Intensive studio experience in a non-studio masters program: Student activities and thinking across levels of design

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Abstract

In conjunction with an emerging view of instructional as a design field versus its traditional identification as a science, the authors have designed, established and studied from 2005—2009 a masters level course using studio-based pedagogy. This paper examines the design tensions involved in that effort from the perspective of the designer/instructors and the design activities and thinking of the students in the most recent iteration of the course. The research is based on analysis of field notes, student work, and syllabi across these five years, as well as on reflections of the designer/instructors. Design tensions center on the difficulties of adapting a pervasive pedagogy into an environment not conceived to support it and on the evolution of the course as it became more studio-oriented. Examination of the student's activities and design thinking was made through the lens of Lawson and Dorst's (2009) models of design, and include analysis of design activities as represented in our field notes together with discussion of sample work from students that illustrate their design thinking. The design models offered a useful vocabulary for discussing student's design behaviors, both with respect to their unique approaches to design and to the observations of the instructors regarding the effect of revisions in the course. We also discuss two categories of design activity used as extensions to the model (using external input and using tools) to describe activities in this class.

Keywords

design pedagogy; studio; instructional design; case study

Although instructional design is a field that has viewed itself for decades as a scientific enterprise, and to a large extent still does (Smith, 2008), questions have been raised about our basic "scientific" identity as early as 1981 (Davies). Recently those questions have been given a clarifying context by the broader discussion of design as an intellectual tradition in its own right (Nelson and Stolterman, 2003), and the recognition that instructional design shares broad characteristics with every other design enterprise, as argued persuasively by Geol and Pirolli (1992) and Goel (1995). This has resulted in the emergence of divergent conceptual tools and broad models of designing within the field of educational technology and instructional design (Boling and Smith, in press).

Questions regarding the way we train instructional designers have also been explored for some time (Boling, 2003; Ertmer and Cennamo, 1995; Rieber, 1998; Rowland, 1994; Sugar and Martindale, 2004; Tripp, 1994). Rowland demonstrated in 1992 that expert professional practice of ISD in the field is not as model-centric as our teaching; it is more in line with the "designerly ways of knowing" described by Cross (2006) and of acting

(Schön, 1983). However, if we examine the standards currently gaining support in the field of instructional design as the basis for masters level curriculum (Richey, Fields and Foxon, 2001) we see that the prevailing view of competent performance is still centered on definable and consistent processes for design (Boling & Smith, 2009). Processes, expressed most often as process models, are useful for designers, but as Lawson (1997) points out in his treatise on architectural design process and its short-lived phase in which process models were popular, the broad scope of design knowledge is in no way addressed by design education centered on process models. Recently, Lawson and Dorst (2009) extend the scope of this argument to claim that the development of design expertise is actually prevented by the use of such models.

The Study

Having considered for some time the various ways in which students in the instructional design program were not developing designerly ways of knowing (Cross, 2006) and behaving (Bichelmeyer, Boling & Gibbons, 2006), the authors undertook in 2005 the adaptation of an existing course in general visual skills for instructional designers into a studio-type course in instructional illustration using a studio model, which is the signature pedagogy (Schulman, 1995) for design education in most traditional fields of design.

This course has been taught, and re-revised, five times since that first revision. We first adapted the ways in which we had ourselves been taught during our respective educations in fine arts and architecture (Boling, 2008) and blended them with the lecture-and-project format prevalent in college-level instructional design programs. Our vision was that we would offer our students an immersive studio experience, which we hoped would compliment and amplify the hands-on project-based curriculum our students already go through. We have used a design tensions framework (Tatar, 2007) to explore the issues involved in making this kind of adaptation of pedagogy, and Lawson and Dorst's models of design (2009) to examine the activities and work of students in the fifth summer class.

