory. Even so, the learners' experience of this internally coherent and consistent content was still boring, onerous, and distinctly nonaesthetic.

It is further tempting to look only at the evidence of learning and choose to overlook the experiential qualities of what was designed—how the event felt and what its meaning was for the participants (Parrish et al., 2011). After all, if the intended learning did occur, the process may be presumed to have done its work and so, one might ask, why does this story even matter? As designers, we may assume that we understand those who will participate in the experiences we design after we have carried out prescribed analyses. However, we really do not have tools to envision the experiential dimensions of our designs early in the process, arguably necessary in order to understand learners in the context we are designing for them. This lack of

appropriate tools can result in generic instruction that ignores the lived experience of the humans who participate in the designed intervention. Without a well-established understanding among IDs of the emotional and aesthetic aspects of learning, we may not know the true cost of that design in the experiential dimension (Damasio, 2005; Dewey, 1938; Greenspan & Benderly, 1997; Parrish et al., 2011). In the context of the story above, for example, what is the future effect on an international learner who has received the message that her time is not considered important? What learning will a student skip or avoid because of a previous negative experience? How will a learner who passes a post-test in the moment use his knowledge later, or perhaps forget it, when it is attached—as it may be—to a negative affective state in his memory?

While the student team in our story simply asked a few of their peers to suffer through a couple of boring hours of instruction, as a field of practice we can use their example to ask some important questions. Are all learning gains worth some form of human cost? Which are, or are not? What level of cost is appropriate? Necessary? Are we looking, as we should, beyond individual learning experiences to consider the long-term costs of instruction which is designed without regard for the experiential dimension? Where and how can the human experience of intentional instruction be considered in ID? These questions bring into focus the concept of the *guarantor of design* and how it may apply to our form and contexts of designing—to whether or not process and principles can actually serve as guarantor for the experiential qualities of design.

Tools

For the purpose of this discussion, we use the term *tools* in a broad sense to include "methods, tools, techniques, and approaches" (Stolterman, McAtee, Royer, & Thandapani, 2008, p. 116), as well as models, theories, and principles. We see tools as multiple and complementary, rather than as all-in-one templates or hierarchical sets of prescriptions (Gray, Stolterman, & Siegel, 2014; Harrison, Back, & Tatar, 2006). We recognize that within the field many tools do exist in addition to ID models, and that they are not necessarily dictated to be used in a predetermined order. However, often when our textbooks and definitions explain that our models are not linear, or that our tools may be used in multiple contexts, either no guidance is given on how to decide when designers should do what (Smith, 2008), or the guidance given is so fully prescriptive (Reigeluth & Carr-Chellman, 2009) that, in effect, it places the responsibility for appropriate design incorrectly within an instructional theory and not within the designer, where it should be.

Instructional design tools, mainly process models and instructional design theories, attempt—at least implicitly—to encompass all of designing, or all designing of a certain class (Gibbons, Boling, & Smith, 2014). And perhaps the problem in our earlier story did lie in the student designers' lack of experience. After all, experience, and the judgment it engenders, are acknowledged to be required in order to

use ID models appropriately (Merrill, Drake, Lacy, Pratt, & The ID2 Research Group, 1996). This may be so, but is the students' lack of experience in this case actually different in kind from that of professional designers in the field? For those who specify designs and hand them off to developers, the distance between the idea of the resulting experience and the actual experience can be wide indeed. For any designer who is directly involved in producing the materials of instruction, but who does not take part in the resulting learning experience (even when formative trials are conducted), a significant distance still exists between conception and reality. While the materials of instruction are immediately present to these designers, the lived experiences they support are not. And as many usability specialists can attest, the time and money required to carry out large-scale, immersive implementation trials—which might provide such experience to these detached designers—are hard to come by (Bias & Mayhew, 2005). Could a different, or extended, set of tools help us connect with the experiential qualities of instructional designs, shifting the responsibility for those qualities out of ID models and into designers' hands?

