

Instructional designers at work: A study of how designers design

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Abstract: Instructional design (ID) in its short life has been dominated by behaviourist approaches despite critique focusing on issues of practice as well as theory. Nonetheless, little research has addressed two fundamental questions: "What constitutes good instructional design?" and "How do instructional designers create good design?" We have begun a search for answers by asking a sample of eight instructional designers to reconstruct how they helped faculty members deal with challenging design problems as they adopted a Learning Management System and other web-based technologies in support of their teaching. From audio-recordings we derived response categories consistently recurring within and across interviews, then validated our analysis with the sampled group of instructional designers. Our analysis suggests that instructional designers employ a set of social skills and cognitive tools that enable them to act as a pedagogical "conscience" in the design process. We interpret these skills in terms of "theory of mind" in the context of instructional design.

Résumé : Durant sa courte existence, le domaine de la conception pédagogique a été dominé par les approches comportementales malgré la critique qui met l'accent sur les questions pratiques aussi bien que théoriques. Néanmoins, peu de recherches ont abordé deux questions fondamentales : « Qu'est-ce qu'une bonne conception pédagogique ? » et « Comment les concepteurs pédagogiques élaborent-ils un bon concept ? ». Nous avons commencé notre recherche de réponses en demandant à un échantillon de huit concepteurs pédagogiques de reconstruire la manière dont ils ont aidé les professeurs à composer avec des problèmes de conception particulièrement difficiles tandis que ces derniers procédaient à l'implantation d'un système de gestion de l'apprentissage et d'autres technologies Web comme soutien à l'enseignement. À partir des enregistrements sonores, nous avons déterminé des catégories de réponses qui apparaissaient de manière récurrente dans les divers entretiens ; puis, nous avons fait valider notre analyse par notre groupe-échantillon de concepteurs pédagogiques. Notre analyse suggère que les concepteurs pédagogiques utilisent un ensemble de compétences sociales et d'outils cognitifs qui leur permettent d'agir en tant que « conscience » pédagogique lors du

processus de conception. Nous interprétons ces compétences sous l'angle de la « théorie de l'esprit » dans le contexte de la conception pédagogique.

Research Context

Intuitive notions of instructional design (ID) have existed as long as people have been teaching and training. However, in the mid-1900s, military needs forced more formal study of the practice, particularly in the United States, where the low level of skills in conscripted men compelled the creation of fast and effective training programs. This demand married well with two of the trends of the time – behaviourism and systems thinking – to engender the early instructional design models: for example, the widely adopted 'Dick and Carey model' (Dick & Carey, 1978) and the US Air Force's 'Instructional Systems Development' model (U. S. Air Force, 1975). These models embodied a belief that a systemic, or at least a systematic, approach would provide effective teaching and fast learning. Though alternative models with slightly different formulations have proliferated, the Dick and Carey and ISD (Instructional Systems Development, or sometimes Design) models dominated the North American practice of instructional design in corporate and educational sectors for the next two decades.

In response to critiques of this 'scientific design' approach, particularly those from the emergent constructivist school of instruction, Dick, Merrill and others, in a series of articles through the 1990s, debated the status of instructional design as an academic discipline. In this debate, Dick weighed the challenges posed by contemporary cognitivists to the behaviourist approach that he devised with Lou Carey in the 1970s (Dick, 1996). On the systems side of the argument, Merrill, Reigeluth, and others proposed comprehensive ISD models accounting more explicitly for the obviously iterative, rather than linear nature of the design process (Merrill, 1991; Reigeluth, 1996). On the more intuitive side, Willis devised a much looser 'R2D2 model' based on a reflective, constructivist approach to learning (Willis, 1995; Willis & Wright, 2000).

At about the same time, Ertrem, Moallem, Rowland and their colleagues (Ertrem & Cennamo, 1995; Moallem, 1998; Rowland, Parra, & Basnet, 1994) examined alternative ways of teaching instructional design that departed from prescriptive models. One common element in their approaches emphasized the use of higher cognitive skills – reflection, and role modeling – which characterize teaching in the studio or apprenticeship mode. In another common element, they defended their departures from prescriptive practice with ideas from the broader design literature: ideas from Nigel Cross on "designerly ways of knowing" (Cross, 2000), and from Donald Schön on reflective practice (Schön, 1987, 1988).