The design tensions framework

We make the assumption that designing a course is an act of design and is subject to the tensions inherent in that act. We discriminate between design tensions and "trade-offs," as they are commonly discussed in design. Trade-off implies that one dimension or aspect of a design must be sacrificed or compromised for another, whereas the notion of a design tension requires that multiple valid requirements in a design situation must be reconciled without sacrificing one for the other or compromising either unduly (Alexander, 1979). These tensions have been classified by Tatar (2007) into four types: vision (goals); approach; project tensions; and "as created" situations. During the process of designing and offering a course, particularly when the course is redesigned and implemented multiple times, these tensions tend to arise in a disorderly fashion rather than in neat categories.

Vision

Tatar discusses the tension related to vision for a project as "a tension between what is and what ought to be ... the project vision or potential" (p. 417). While this sounds much

like the result of a traditional needs analysis in instructional design, and might very well be, it does not describe the desired outcome so much as the open-ended “problem of active choice” and “interrelationship between the sociological and technological” in design (p. 417). That is, the designers do not attempt to identify a gap between what is known (someone’s knowledge or performance) and what can be quantified as an outcome, so much as to work with the tensions set up by envisioning change.

Approach

Design tensions at the level of approach arise when designers consciously select methods of reconciling what ought to be with pre-existing reality (Tatar, 2007; p. 418). These realities may be anything from limited resources to conflicts in values, and the approach taken toward action by designers is flexible in light of the realities. In other words, there is no single, approach determined by pre-existing realities. Using existing terms from instructional design, this would mean that context, content and audience analyses only tell the designers what the tensions are likely to be for a given approach; they do not bound the choice for an approach absolutely. Designers must choose, or create, that approach in light of the foreseeable tensions present. This is not to say that designers always make up an approach from whole cloth; they may reach for known patterns or “standard configurations” (Vincenti, 1993) with which to reconcile vision with reality. However, this choice will both “narrow the focus,” an outcome well recognized in traditional ISD, and “introduce complex systems” (Tatar, 2007, p. 418), an outcome less often addressed in the basic process models.

Project tensions

The next level in the framework, these are “places in the project that (a) directly or indirectly fall within the designers’ scope of influence but (b) where means, ways, and values come into conflict” (Tatar, 2007; p. 418). Here the designers are moving from a general approach to the specifics of how that approach is supposed to play out in the enacted design. Tensions arising here require designers to attend to specific and concrete realities, versus broader or more conceptual ones.

“ ‘As created’ ” situations” (Tatar, 2007; p. 418).

These tensions arise during the implementation of a design as a result of the design having changed the situation into which it is introduced, or of the design having been changed by that situation. “As created” situations give rise to the last level of design tensions in the framework because some of the resulting outcomes of the design as enacted may be in conflict with the original vision. Resolving these tensions may involve reconsideration of the moves that were made to resolve tensions throughout the framework.

The Design Expertise Framework

In their recent extensive exploration of design expertise, Lawson and Dorst (2009) identify three inter-related descriptive models that describe designing; one model covers the nature of design activities, one the levels at which those activities occur, and one the types of thinking in play during design. Design activities are envisioned as affecting one

another constantly and in every relationship. The primary activities are: formulate, move, represent, evaluate and manage (p. 51). The levels at which these activities occur begin at the bottom of a pyramid and comprise project, process, practice and profession (p. 61). The third model addresses the types of thinking that may be employed while designing. These are shown as circles within circles, the innermost being convention-based thinking, then situation-based thinking and then the outermost being strategy-based thinking (p.69).

Methods

This repeated single case study extended over five iterations, with revisions, of a course in instructional graphics design in a masters level instructional design program. The authors designed the course collaboratively; it has been taught both cooperatively by both authors and individually by one author. The course is eight weeks long, held in a dedicated studio space with a flat table workspace assigned to each student. Six hours a week are designated as class meeting time; the studio is available to students 24 hours all week. Assignments have varied but always include the conception and production of visuals for specific instructional situations (conceptual or procedural learning, job aids, informational resources, and so on) together with collecting some kind of visual samples from lived experience and completing “Draw 100 Things,” for which students may use any production path they can manage to produce an integrated set of 1”x1” depictions of 100 common man-made objects. It may be worth noting that, in all but the second iteration of the course students and except for Draw 100 Things, project briefs are not the same for each student; students choose their context, audience and subject matter. Participants have included 39 students over the five iterations of the course; these students have been drawn primarily from graduate programs in instructional systems technology and human-computer interaction design.