Designerly Tools

Instructional design tools are by and large *not* what is termed *designerly* by Stolterman et al. (2008). Starting with the premise that tools reflect the context out of which they are developed (e.g., research context versus practice context), these scholars argue that tools most supportive of designers as guarantors of design are those that "do not guide the actions of the designer" but require skill, and are actually difficult to master (p. 116). By implication, such tools are open-ended and do not attempt to simplify designing so that responsibility is shifted to the tool.

Discussions addressing tools and views of designs in the field of ID that are not based on process models have begun to expand the view of how instructional design can happen and can be taught (Botturi, 2006; Gibbons, 2013; Boling & Smith, 2008). Tools have been explored that offer alternative ways of thinking about experience; these depict experience indeterminately rather than in deterministic or closed ways (Goel, 1995), and a number of these involve the designer's use of visual representations. Waters and Gibbons (2004) have drawn from work outside of ID to explore the ways that a design language might emerge, investigating visual notation systems from other fields such as musicology, choreography, and chemistry. Gibbons' (2013) conception of a designer moving through various layers in a design situation, with each layer involving the designer foregrounding certain concerns and backgrounding others is an example of an approach that is not explicitly visual, but rooted in a visualization of designing. Yamagata-Lynch (2014) has explored Cultural-Historical Activity Theory (CHAT) theory, imported into and applied to ID, as a tool producing visual diagrams for understanding the complexity of human behavior, intended to allow designers greater insight into a learning situation than traditional analysis tools can do.

Botturi and Stubbs (2008) offer perhaps the most extensive examination of visual methods for instructional design to date. Theory and methods are both addressed in this edited volume; much of the focus is on explaining, sometimes proposing, the methods themselves. While some are oriented toward envisioning experience, others are intended to assist designers in analyzing data, understanding the design process, and modeling entire designs. One author in that text advocates sketching in general as a designer-controlled means of supporting design thinking (Hokanson, 2008), while two others conclude that design sketching is used productively *outside* this field and that design sketching is not much practiced *inside* the field (Stubbs & Gibbons, 2008).

Attempts to explain users' interactions with a designed artifact also exist outside the field. For example, a method for task deconstruction like GOMS (goals, operators, methods, and selection rules) used with the concept of a "model human processor" in Human–Computer Interaction (HCI) (Card, Moran, & Newell, 1983). Such tools and concepts have utility, but they focus on the design as a specification rather than on the experiential dimension of designs coming into existence only during use. Similarly, there have been attempts to create a more holistic understanding of how a designer moves through the experience of designing, with varying levels of support and levels of flexibility. Holistically in experience design, Young (2008) has proposed the use of mental models as a way of understanding user needs, discovering those needs through sustained interaction with users and data analysis, with insights then being drawn that relate back to the user's experience. Reaching back even further in HCI, Beyer and Holtzblatt (1998) proposed an end-to-end method of contextual inquiry for designers to stay engaged in the interests of users and their individual lived experience. From the emerging field of user experience (UX) design, "experience maps," springing from a service design perspective, offer an example of how designers conceive of a large-scale system of experiences (Hanington & Martin, 2012; Risdon, 2011). We can see the utility not only for the individual designer in articulating complex "journey moments" that a user might go through, but also the importance of an artifact like an experience map as a boundary object (Bergman, Lyytinen, & Mark, 2007) with which to facilitate client and stakeholder communication.

Sketching as a designerly tool. Hokanson (2008) argues that sketching, the ability to create visual representations, affords methods that support designers in thinking iteratively and fluidly through an experience they are designing. Such methods may help designers move outside of their own subjective positions, and to move them away from the supposedly objective position of traditional methods, into that of the instructor and learner across multiple dimensions: temporal, physical, emotional, curricular. The visual mode of representation allows designers to exploit the ambiguity of images and related analogical mode of thought for qualitatively different understandings than allowed by text (Goel, 1995). In turn, ambiguity allows designers to appreciate factors within an image that were not specified or anticipated during production of the image, a quality also labeled as "indeterminancy" (Fish & Scrivener, 1990).