Extending this argument further, Willis and Wright (2000) declared ID "much more an art than a science ... And it is much more art than it is the correct application of technical recipes" (p.5); "[a field] ... somewhat isolated from trends and developments in related fields There is a rich body of literature that we can mine for alternative ways of thinking about design" (p.16).

In fact, however, very little of the theorizing on instructional design has been subjected to empirical testing, as lamented by Jonassen:

Instructional design is a classical example of ill-structured problem solving. Despite our allegiance to design models, given any instructional design problem, there are an infinite number of possible solutions to that problem. And despite claims to the contrary, there is not a sufficient research base to support any [ID] model in diverse settings. (Jonassen, 2002, p. 117)

Similarly, in a literature review intended to determine whether instructional designers actually relied upon any ID models in their work, Kenny, Zhang, Schwier and Campbell (2004) were able to find only ten papers dealing with the topic six surveys, one interview and three case studies examining how instructional designers view their work. All these studies focused on very broad roles and tasks, such as those outlined in a standard ADDIE model: Analyse, Design, Develop, Implement, Evaluate (e.g., Seels & Glasgow (1998); or very general skills (e.g. communicate with the client). No study discovered designers following a theory-based approach, and none investigated the cognitive processes underlying design activities.

More recently, in a web-based survey of 113 instructional designers, Christensen and Osguthorpe (2004) found that only half of them referred to theory in their work, using other strategies and especially other people to make design decisions. Campbell, Schwier and Kenny (2006) have explored in depth the notion of instructional design as a conversation between the designer and client, focusing on how the designer represents personal, professional, institutional and societal values in a process of 'socially constructing' knowledge (Schwier, Campbell & Kenny, 2007). Similarly, other researchers (Cox & Osguthorpe, 2003; Liu, Gibby, Quiros & Demps, 2002) have found that instructional designers tend to spend the largest part of their working life dealing with the client. Our work builds on this line of work, viewing the design process as a conversation between designer and client, and extends it by focusing our lens on the skills that the designer employs to guide these conversations.

Methodologies in Design Research

Brown (1992) proposed the study of the learning process through 'design experiments' that explore how the constructed elements of a particular pedagogical environment affect learning. This approach has goals that are pragmatic (discovering what works) and theoretical (why it works in terms of learning theory). Design experiments have been characterized as 'ecological' in the sense of considering all the factors in play; interventionist, as a test-bed for innovation; reflective; iterative; and results-driven (Cobb, Confrey, di Sessa, Lehrer & Schauble, 2003). However, the design experiment movement's focus on the performance of American schools limits its impact. First, the complexity of this environment entails the use of rich but difficult data (logs, narratives), at a time when school administrators increasingly look for hard results from randomized testing (Shavelson, Philips, Towne & Feuer, 2003). Secondly, there is little or no cognizance of the broader field of design (Zaritsky, Kelly, Flowers, Rogers & O'Neill, 2003).

Moving towards what Nigel Cross has labelled a “science of design” capable of identifying ‘good’ practice, and how to develop it (Cross, 2000), the broader design field has begun to develop research methods and techniques for analysis of ‘soft’ data on the cognitive processes that underlie design activities (e.g. Eckert & Stacey, 2000; Goldschmidt, 1994; Heylighen, Neuckermans & Bouwen, 1999; Purcell & Gero, 1996). For example, Heylighen et al. have identified different forms of knowledge – dialectic, Cartesian, existentialist, pragmatic – that require different approaches to problem formulation and data collection. In small-sample ethological studies, Purcell and Gero have examined how students educated in different disciplines (mechanical engineering and industrial design) translate the same problem into different types of design features. Akin and Akin (1996) have conducted experimental studies of how students frame design problems with a view to creating computer-based models of cognitive processes underlying ‘sudden mental insight’. Pereira (2000) has evaluated the limitations of yet another approach to rich qualitative data, protocol analysis. Two of our colleagues have used the analysis of protocols and graphic representations to conduct a long series of studies of how undergraduate students evaluate, elaborate and optimize their creative activities and outcomes in the context of information systems design (Faro & Giordano, 2000; Giordano, 2002).