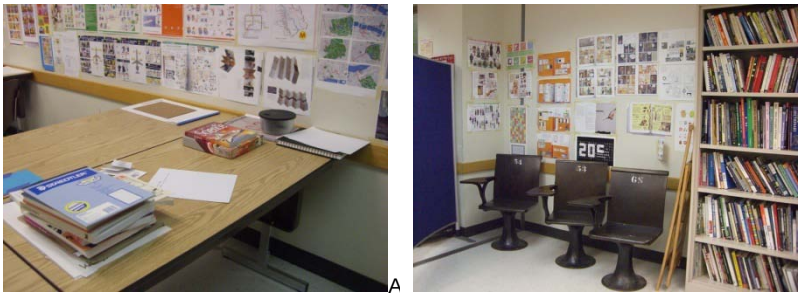


Figure 1 Two views of the studio; A) work-space for two students, B) design books and reading area. Both views show precedent images on the classroom walls.

The data sources for the study include student work and course evaluations for four of the five iterations (2005, 2006, 2008 and 2009), and syllabi and handwritten field notes for all iterations (2005 – 2009). The field notes were most detailed for the latest two iteration of the course when one researcher wrote them immediately following each class session and focused specifically on design tensions (2008; 63 pages) and on student design activities and decision-making (2009; 85 pages). These notes were intentionally as comprehensive as possible, subject to the sometimes overwhelming detail involved in classroom interactions. The unit of analysis for these notes was a

statement, portion of a statement, or group of statements representing a distinct idea. After the initial coding, both researchers reviewed, discussed and refined the resulting themes. The researchers used both manifest and latent coding (Holsti, 1969); that is, both explicit and implicit meanings were sought.

For the first phase of the study (Boling & Smith, 2009), explicit statements regarding design tensions (e.g., “Going to the lab … is so far positive. At the same time, opportunistic teaching is less available to all …”) were noted. Implicit meanings that pointed to design tensions (e.g., “I replaced the hard pencils people were using with soft ones – immediate new energy in their sketching;” which may imply a tension between offering an open choice of tools and directing tool use for desired experiences) were also considered. All statements were reviewed and re-reviewed for emergent themes, which were then agreed upon between the researchers as expressions of the tensions consciously felt during the experience of design and redesign and, often somewhat less consciously, captured or revealed in the field notes. We also compared the course schedules and assignments from each summer, and discussed all factors that we considered to have been at play in the course.

For the second, and current, phase of the study, analysis of the field notes began with a close re-reading of them. The notes were then color-coded the notes according to Lawson and Dorst’s (2009) model of design activities. Each notation describing a student framing or re-framing a design problem was marked in pink; each description of a student engaging in evaluation was marked in purple; and so on. During this analysis, the authors conferred on notations describing other activities that took place in class which did not seem to be covered by the model being used and chose to mark up two additional categories of design activity; 1) use of tools and 2) external input. We reviewed these again for themes, but also calculated means and standard deviations for the activities captured in the notes by student to build a quantitative picture of those activities. This phase of analysis also included review of students’ sketches, iterative design products and written papers from 2009, all in light of the field notes and our previous analysis of them.

Findings: Design tensions

Our vision for this course contrasted the “what is” of instructional design—students who struggle with development of designerly judgment (Nelson & Stolterman, 2003), studio thinking (Hetland, Winner, Veenema & Sheridan, 2007), and designerly habits of thought (Cross, 2006)—and what ought to be, specifically, students who do develop these ways of thinking and acting. Tensions at this level included the desire across the faculty for productive change versus the anxiety that experiments in pedagogical format might erode what have long been seen as program strengths, which include strong grounding in systematic processes for design and adherence to reductionist instructional theories rather than design judgment as the basis for rigor in design. This anxiety was most evident in colleagues without prior experience of their own in studio settings, but turned out to be more influential on the researchers than we realized as evidenced by the number of iterations we went through before implementing a well-integrated studio design. n additional tension at this level was that between the resources needed for studio pedagogy and the traditional resources available in the organization. One concrete example involves the use of dedicated space across the duration of a course; this is difficult to do in an environment where classes are expected to move in and out of classrooms every 60-90 minutes, bringing what they need and leaving nothing behind them.