Sketching produces artifacts that are not the final products of designing, but that serve as bridges between modes of thought (Goldschmidt, 1991) and are therefore supportive of open-ended action—making the ability to sketch a designerly tool (Stolterman et al., 2008). A design situation cannot be fully deconstructed, but it must be represented in some way; in fact, in more than one way if the design is to address multiple aspects of a situation (Goel, 1995). It must also be represented with flexibility in methods for the situation at hand, versus a templated tool that does not meet any specific conditions perfectly. Also required is an awareness that the representation is not the design, but a tool for considering aspects of the design. Laseau (1986) provides a useful illustration of how such representations facilitate designing, demonstrating the analogic function of images and their bridging function from abstract thought to concrete experience. He also points out an important aspect of representations as a design tool; forms of representation need to be respected for their unique roles and not confused with each other (p. 28). In his example, students of architecture are prone to designing spaces directly from the boxes they have drawn to represent the functions of those spaces. In our field, those of us who teach have probably seen a similar phenomenon—the student who organizes a course directly from the content outline created during analysis; objective A becomes module A, objective B becomes module B, and so on. Obviously, tools for representation are no more the guarantors of design than are models and theories. The guarantor is the designer who uses the tools—and creates the tools—out of her flexible capability to do so.

Examples of Sketching as a Flexible Capability

We are proposing that sketching, as a unique means of reasoning and communicating in design (Goel, 1995; Hokanson, 2008; Laseau, 1986), affords a unique embodied experience on the part of the designer. In the process of sketching, the designer enters a reflective and iterative space where the act of sketching introduces a reflection-in-action (Schön, 1983), where the physicality of sketching speaks back to the designer in a way that textual descriptions of designs or computer-based drawing tools cannot (Goel, 1995; Verstijnen, van Leeuwen, Goldschmidt, Hamel, & Hennessey, 1998).

Three sketches are offered here (one presented as a series) as examples of using *the flexible ability to sketch* as a designerly tool that allows a designer to explore potential experiences during the process of designing. The sketches do not represent fixed templates, or implied processes that are intended to be used under prescribed circumstances. They are the outcome of using a developed visual sensibility together with basic skill in freehand sketching to think through design situations. In this case, we chose examples that emphasize the experiential qualities of the instructional designs involved—emotional qualities of a learning experience, the physical use of space for learning, and the workload imposed on students across multiple courses through curriculum design.

Emotion (Expressed as Energy)

Parrish et al. (2011) discuss immediacy and compellingness as situational qualities contributing to *aesthetic learning experiences*; experiences with the potential to rise above the everyday and influence transformational learning. In the small studio class forming the basis of Figs. 1, 2, and 3, these qualities might be termed "energy." They include students' active, ongoing attention to their own work and to the talk surrounding them, their willingness to stand, move, and talk during critique, and the degree to which they allow themselves to be drawn into discussion of their work on the spur of the moment. Class sessions are long, while the duration of the course (8 weeks) is short and the demands it makes on most students in terms of developing complex abilities are heavy. Therefore, keeping energy strong over the course of several hours, while providing some relief to avoid fatigue, is a clear imperative for the instructor creating this diagram. It is intended to explore the ebb and flow of energy over the typical class period by representing it as a fluctuating line running parallel to a timeline. The line is not precise and not tied to actual data; rather, it represents the felt experience of the instructor and the holistic observation of students as observed repeatedly in the past. The designer/instructor in this situation is, of course, bearing the timeline of a typical class session in mind—not capturing a stream-of-consciousness description of sensation, like drawing in response to music, for example. But there is also no intention to link each fluctuation of the line to an exact point in time.

As a second step (Fig. 2), the designer/instructor annotates the line, identifying the waxing and waning flow of energy as they are linked to key activities, or to phases of activities, as they play out during each class session. This use of line and text brings the original curvy line into a more precise focus, still without requiring a one-to-one correspondence with some form of precise data—which would not be available anyway until after the designer had considered the class in this visual way.

