Broadening Our Foundation for Instructional Design: Four Pillars of Practice

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A recent special issue of *Educational Technology* (May-June 2004) began a dialogue between researchers associated with two fields: instructional design and a newer field called the learning sciences. The learning sciences field (LS) enjoys higher academic status due to its closer ties to psychology and cognitive science, which are seen as more basic and rigorous disciplines within the academy. On the other hand, instructional design (ID) holds a powerful advantage in that we train professionals for non-academic jobs. We are seen as having more relevance to everyday concerns of practice, training, education, and commerce. Learning scientists, I believe, recognize this practitioner advantage, but the ID community continues to suffer from psychology envy, affording higher status internally to its own researchers steeped in the latest psychological theories and methods.

Reading the special issue, I was reminded that in order for the practice of ID to thrive, we must exploit our strengths. The learning sciences will always be stronger in learning theory and psychology, but ID as a field holds two key advantages: (1) attention to practitioner concerns of design, technology integration, and other forms of professional problem solving; and (2) a broader and more eclectic theory base, including but not limited to psychology and cognitive science. ID belongs to a family of professional fields concerned with design of systems, including human-computer interface and human-factors design; systems engineering and the information sciences; architecture and planning; industrial design; new media design; and technical communications. While psychology plays a role in every one of these design fields, concerns move far beyond individual cognitive processing into areas of social and community context, implementation and use, management, and evaluation. In particular, design practitioners must pay close attention to questions of social value and use. Most design fields also acknowledge the importance of aesthetic considerations as they encourage design of meaningful and positive human experiences. In this paper I explore ways of expanding our conceptual framework for thinking about design of instruction. By maintaining a broad base to inform practice, we can respond more effectively to challenging problems of practice, and in so doing, maintain solidarity with other design fields.

But Why Am I in This Issue?

Before proceeding, I first find it curious that I am included in this special issue on cultural studies. I am not trained as a cultural critic. Rather, for nearly 30 years, I have followed a career in instructional design with an emphasis on cognitive learning processes. After a BS in psychology, I completed another 15 or 20 psychology credits in pursuit of my doctorate in Instructional Science and Technology. Looking back on my career, however, I can see my perspective evolving across the decades:

**1970s - Cognition and instruction.** A landmark book (Klahr, 1976) signaled a shift in attention among cognitive scientists toward complex problems of schooling practice. I rode the wave of enthusiasm for cognition applied to instructional design, and worked with my mentor (Dave Merrill) and fellow students (including Charles Reigeluth) putting information-processing models of cognition to work on instructional problems, resulting in elaboration theory and early versions of component display theory.

**1980s - Human performance and cognitive tools.** Teaching at Northern Illinois University, I was active in the Chicago chapter of ISPI (now the International Society for Performance Improvement) during the rise of various performance-oriented theories and models. I applied expert system shells to develop IF-THEN rule sets for modeling various forms of expertise, and analyzed performance problems for their various causes and potential solutions. Joining the University of Colorado faculty in the late 1980s, I collaborated with Dave Jonassen, Scott Grabinger, and Marty Tessmer on various projects combining information-processing psychology with hypertext and expert-systems
modeling technologies.

1990s - Constructivism and postmodern criticism. At first, the constructivist movement seemed more revolutionary than it really turned out to be. I expected a true paradigm shift toward a new epistemology and ontology—toward a more qualitative, non-reductive understanding of human agency and activity, assisted by various learning technologies and resources. What we got, rather, was old wine in new bottles—new ideas about knowledge construction and learning environments, but pretty much the same old assumptions about scientific objectivity, technology determinism, reification of psychological constructs, and theory-driven design (cf. Popkewitz, 1998). Postmodern criticism proved a temptation, but seemed unable to recognize its own place as another idea competing for journal space.