Project tensions included the difficulty of addressing the skills and principles students felt a need to have versus the authentic situated project-based work upon which the course was based. This was related to a tension between offering presentation of principles and techniques versus introducing material opportunistically. For both these tensions the course design needed to provide sufficient support that students were confident to act. However, since the best support was only possible during and after action on the part of the students, we learned that the support could not be front-loaded and that managing "anxiety in action" was more important than creating calculated sequences of prepared instruction. Since this course was not embedded in a full studio environment (where the culture promotes "living in the studio"), we also faced a tension in support of the energy and engagement in the studio through lively discussion/critique versus the time and space individuals need to work and rework tangible products.

"As created" situation tensions involved our concerns over the amount of direct guidance being given to individual students versus their control over decisions and process. In an eight week experience some of them floundered too long without direct guidance, but they seemed to relinquish control quickly in the face of that guidance. Iterations of the course were largely driven by efforts to strike a balance in this situation of tension. Studio pedagogy versus established expectations of instruction, for students and instructors both, was also a major tension once the course was underway. For example, the design briefs we offered were experienced almost as evidence of inadequate instruction by students used to traditional classroom assignments with their full explanations of parameters and detailed rubrics for assessment. In turn, we wondered if we dared to mention to colleagues that the fourth iteration of the course incorporated no prepared presentations whatsoever lest we be seen as shirking the expected baseline responsibilities of an instructor.

Our presentation of design tensions in this paper represents, by and large, the fourth iteration of the course. The fifth iteration incorporated some project refinements, but repeated the basic structure of the fourth. Naturally, the tensions have shifted over time and we have presented those that stand out most clearly across the multiple iterations. Across five summers the course syllabi show a clear shift from more closely specified assignments to less, and from less open classroom format to more open—from 66% structured time in 2005 to 0% in 2009. Critique takes on a different character each class period and is therefore classified as unstructured time. This is particularly true since the "every class" critique plan in the fourth year allowed us to engage in critique without having to dictate the actual structure of critique.

summer	#assignments/ #unique types	minutes of structured time out of 180 total: percent
2005	8/8	120: 66%
2006	8/5	90: 50%
2007	6/5	75: 40%
2008	6/3	0: 0%
2009	6/3	0: 0%

Table 1 Assignments by summer with number of unique types and minutes of structured time out of 180 total per session compared to the total by year

In our efforts to resolve tensions iteratively over the four years, we see the class as having shifted progressively toward a design that resembles studio pedagogy more and

more, and looks less and less like an adaptation of that pedagogy. Providing a rich environment and conducting critiques of student work were not course features that could stand alone without sustained periods of time in which students are working and instructors are engaging in dialogue with them about that work *in the moment*. Presentations of principles and techniques, while ensuring that certain topics are covered and that all students are introduced to them, lose their force in a situation where the students' immediate design problems are highly contextual and highly absorbing.

In the most recent summer class we observed them several positive outcomes. Students made active and independent use of the precedent materials in the classroom (primarily a library of about 200 design books and another 150 or so samples of illustration covering the walls), something that had not happened previously. They made more frequent and more complete revisions to their projects than had ever happened before. They began to use critique as a sounding board and an opportunity to benefit vicariously from the design moves of others, rather than showing only their refined work and making minimal revisions in response to input. They experimented more freely with materials than previous classes have done, and several of them made extensive use of precedent models to explore approaches used by previous designers and applicable to their own self-defined design goals. On the whole, they made a stronger shift toward expressing themselves in terms of design principles than most members of previous groups. They grew comfortable in the studio space and were purposeful about spending their work time to solve particular technical and design problems rather than fiddling with tools until someone came around to direct their efforts. In the second phase of our study we focused on this aspect of the course in order to make these observations more purposeful and systematic.