Other colleagues have conducted small-scale empirical studies on how engineering students use ‘sketching’, seen by some theorists as a key activity in design tasks (Arnheim, 1995). For example, Zeng et al. (2004) have proposed that sketching, as a cognitive process, can be decomposed into the application of three types of tools: geometric form (e.g. drawings) to visualize, text to label or explain, and gesture (e.g. vector arrows) to demonstrate relationships or movement. A conception of ‘sketching’ approximates Arnheim’s notion of ‘design dialectic’, a conversation between the designer and his or her emerging ideas.

This sort of ‘trial by error’ behaviour would seem to underlie all design activity. We wondered whether sketching in some sense contributes similarly to thinking in the admittedly less visual processes underlying the design of instruction. We decided to conduct an open-ended study of how professional instructional designers go about their work, as a prelude to a more microscopic examination of the cognitive processes underlying this activity.

Method

Given that we planned to tread new ground, we adopted a grounded theory approach (Glaser, 1992), with a modified “contextual inquiry” methodology. Contextual inquiry (Raven & Flanders, 1996), rooted in the early writing of Glaser and Straus (1967) on qualitative methods, is a field-research technique that closely examines how a carefully-selected group of people go about their work. Interestingly, designers have used this technique to explore and analyze user needs in the software design industry; we have turned it on its head to examine the designers themselves. Our approach was further informed by Campbell, Schwier and Kenny’s (2006) description of their use of conversation

as a method of inquiry with instructional designers.

Context

Our study focused on instructional design practitioners working in an instructional technology support unit at an urban Medical-Doctoral University. The institution had recently adopted the goal of using web-based technologies to enhance student learning experiences, and had created the support unit to help faculty members use the new tools effectively. The web environment was expected to provide increased access to resources, more opportunities for interactivity with content, and communication tools as a supplement to face-to-face classes. Thus the unit's goals were to support the move to a blended learning environment.

Participants

Our purposive sample (Glaser & Strauss, 1967) consisted of a group of eight professional instructional designers responsible for helping university faculty members shift some of their instruction to an online Learning Management System (WebCT Vista, in this case) or other web-based environments. When we explained our research project and asked for volunteers, we received a very enthusiastic response that enabled us to enlist all eight designers in the unit, six women and two men, as participant-collaborators. All had completed graduate degrees in educational technology or related disciplines (five in the same MA program), and all had two years or more of experience as designers, with a range of one to seven years in the current position. Their ages ranged from 30 to 45 years.

The participant-collaborator relationship was important as one of the researchers was a supervisor in this unit, and both of us had taught some of the designers in their graduate program. Given the potential for ethical concerns, we approached the study as an exercise in professional development and reflective practice (Schön, 1987), an opportunity for the designers to reflect deliberately and deeply (Campbell, Schwier & Kenny, 2006) about their practice.

Procedures

Contextual inquiry has three key features: 1) actual practitioners are the source of data; 2) practitioners collaborate as partners in the data collection; 3) data collection focuses on a clearly defined set of concerns (Raven & Flanders, 1996). In our case, we did not observe our participants at work, but rather we collected their reflections on how they go about doing their work. We used a lightly structured protocol to interview the participants, beginning with the questions that follow, which asked them to focus on events drawn from experience, and the actions they generated: "Can you recall encountering a specific problem in designing instruction for a client?" We followed this up with: "What did you do about it?" and "Can you show us by reconstructing what you did?" In general these questions generated long, laterally-branching conversations involving the designers and the researchers, ranging over various examples of design challenges, a wide range of

techniques for responding to these challenges, and to issues we had not anticipated.

Since the instructional designers were used to working in teams on projects and their relations with their colleagues were positive, we addressed the potential for ethical concerns by interviewing them in groups. Since they already knew each others' stories, we expected that this would also enrich the flow of ideas. The groupings were based on their seniority: two groups of three junior designers (less than two years in current position; interviews 02 and 03), and the two senior designers together (interview 01). All signed consent forms inviting them to fully participate in the research. Interviews were captured using a digital recorder. Interviews lasted 55, 58, and 79 minutes respectively.