2000s - Practitioner concerns. As the new century emerged, I found myself increasingly alienated from the constructivism-instructionism debates and from discussions that only fostered ID's continuing dependence on psychology for insight and direction. At the present time I find myself preferring pragmatism or pragmatic realism as an underlying philosophy (e.g., House, 1991; Rorty, 1989), and practitioner perspectives as a needed antidote to the surfeit of high-road theory and privileging of science over other ways of knowing and doing. By temperament I am more of an iconoclast than model-builder—more attracted to poet-philosophers than to architects of grand systems and theories. I prefer to listen to a good practitioner story than to decode a set of boxes and arrows, although I acknowledge that both have a place.

So on a personal level, my road has been long, winding, and steep at times (see Gallagher, 1996 for a similar developmental report). In some respects I have followed the fads in psychology, which during the 1980s became self-consciously aware of its inward, individualistic focus and began looking at cultural and community dynamics to complement internal machinations. But I feel that, lately, I have finally moved beyond psychology to a renewed commitment to ID as a legitimate field of endeavor in its own right.

Outgrowing a perspective does not mean throwing it out entirely, however. Practitioners I teach and consult with have found value in good learning theories, and I follow their lead. But I don't want psychology to dominate. Rather, I want theories of learning and instruction to guide instructional design, but only in step with other concerns I have learned to pay attention to. So in good model-constructing form, Figure 1 presents a conceptual model that retains elements of psychology, combined with my new interests. The figure summarizes the four columns or pillars I am offering to underlie ID practices.

![Practice of Instructional Design](chart)

**Figure 1.** Four pillars of instructional design practice, two familiar and two not so familiar.

The first two pillars are no doubt familiar to designers everywhere. Models of information processing, cultural context, and performance support are successfully integrated into current thinking and practice. The next two pillars are less prominent in the literature; therefore, I'll spend more time explaining them.

**The First Pillar: Principles of Learning, Cognition, and Message Design**

Here is a simple, familiar depiction of the three-way relationship between teacher, learner, and the outside world (see Figure 2).
I have heard this relationship called the three-person problem. That is, the basic unit of instruction is not simply an issue between student and teacher, but extends out to how we use our knowledge in the outside world.

To be thorough, looping arrows should connect all the boxes. As presented, the figure highlights the importance of teachers and learners interacting together. It also shows that learners hope to apply their new skills and understandings to their work or performance environments once instruction is over.

Interactions between teacher and learner require clear communication and presentation of information. A learner-centered take on instruction would make sure the learner-as-individual gets a good message, presented in a clear way, suited to his or her prior knowledge and learning preferences, with lots of opportunities to use the new information in practice. Thus the teacher-learner relationship can rely heavily on cognitive learning psychology to achieve good transmission of information.

The following is a brief sampling of design principles based on behavioral information-processing psychology. These principles can be used to guide the design of information resources and exchanges.

- **Cognitive load.** Presentations should take into account learners' limited memory load and the processing requirements of the task, and seek to minimize extraneous processing requirements. Managing cognitive load—keeping instruction simple, direct, and coherent—allows learners to focus on the content and the relationships within the information presented.

- **Instructional guidance.** Learners need practice at targeted skills, and they need clear examples of worked-out material. Good instruction is a filter to the real world's complexities, guiding the learner toward scaffolded representations designed to aid understanding and skill development.

- **Schemas and conceptual change.** People organize their knowledge into coherent structures called schemas or mental models. These schemas become tremendously important in making sense of the world, but they can be hard to change. Deep conceptual change involves restructuring schemas and mental models. This is best done through direct challenge to those schemas, through repeated empirical and social encounters with the world. Cycles of experimentation and observation will eventually lead to revised schemas and understandings, which in turn will change how people see and interpret their worlds.

- **Knowledge, skill, and attitudes.** Various taxonomies differentiate lower-order learning, such as rote memorization of fact, from higher-order learning, such as using information to solve divergent problems, or creatively combining resources to design a useful artifact. Regardless of the taxonomy used, learning outcomes include verbally encodable knowledge, skill or procedural knowledge, and attitudes, each with different learning requirements. In general, we want to encourage higher-order, integrated, whole-person learning outcomes rather than low-level or overly narrow learning.

- **Optimal chunks and challenges.** To keep people motivated to learn, instruction should be modularized into chunks that challenge—but don't overwhelm—the learner. Other motivational principles involve learner perceptions of relevance, maintaining confidence and interest, and encouraging goal-setting and self-regulation.