Even so, while the current course does create an intensive "studio bubble" experience for students that seems to exert a strong effect on them, that experience does not last nearly long enough to ingrain the long term changes in thinking and character that we desire for these students. The course is sustainable, and in demand, but it does not do more than give students a start, or a recognition that such dimensions exist within design. This leads us back to the top level of the design tensions framework. We never wanted to leave behind the genuine benefits of a systematic orientation to design—only to address dimensions we saw as lacking; specifically, development of design judgment and designerly ways of thinking. Both of these are traditionally developed in a studio-type setting, and it is not clear how well they can be developed outside such a setting or in a setting that includes only some of this signature pedagogy, divorced from other aspects that support the whole and make it work—or in a setting that offers only one or two courses, or semesters, of studio education. We have seen in 2009 that students coming into the course from a full year in the HICD program which does emphasize design thinking (although not in a classic studio format) brought with them a little higher comfort level with some aspects of design thinking. However, we feel the need to return to the vision level of the design tensions framework to address in more detail the difference between what is and what ought to be in instructional design education. In point of fact, we have done so; our department is planning the conversion of our onsite masters program to a one year intensive, full studio experience.

Findings: Design activities and thinking

The most frequently recorded design activity was working with external input (m=14.8), which may not be surprising for a class in which most students were beginners (in

illustrations, if not in general design). This activity was an extension of the framework and covered discussion and guidance from the instructor, peer critique suggestions, and use of precedence materials. Of the activities in the original framework, the move was most common (m=12.3). Formulating (m=6.9), using tools (m=6) and evaluating (m=5.8) followed in descending order, with representing (m=4.8) and managing (m=3.5) lagging behind. (See Table 2 for summarized findings.)

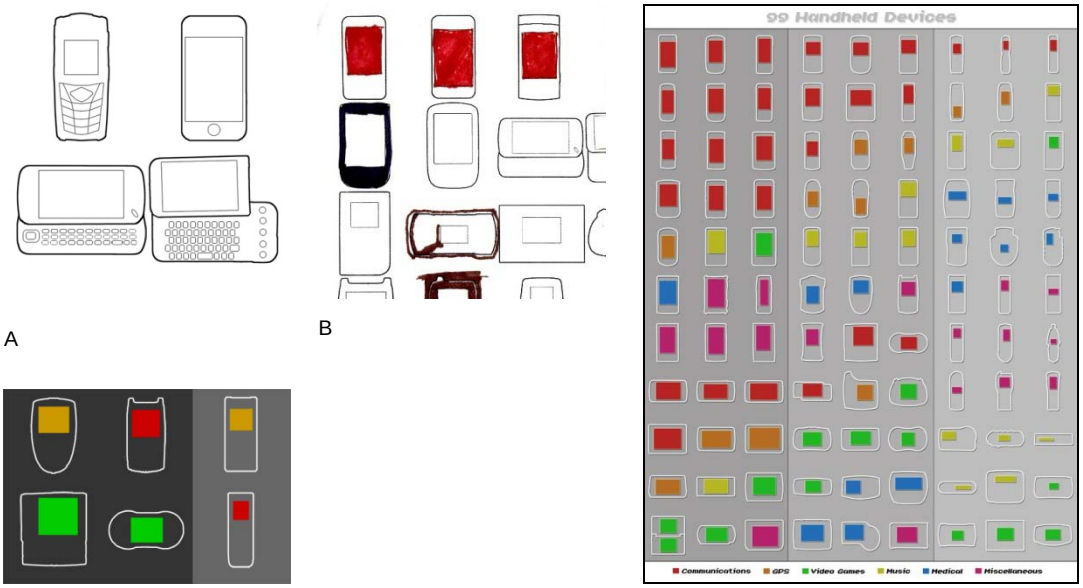
	formulate	move	evaluate	represent	manage	external input	using tools
Han	10	11	6	6	3	13	8
Don**	12	14	9	7	2	18	2
Min	7	13	3	5	2	14	9
Van**	5	9	6	2	2	16	3
Nikki**	9	8	5	5	3	11	4
Randy*	5	12	5	4	3	13	6
Andy****	3	8	3	4	4	9	7
Ana**	6	12	4	6	1	16	5
Dan*	9	22	7	5	7	26	4
Dana*	3	14	10	4	8	12	12
mean/SD	6.9/2.9	12.3/ 3.9	5.8/2.2	4.8/1.3	3.5/2.2	14.8/4.5	6/2.9