Layered over the original line is a second one in gray, depicting what may change about the energy profile of the class period when planned changes are made to the design of the course. In particular, this instructor has decided to replace "wall critique," or posting work from all the students in one place and addressing as much of it as possible, during the final hour of each session. As the original line shows, this has been a point in the class where the students lose momentum, lapsing into a kind

Fig. 1 First stage of a free-form sketch depicting holistic impression of student energy levels during a typical session of a studio class

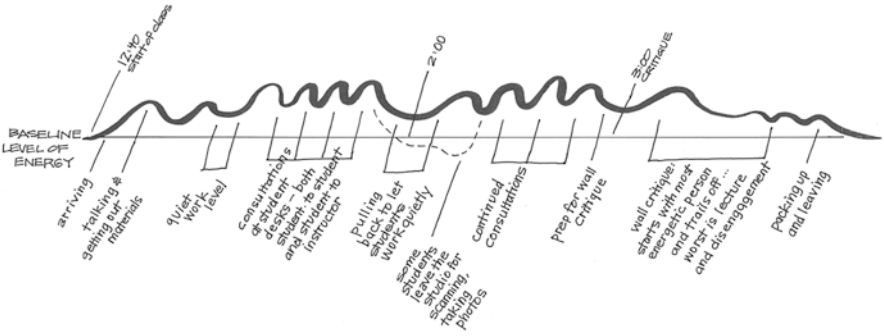

Fig. 2 Second stage of free-form sketch with annotation making the phases of class activity more specific in relation to energy level ebb and flow

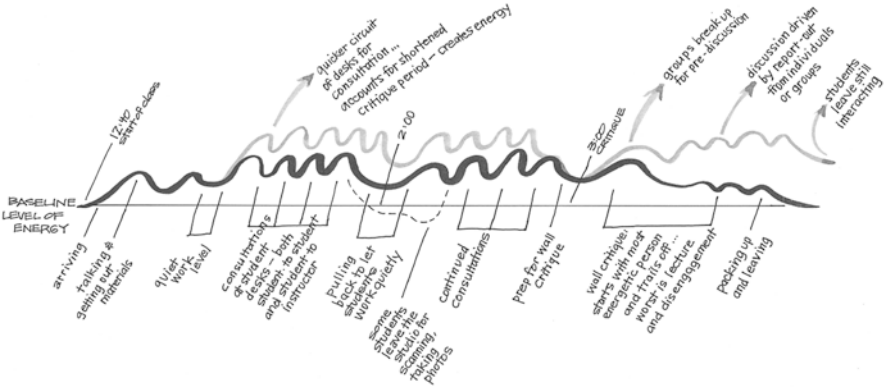

Fig. 3 Third phase of sketch using a gray line and additional annotation to speculate on energy changes that might result from revisions to the design of the course

of passive or desultory commentary on each other's work, or staying silent until the instructor ends up taking the lead—even carrying on a monologue. Knowing the class is not actually part of a strong studio culture, this instructor has decided to replace it with a format that has been effective in other courses: break-out peer-to-peer discussions followed by a full group debrief or expansion of that discussion.

In order to find time for the break-outs in the last hour of class and not cut down the students' work time, this view of the course naturally suggests that it will be necessary to carry out desk consultations with individual students on a slightly faster cycle than had been the case previously. This will require a behavioral change on her part, and she realizes that in fact there has been a problem previously when these individual consultations at the students' desks have dragged on—sometimes resulting in students not getting a consultation every class period. While the students

did keep working at those times, there was a palpable lessening of the energy in the room when the consultations ran on too long for one or another student. We can see the gray line showing the planned revision rising above the black line showing the class as it is now—an expression of designerly optimism regarding how the revision may result in a higher level of energy overall during that middle period of each class sessions. The same optimism accompanies the planned revision from the previous group critique at the end of each period to break out discussions during that time; the peer-to-peer engagement and the chance for everyone to participate are expected to increase the energy level for that phase of the class period as well.