### The Second Pillar: Connecting to the Practice Environment

Recall our simple three-box figure, linking teachers, learners, and the outside world (Figure 2). We focus now on
links between learners and the outside world, often the workplace. Learning outcomes gained through instruction should relate to the outside world in significant ways—otherwise school learning remains of academic interest only. To understand this link to the outside, additional theoretical perspectives are needed, in particular, theories of work, knowledge transfer, and social context. Listed below are a few principles and concerns relating to this second-level concern.

**Social context of learning and performance.** In the 1980s and 90s, mainstream psychologists became aware that information is processed within a social and cultural context. Change the social rules, and individual cognition is impacted. The most enduring ideas for design have to do with emergent communities of practice, situated learning, and cognitive apprenticeship. Activity theory is a promising framework for accommodating multiple levels of scale (individual and social), human agency, and tools within an overall environment of intentionality and collaboration (Jonassen, 2002; Peal & Wilson, 2001; Ryder, 2004).

**Work context.** The physical, social, and technical context of work became a closer object of study and analysis. Cognitive analyses of work and performance help designers of instruction know what new knowledge is needed and useful.

**Tools and technologies.** Tools and resources become essential elements of both learning and performance. Cognition, once viewed strictly in individual terms, is now seen as distributed throughout an environment, particularly through different people, tools, and environmental cues. Moreover, designers should examine the tools and resources available in training, to see if they fit those available on the job.

**Timing and access.** Seen in terms of performance support, training should be conveniently available when performance needs arise. The closer to the performance context, the more likely that learning will prove relevant and useful.

This second pillar, connecting instruction to the outside world, affects the world of instruction as well as links to work. Resnick (1987) spoke of bridging devices like simulations and multimedia resources that could bring features of the outside world into the smaller world of instruction. These second-pillar principles help designers keep in mind the need for authenticity, rich information resources, and links to the world outside of instruction.

**The Third Pillar: The Larger Context of Values and Political Concerns**

Beyond the social and technical issues touched on above, human contexts reveal additional layers of meaning and value. Subramony (2004), for example, has documented ID's scandalous inattention to issues of cultural diversity. In this section I review some not-so-obvious ways that values reveal themselves in instruction.

**Representing expertise.** How is expertise presented in instruction? Consider, as an illustration, methods for audio narration used to illustrate a multimedia learning object to be included in an online lesson. Is paid talent used to read a script? Or is a bona-fide expert used? Does the expert read a script in a studio, or is a conversation or lecture captured live and edited for use in a module? On the surface, these decisions sound purely technical and message-design related—and not particularly value-laden. At another level, though, we are saying something about the nature of expertise and the student's relationship to it. By using a content expert (rather than paid talent), we are inviting learners to enter into some sort of relationship with that expert. Textbook knowledge becomes more clearly embodied through the expert's persona. By capturing a live event (rather than script-reading in a studio), the learner is invited to see the content as more fluid, more context-bound, than a canned script might suggest. Word-perfect scripts, in common with other written materials, suggest that expertise can be pulled out of a situation and made more fixed and permanent (McLuhan, 1962; Postman, 1979). The capturing, packaging, and presentation of expertise is more than a technical matter—it says something about how we see knowledge, whether in embodied or transcendent terms.

**Social and work roles.** Who is being trained, and for what? A lesson may send conflicting messages about who is in charge and the level of initiative needed for a job assignment. The authoritarian tone of a corporate-sponsored lesson may suggest a level of social control and supervision, while the content may be aimed at more flexible problem solving. Then to complicate matters, the lesson deceptively suggests a level of initiative and flexibility that in reality is unavailable on the job. In these cases, learners are getting mixed messages, and they may have trouble working out
exactly what is expected of them. If workers are told to take risks in solving problems, but then are punished on the job for doing so, then trust and credibility go out the window. The instruction is not really preparing the learner for life outside, and the learner will suffer for the mismatch.