Table 2 Recorded design activities by student (pseudonyms used) with means and SD for each type of activity. NOTE: *absent once **absent twice ****absent 4 times

The high standard deviation for external input activity may have been influenced by the absences of individual students from certain class periods and resulting lack of field notes for them. In addition, two students completed their projects after the class ended, one for health reasons and one due to loss of computer data, which affected both the mean figure (which presumably would have been even higher) and the difference between numbers of moves (which presumably would have been lower) across the class. However, we also mapped the activities of these students over time and then studied the maps. This study showed that each student exhibited an individual profile of activities across the class sessions (some were fascinated with tools and explored them more than others; some formulated and reformulated ideas then moved quickly to finish their work).

We came to see these profiles as representing in action the combination of predilections, experiences and existing skills brought by each of them to the class in interaction with the experiences afforded to them by the class and the guidance offered to them while they worked. They were clearly not an undifferentiated mass of “novices” who could be led via a pre-calculated set of experiences to become a uniformly improved group of graduates, and neither was any one representative of a fixed point on a path toward expertise through which every other one must necessarily pass; each needed to be developed with reference to her unique profile. Returning to our earlier study of design tensions, this finding informs our observation that a less structured course design produced more of the learning and design behaviors that we hoped to see in these students. External course structure (presentations, exercises, planned discussions, reports) was replaced with enough time for the instructor and opportunity for action on the part of each student to allow for responsive interaction within the context of meaningful work—different interactions and different work for each student.

As we noted informally in 2008, students in the 2009 class were documented reformulating their design problems more often, more significantly, and with less concern for the rework it was going to cause them than did students in previous summers. Every student reformulated one or more designs after the eight class period (halfway through the term) with 37 instances recorded and only four of these indicating projects that were simply started very late. In the illustrated case (Figure 2), Dan pushed his initial concept through three reformulations, one of which required total rework of all 100 images. The substantial amount of work time available to them, frequent critique sessions and desk discussion of their work in progress seems to have shifted their focus from reluctant revision of work after formal review by the instructor to self-motivated reformulations of their core ideas.



A B C D

Figure 2. Dan's 100 Things were framed first simply as handheld devices (A), then as types of devices (B), then as demonstrations of different ratios of screen size to device size (C), and then as a more complex diagram showing three classes of screen/device ratio color coded by type of device.

In the first three iterations of the course, we noted that students spent very little time examining the examples of illustration on the walls of the classroom, and no time exploring the books. We logged the books online, assuming that these students might be more comfortable with rapid searching online that with browsing physical shelves and one summer we laid out books each week in the classroom relevant to the presentations for that week. Neither strategy made a difference. In 2008 and 2009, after presentations were discontinued, the instructor had time to pull books off the shelves and point to the walls while talking to students about their work in progress. In the 2009 field notes, of 164 notations coded as external input to design, 18 instances (about 9%) refer to the use of precedent on the walls or in the class library.

The field notes reveal that students were willing to make decisions about tools based on their goals and the moves they saw as important, rather than restricting design moves to the tools they knew or could manage already. In the two cases illustrated, Dan changed

tools (incurring significant extra effort) in order to enable moves he needed to make (Figure 3) and Min chose a tool she had never used before to achieve the look she wanted for one of her graphics (Figure 4).