What this sketch is doing. The informal diagram in Fig. 2 exhibits two qualities that text alone would lack when describing fluctuating energy levels in a classroom. The first is simultaneity. It is possible to look across the span of the whole class session and compare all parts at one time; for example, the anticipated energy level of starting class, holding group critique, and holding individual consultations, which cannot be done as quickly with a linear description of these activities. The second quality is immediacy. Once it has been grasped, the relationship between form (the path of a line) and concept (energy ebbing and flowing) does not require continuous abstract translation as does a verbal or textual description of that same relationship, so interpretation of a sketch like this one is more direct than interpreting a textual description of the same thing.

Another visual element in play with this example is one already familiar to those in the field who have studied traditional message design; the gestalt principle of proximity (Ellis, 1938), which states that items grouped in visual proximity are understood to be related. Instructional designers who use this principle in producing instructional materials can turn this understanding to their advantage in annotating this kind of visual during designing. We do not understand these text segments to refer to parts of the undulating line only because there are lines connecting the text and the squiggles, but because the text segments appear spread out along the timeline.

Physicality

The physicality of the space in which instruction takes place has not been sufficiently addressed in the literature—particularly in ID. Some attempts to look at the physical features of a space and how they relate to pedagogical activities and content have been addressed in the context of design and studio education (Brandt et al., 2013; Shaffer, 2003, 2007), and as an indication of the kind of work that is produced in that educational environment (Vyas & Nijholt, 2012). Designers of the spaces in which learning takes place understand that there is a relationship between physical surroundings and the lived experience of learning (see the 2013 special issue of *International Journal of Designs for Learning*). Recent research has also brought some of the physical spaces of the classroom into greater focus, but is still largely centered on effects (or potential effects) of specific objects or classes of objects in a physical space, rather than the holistic, felt experience of a space.

This sketch (Fig. 4) example was created to support a reconception of a small studio class that had been required to move from a large space (for which it was designed) into a smaller one. Each period of this class includes 2 h of individual work time during which students each occupy a table while the instructor circulates, discussing their projects with them. During the final hour of class, group critique takes place; this requires space to tape sheets of paper to the wall and place or hold laptops, and enough room for ten people to stand looking at the item under discussion. The options are limited by the location of the classroom and the available spaces near it.

What this sketch is doing. Small diagram sketches like the ones shown allow a designer to interrogate the physical side of an instructional design actively, visualizing placement of classroom furniture, possible locations of students and instructor (the dots), and how the various relationships may afford (or not) the experiential qualities desired. In this case, space is tightly integrated with learning activities. This is not always true for every design, but may be true for more situations than is usually assumed.

This kind of visualization also stimulates thinking around different kinds of instructional strategies, and how these might affect the learning environment—both when the students and teacher are engaged in those strategies, and how one strategy might transition into the next. Creating a range of such visualizations of space promotes an active discussion of the affordances of each, and how these physical affordances relate to the overall goals of the educational encounter. Without the common