Multiple perspectives. How does instruction represent fuzzy areas where experts might disagree? Every subject has its fringe or border areas where current inquiry is arbitrating between conflicting positions. Training programs that gloss over these disagreements by presenting only one model or approach seem intellectually dishonest, even when the purposes of training are introductory. Even established content can become problematic when applied to complex, uncertain situations. Oversimplifying truths can lull learners into a naive view of the subject matter and an undeveloped personal epistemology (Hammer & Elby, 2002; Jonassen, Marra, & Palmer, 2002; Walton, 2000).

Privilege and access. As performance technologists are fond of reminding us, training is an expensive enterprise. It's always good to know who is paying the tab, and for whom (especially true when technology is involved). Instruction's implicit agenda is influenced by the goals of the sponsor. Often training or education is delivered in a way that restricts the receiving audience to a privileged group, either for proprietary, cost, or cultural reasons (Sutton, 1991). When designing lessons or critiquing existing instruction, it's good to ask questions about who will receive access and how that access is accomplished.

The concept of privilege goes beyond who will receive instruction. Messages of empowerment (or disempowerment) pervade our communications, including instructional messages. Some people are visible and articulate in instruction; other people are invisible or muted. Designers need to get into the habit of reading instruction with an eye toward privilege, access, and voice. A recent study of an online forum, for example, found substantial biasing of positive messages toward men, at the expense of women on the forum (Herring, Martinson, & Scheckler, 2002).

Workplace realities and incentives for use. Real working conditions result in a complex nest of incentives and disincentives to participate in instruction and apply new knowledge on the job. Instruction may encourage sharing communities of practice, while the worker is convinced that hoarded knowledge is the only thing that keeps the boss from firing them. Workplace incentives are shaped by union rules, office conditions, even shift rotations and vacation schedules. Online lessons may be assigned with workers expected to complete the training on their own time. The level of bureaucracy and opportunities for advancement (or layoffs) affect how a worker reads the messages contained in instruction and their attendant ethical and moral imperatives. Just as commercial advertisements must manufacture an unmet need or desire, so an organization must create a need or requirement to complete training, particularly for the latest technology or procedure installed, often to keep up with one's competitors. Supervisor mandates are relatively rare tools for achieving compliance, compared to the multitude of more subtle messages conveyed. Just as Foucault's (1977) prisons managed to maintain a level of compliance and conformity with minimal overt violence, organizations often send subtle messages of expected compliance and conformity, including continuing training and professional development to keep up with developments in one's job—but always with an implied threat of sanctions for resistance.

It should be clear that all of these issues relate directly to values, politics, and moral responsibility (Thomas, 2003). As a further exercise applying this pillar of practice, contrast two hypothetical approaches to floor-sales training developed by a membership-based warehouse store. One module is delivered via CD-ROM and follows a rule-example-practice strategy to teach simple content, guided by a cheerful animated character. The module uses humor and upbeat motivational techniques to maintain interest and enjoyment. The content is highly simplified and abstracted, essentially teaching workers to be sensitive and responsive to customer needs by applying three simple rules of courtesy.

A second approach, also a CD-ROM multimedia module, presents real floor workers reporting experiences with customers, along with testimonials from customers themselves. The module offers advice about how to handle conflicting priorities—doing assigned tasks versus responding to customer requests. The instructional strategy includes shared stories and a problem scenario presented via video, but the production values are simpler and have a homegrown feel to them. The actors are somewhat amateurish, as though they were asked to re-enact an experience they themselves had recently in the store. Humor arises directly out of the storytelling and re-enacting. Small groups of

workers are encouraged to complete the module together, or to talk about it during brown-bag discussion sessions.

To understand the political or value layer of meaning attached to these two modules, consider the audience and purpose of instruction. Typical floor workers in American warehouse stores earn just above minimum wage, part-time or full-time, usually without insurance and retirement benefits. The supervision style of managers will vary substantially, from respectful to abusive. Management’s reasons for offering the training might be to improve work performance, but there also seems to be a level of social control needed, to maintain a level of courtesy and compliance in spite of conflicting job demands and less than pleasant working conditions.