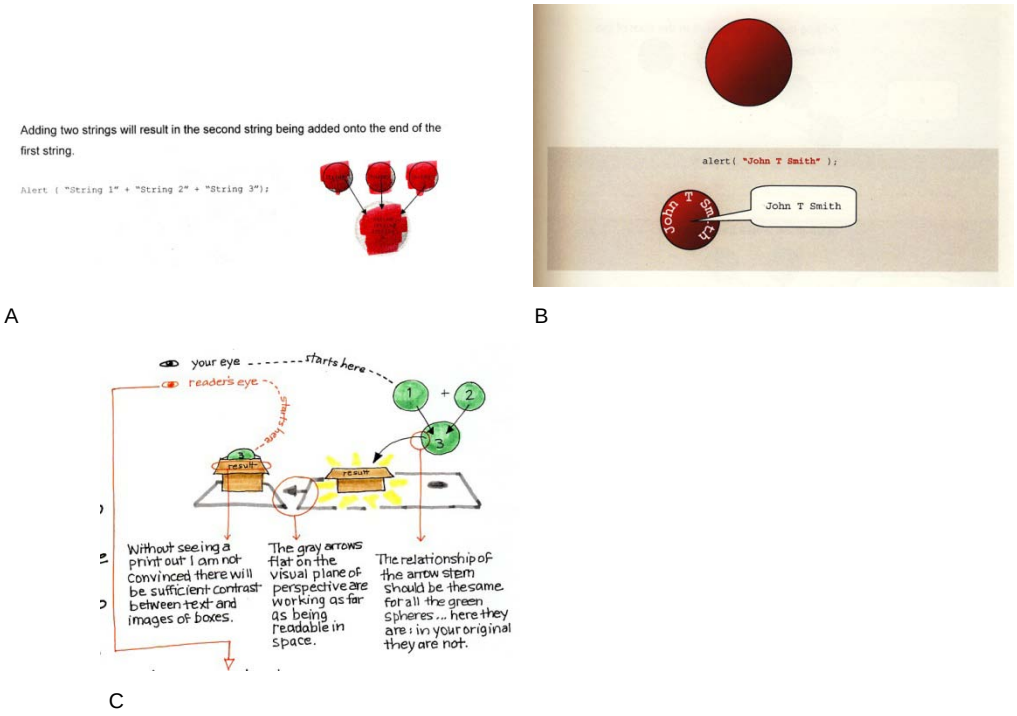


Figure 3 Dan sketched his vision for a booklet he planned that would teach programming through a combination of text and visuals (A) and he began producing pages in Word, a tool he already knew how to use; in midterm feedback (B), the instructor pointed out several problems with the graphics that Dan could not address with the functions available in Word; he decided on his own to rework the dozens of pages that he had previously considered complete using Publisher—he had never used this or any page layout tool before.

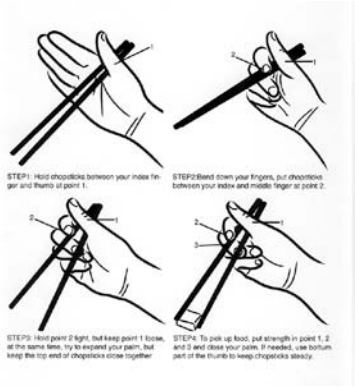


Figure 4 Min used the hand model provided for class to shoot source photos for her procedural illustration on using chopsticks; she reshot the images after realizing that the first set were not taken from the best perspective and was ready to trace these photos by hand to produce the graphic when she saw a classmate using the brush tool in Illustrator; she felt the tool would be appropriate for this graphic—although she had never used Illustrator, she chose this tool to create the final image.

Findings: Types of thinking

Students who situated their projects in contexts well known to them used situational and strategic thinking more often and to better effect than those who chose projects further from their own experience base. Andy and Ana's projects (see Figures 5 and 6) illustrate this connection between choice of project and the type of thinking students employed. While all the students made decisions based on convention, it appeared to us that deep understanding of the context for a design assisted some of the students in recognizing unique factors of a situation that demanded different thinking strategies. In the case of Andy's project, he also employed some strategic thinking, inventing what was for him a new process of design in which he sat with his in-laws and photographed them while they used their TV and CD player.