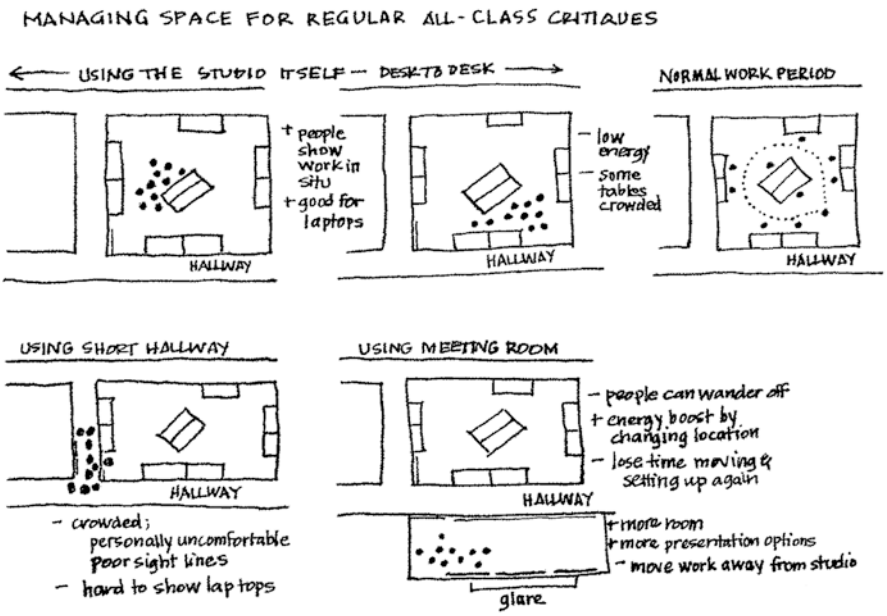

Fig. 4 Sketch diagram showing small multiples of a classroom and hallways with desks, doors, and students indicated

use of such tools, we may not actually realize how often physical space is an important factor in enacting an instructional design.

The affordances of a given physical space—alongside the kinds of interactions that those affordances might promote or discourage—also stimulates thoughts about how it might feel to be engaged in that environment, promoting empathy on the part of the instructional designer. This heightened empathy may allow for greater care to be taken in visualizing how the "flat" instructional design (understood as a specification) might play out in the real world, where the location of instruction, physical features of that location, and students with agency all vary in real time.

What a designer would have to be able to do/what way of thinking. For this kind of visualization to be useful, instructional designers need to master rudimentary skills in representing physical space as basic two-dimensional shapes. Most will find this no more difficult than sketching a simple map to give driving directions, but will need to extend those everyday skills so that they can innovate to meet the requirements of multiple contexts where this kind of tool may be used. The principle to be grasped is the inherent ambiguity (indeterminism) of visual shapes (Klee & Spiller, 1992). A rectangle may represent a table, a room, or a hallway. A circle in this case represents the top view of a person; in another circumstance, it might represent a chair, a whiteboard marker, or a pushpin.

Curriculum Planning

Shifting focus from the content of a curriculum to the experience of students moving through that curriculum requires the capability to look across courses taking an experiential view. In the example here (Fig. 3), two required courses in Master's level program both call for team-based project work supported with multiple readings and both individual and team deliverables. A simple sketch helps the curriculum designers see what the workload would be for students who are required to take these courses in parallel during their first program semester. Each square in Fig. 5 represents a week of the semester, while the visual principles of shape differentiation and visual dominance (White, 2011) allow this representation to reveal points during the semester when work load will be heavy in both classes.

What this sketch is doing. The diagram serves as a tool to shift the designers' perspective from the instructional strategies planned for each course to the impact these strategies will have on the students taking the classes in terms of effort. As most instructors know, the impact of effort can influence the effectiveness of instructional strategies; students struggling with the demands of a heavy workload and group dynamics may not realize the anticipated benefits of, for example, complex, team-based, realistic projects in which both continuous action and serious reflection are required of them.