Within that context, the simple module seems targeted to be easily consumed with a smile, but the authenticity is lacking. The scenario-style module seems more respectful of the legitimate concerns of workers, while still conveying the message and content needed by management. An instructional designer assigned to develop training in this situation should consider more than cognitive and technical issues when determining a best approach. The value implications of different approaches should be considered—the messages conveyed by different strategies, representations, even choice of media.

The Fourth Pillar: Aesthetics as the Immediate Experience of Learning

The final pillar for ID practice is aesthetics, by which I mean careful attention to the immediate experience of learning (see Parrish’s [this issue] discussion of Dewey). Instructional designers are designers of materials, but they are also designers of experience. On both levels (design of materials and experience), they move beyond purely technical issues of theory application and enter into the realm of aesthetics. Designers don’t fully determine or control the learning experience, but they fashion available resources to help learners have a particular kind of effective learning experience. And learners will point to a number of non-technical, non-cognitive factors that helped make particular learning experiences deep, meaningful, and memorable—including perhaps:

- A teacher’s charismatic storytelling, presentation, or engagement in discussion
- An absorbing project leading to an optimal flow experience
- A well-written essay pondered and reflected upon
- A carefully designed online course experience using all the tools available to lead to effective learning

Thinking about these kinds of peak experiences is not what first comes to mind when thinking of aesthetics, but it fits our emphasis. Parrish (this issue) views aesthetics as moving beyond thinking of ID as an art form, which is sometimes discussed in the literature (Gibbons, 2003; Reigeluth, Bunderson, & Merrill, 1978; Visscher-Voerman & Gustafson, 2004). How designers make decisions may be partly technical and partly artistic, but an aesthetic perspective on design focuses on the what. We are designing for heightened levels of immediate experience that will convey deep and lasting impressions on learners through careful orchestration of available design elements. Cognitive psychologists are beginning to examine affective design more carefully (Norman, 2004), but I believe aesthetic considerations can be studied in their own right.

An example of the aesthetic comes out of my current teaching experience. I am presently co-teaching a class with Len Scrogan, director of Instructional Technology for the Boulder School District. Len’s approach to teaching is highly personalized, a result of careful thought and attention to detail. He employs a wide variety of teaching strategies; in fact, he intentionally incorporates a full list of fifty strategies into his leadership class, at different points in the course, often subtly and without notice. First day of his leadership class, Len re-creates a Hawaiian luau atmosphere, complete with colorful decorations and music. He even asks students beginning class to come in colorful dress. Through a process of initiation, Len is sending a message to students: "This is a different kind of class. I am not your typical instructor. Follow me, and I will take you places you haven’t considered going. Things you learn will change your whole way of thinking about learning and technology." As I co-teach with Len, I am drawn to reconsider my own practices, and ways to lead students to deeper levels of reflection and conceptual change. With Len, this happens not by recourse to technical strategies or cognitive theories, but rather through a sustained effort at providing heightened, intense learning experiences that are both cognitively challenging but also placing students on full aesthetic alert. The words "entertainment" or "appeal" don’t quite capture the careful design and intentionality that go into Len’s preparation and delivery. I prefer to think of his aims and accomplishments in terms of an immediate, aesthetic
connection through heightened experience.

Conclusion

Reigeluth (2004) spoke of the "balanced diet" provided by ID’s broad concern for design, development, implementation, management, and evaluation. In a similar way I am calling for a more balanced diet by increasing servings of often-neglected aspects of design, particularly the moral and value layers of meaning, and the aesthetic side of our work. The foundations or pillars of practice need to go beyond learning theory, and beyond the ADDIE model depicting the life cycle of design. By re-valuing the foundations hitherto neglected, we will position ourselves to build fundamentally solid designs, and successfully differentiate ourselves from communities like the learning sciences that lack such broad foundations.

References


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[1] Tom Duffy (2004) notes that ID theorists tend to rely more on design principles, whereas learning scientists work more from coherent theory. I believe this is often true, certainly in my case. The advantage of design principles is that they can be eclectically appropriated and combined for different practical uses. Mixing theories is usually a no-no for scientists, but I don't believe a single theory could explain the processes coming into play within a real-world design problem.