Paradoxically, strategic thinking did not necessarily produce artifacts that we also judged to have the potential for highest usability or appeal. That is, a student may have been exercising more expertise in one dimension of designing than another student, but have arrived at a result with less overall utility. The difference, at least in this illustrative case, is that the tangible realization of the artifact exerts its influence not just as a failure to realize the concept, but as a confounding factor that interferes with the concept. To make an analogy with writing, fuzzy writing is widely agreed to be a symptom of fuzzy thinking. However, clear thinking does not automatically result in crisp prose unless the writer has a practiced facility in the first place; and lack of such facility can actually infect the thought process. Just as process models are not sufficient to produce a good result (Rowland, 1995), so one or another type of design thinking is not sufficient. Of course this is hardly news, but in the quest to encourage one or another type of thinking in our students, it is worth remembering.

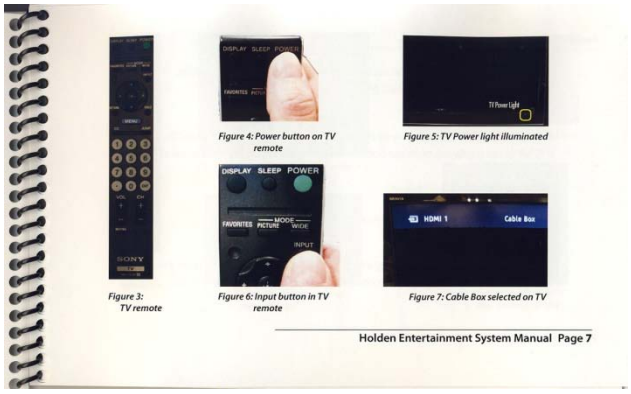


Figure 5 Single page from Andy's instructional booklet created to help his elderly in-laws use their entertainment system; Andy made strategic decisions about where his in-laws would keep the booklet, how easily he might replace it if it were lost (which was very likely); what size the images would need to be for them to be seen easily; and how showing a thumb on the remote would support the viewer—but he also produced an artifact in which it was difficult to follow the sequence of visuals and to interpret the captions.

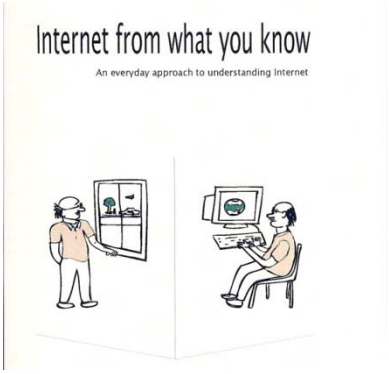


Figure 6 Cover of Ana's booklet explaining internet concepts to elderly people in India; although she was from India, her experience with the elderly ("people over 50") was not immediate or extensive and she struggled with finding appropriate metaphors and the right level of detail for presenting concepts—however, her attention to details in the images and to clear layout resulted in an artifact that we anticipate would reward close study with rich communication.

Findings: Levels of thinking

The students operated primarily at the project and principles levels, as might be expected in a short course focused on one specific aspect of instructional design. A few questions did arise from students, or were introduced by the instructor, regarding practice level issues in design (e.g., the influence of legal departments on what can be shown or not shown in procedural graphics, for example, or the degree to which an individual illustrator is responsible for optimizing a graphic for viewers from different cultures), but this was not the norm.

Summary

As we launched the second phase of this study, we expected to look for evidence that the students were making progress in design thinking during the course as described by the language of the Lawson and Dorst (2009) models of design. In actuality, we used the models not as a way to measure progress directly, but as a valuable lens through which to promote, observe and discuss design thinking and activities in our students, as well as to characterize the unique profile each student brought to the course. We were able to document the guidance given to students during class separately from their design moves and their own evaluations of their work, easing a design tension identified the year before. Some of our findings from these small case studies may not seem very radical to those who teach in studio settings all the time, but they represent important shifts in pedagogy for instructional design. We also found ourselves extending the model of design activities (Lawson & Dorst, 2009) to account for account for the contribution of external input to design and for grappling with the tools involved in designing.

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