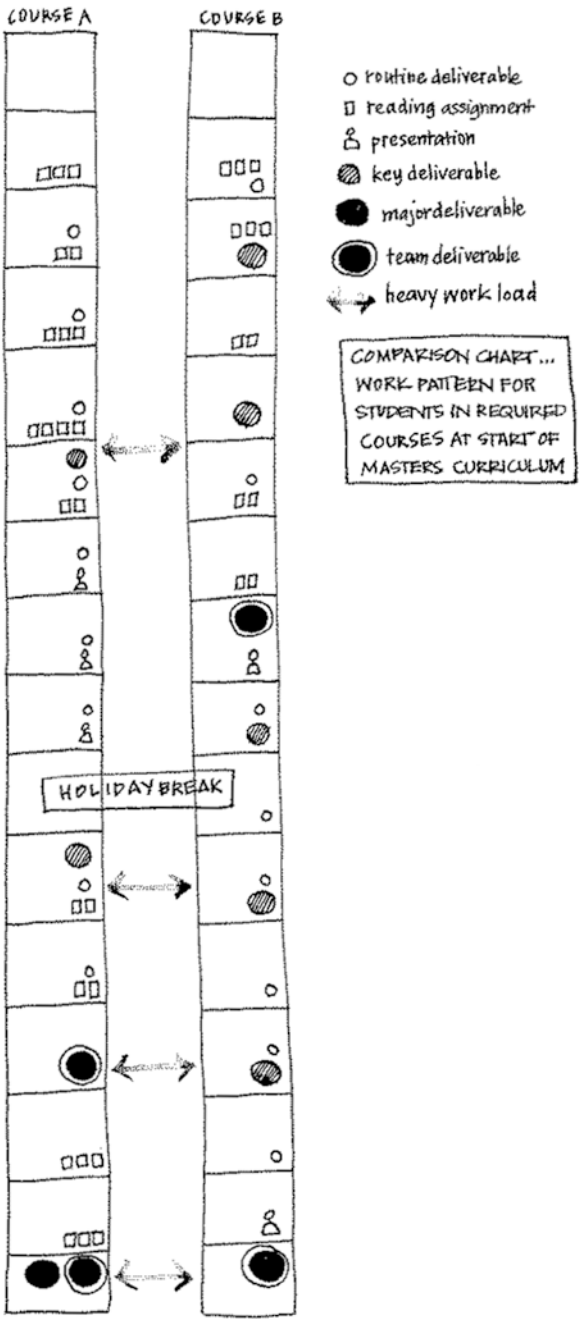

Fig. 5 Sketched visual table showing two classes side by side with deliverables indicated in relevant weeks and the effort required by those deliverables depicted symbolically

What a designer would have to be able to do/what way of thinking. For this kind of visualization to be useful, designers must master analogic, or "stands for," thought with respect to shapes and relationships. Such thinking may be familiar to IDs who are used to reading, and sometimes creating, conceptual models. Those models rely almost entirely on the understanding that a shape may stand for anything as long as it is designated "as" that thing—a rectangle may stand for "design," for example, or for a week of class. The relationship is not indeterminate; it is arbitrary (Easterby, 1970). Skill in creating this kind of sketch can be refined; judgment can be developed regarding whether to lay out visual structures vertically or horizontally in a given situation, what shape might prove more evocative for an arbitrarily assigned meaning, and sustaining consistency in the meanings applied to shapes. Its basic utility may be realized at a low level of skill, however, when it is used as a vehicle for the designer to interrogate her own design decisions privately or internally to a team during discussions where confusions and meanings can be verified in real time.

Discussion

The student team in our story intuited a different position for the guarantor of their design than had been taught or implied by their education so far. At the trial run they had the confidence to conclude that they had carried out the process faithfully, but it had not guaranteed an outcome that was engaging to, and therefore respectful of, the learners. The team realized they had set aside their collective relevant experience in favor of following the process. One member of the team had significant experience teaching outside the United States, and three others were themselves students from outside the United States, but they based their learner analysis on a short survey of potential learners in the department—using data, as specified in so many of our textbooks (Smith & Boling, 2009). They had also failed to appreciate the repetitive nature of the designed instruction because they were focused on the fact that it conformed to theory. Until they saw it play out in experiential form, they did not realize what they had required—by design—their learners to go through. At that point they took responsibility for the outcome of their designing, not in the sense that they had missed a process step, or carried it out incorrectly, but in the sense that the process—even carried out as specified—could not guarantee a fully positive outcome. Their human concern for the quality of experience they had created, and practical concern that a less polite or invested group of learners would probably not have met the target objectives, turned their focus to themselves as the source of judgment and invention required to guarantee a positive outcome of their design activities. What if they had been aware of tools that would help them do this in advance, or at least to ask themselves key questions that would have led them beyond the model they were following and into a speculative consideration of the experience they were creating for other human beings?

And how would we teach students to conceptualize and explain the experiences they are designing in a compelling way? The ability to do so in visual terms does not arise naturally; it needs to be taught and may best be introduced during formal

education in instructional design. What should we focus on when looking for and teaching representational methods to ID students that enable them to grapple with the human dimensions of the experiences they are learning to design? Is the simple ability to sketch enough? How would an ID student be taught to recognize the moment when a visual tool would be useful? What appreciative capacity is required in order to invent necessary visualizations for previously unknown contexts, and how is that capacity to be developed? How is it to be integrated into the larger program of preparation for ID practice, particularly when it is not likely to be successfully taught as concept, principle, process, heuristic (Reigeluth, 1999), or even complex problem solving (Jonassen, 2011).

A central question to be addressed in tandem with those above has to do with the viewpoint generating those questions. Designs, including experiences created intentionally—by design, that is—embody ethical positions (Verbeek, 2006). An instructional design, for example, as conceived today, is itself an implicit promise that people will learn, or, at minimum, that they will learn more efficiently and effectively than they would without this experience. It is, further, an experience affording certain relationships and actions while making others difficult. These affordances embody value positions and ethical frameworks. Instructional designs created without particular regard to the human dimension of their final form take the implicit ethical position that efficient and effective learning is more important than aesthetic and engaged experiences. These two factors together raise troubling questions. How strongly can we guarantee that we can support people in learning, and in what areas is this really possible? What ethical responsibility do we assume for the learners taking part in the designs we create? What if we offer only the guarantee of process regarding the learning that may take place, and the design causes some degree of suffering on the part of learners as well? Perhaps suffering—for example, anxiety in the face of legitimately challenging content or physical pain during acquisition of athletic skill—is necessary in some cases, but we need to acknowledge, and understand, when such suffering is appropriate, how it relates to the guarantee of learning, and how we know that is the case. In other words, we need to move beyond the easy mapping of everything to learning goals, while also taking the implicit promise of learning more seriously. A feature of a design does not have to prevent learning in order to be wrong, and in tandem, suffering should not exceed what is required to produce the level of learning that is promised.

Conclusion

As do design theorists outside this field (Nelson & Stolterman, 2012; Verbeek, 2006), we propose foregrounding the designer's role in creating an infrastructure for providing learning experiences that respect and engage the human participants taking part in them. This includes placing the burden of understanding the complexity of a learning experience—both in its intrinsic properties, and in the situational and individual qualities (Parrish et al., 2011) that are context- and learner-dependent—directly onto the

designer. Our own theorists have situated the guarantor of design inside our models and theories (e.g., Merrill et al., 1996; Reigeluth & Carr-Chellman, 2009; Seels & Richey, 1994), the idea being that a model followed correctly, backed up with appropriate theories and principles, will produce an effective design. But we argue that rigor should be placed in the enactment of those models and theories by individual designers or by design teams exercising disciplined judgment and designerly tools (Stolterman, 2008; Stolterman et al., 2008), and propose that a fuller understanding of the implications of where the guarantor of design (Nelson & Stolterman, 2012) is placed is an important issue for the field to address. Unless this shift takes place, the ability to reflect on human experience within intentionally designed learning experiences, to establish value for it in relationship to learning gains, and to consider it in the process of designing, will be difficult or impossible to undertake.

Furthermore, if we view the guarantor of design as centered within designers instead of within their tools, then we must be able to teach instructional design students to take such responsibility—and our models don't generally include (and probably cannot include) sufficient guidance on how to do so (Smith & Boling, 2009). This is not the kind of knowledge that can be decomposed into rational form, then taught propositionally to students or novice designers, consequently producing effective practice (Dunne, 1997). While we have some resources in the ID literature that explain the infrastructure of aesthetic experiences (e.g., Dewey, 2005; Parrish, 2009; Parrish et al., 2011), these resources have not adequately operationalized how designers would create, or would learn to create, such experiences. Acquiring the ability to sketch, to recognize when sketching may be useful, and to employ sketching as a flexible, designerly tool in the process of instructional design makes the idea that instructional designers—not their models and theories—can be the guarantors of design more probable than it may have seemed in the past.

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