Data Analysis

Both researchers listened to the recordings, independently preparing transcriptions of participants' reflections on their thoughts and actions as designers, as well as the time of the comment. Subsequently, both researchers independently reviewed their notes to code the comments, grouping them into rough categories. We met to compare our different perspectives on the reflections and together sorted, using Glaser's 'constant comparison' approach, the initial categories into a new schema that appeared to represent the themes that were emerging. Subsequently, the first author reviewed the recordings again to confirm the accuracy of the transcriptions and time codes. Then we met again to discuss the appropriateness of the categories we had created.

After some discussion of our respective interpretations of the raw data and our initial categories, we agreed on the organization of the data into the two subsets presented in Tables 1 and 2. We then presented our analysis to the eight participant designers all together in a meeting where they had opportunities to question our categories and elaborate on their experiences. We used their feedback to further refine our ideas.

Results

As we explored how the eight instructional designers reported their work, we encountered a rich variety of reflections. Though we did not start with pre-conceived categories, our results generally conformed to those that emerged from contextual inquiries conducted in the software design environment by Smart and Whiting (2001, p.180). Smart and Whiting's categories are: activity sequencing, information flows, attitudinal issues, artifact manipulations and physical conditions

At the most general level, our participants' reflections traced the actions with which they searched for ways to understand and communicate with their subject matter experts (SMEs). We interpreted these actions as interventions directed towards two types of goals: building relationships through the use of social skills; and building sense through the use of cognitive tools.

Building Relationships

Our designers began relationship building with 'getting to know you discussions' that generate trust. Later, they drew upon this trust to establish credible expectations, assuage client anxieties, evaluate design solutions, and generally manage the design process. One designer stated at the outset: "you have to build a relationship ... where you know how the [client] thinks ... time is a big issue." Table 1 lists the sorts of social skills our designers reported they employed in building relationships with clients, and illustrates each with quotations from the transcripts.

Table 1. *Building social relationships: social skills instructional designers report using in building relationships with clients, with examples.*

<i>Social Skills</i>	<i>Sample quotations from interviews*</i>
Establish credibility	"[clients'] complete and utter surprise to see the experience we bring into the training sessions. They're actually quite impressed by the fact that we have a real strong pedagogical background" (02:1450)
Validate their expertise	"I have some things I know I want even though the [SME] is there...you [the SME] know about the knowledge ... it's kinda finding a way to make it work between us..." "It's also very, very important to validate their expertise" (02:3350)
Let them think they're driving the project	"you can't let the [content expert] decide how the instruction is going to go...you can let them think they're driving the project"(01:1530)
Find middle ground	"what appeals to me may be totally unappealing to you so gotta find that middle ground ...go and look at [the product] through somebody else's eyes ...they forget to step out of the box" (02:2800)

<i>Social Skills</i>	<i>Sample quotations from interviews*</i>
Ask about needs	<p>“it’s important to be able to understand... the objectives... it’s by asking those sorts of questions...I’m starting to get a clearer perspective of what they don’t want as well as what they do want...and then I can sort of...lead them in a different direction and get a response...” “it’s different kinds of cues...the verbal cues of what they’re telling you as well as the visual cues of what they see...you need to be able to combine both” (01:1300; 2000; 2400)</p>
Make design decisions	<p>“I need to be able to make a decision and I need to be able to move forward” (01:2730)</p> <p>“I find I have to adapt myself to how much information I will give them and how much I will push them to do” (02:3250)</p> <p>“when you have contradictory information, how do you make a decision?... (03:4500)</p>
Manage commitments	<p>“if you have to spend more time convincing [late project joiners] of why these decisions are right, then it makes it really difficult to go forward because ...they are never on board” “[the ID] can’t be completely detached...” (01:4200)</p>
Align perspectives	<p>[the problem of a] “clash between or potential conflict between ...your instructional design and what your client wants.....how far do you compromise your [ID] principles” ...“the ID as psychologist solving problems rather than prescribing outcomes like say an architect” (01:500)</p>
Flag constraints	<p>“deadline dates and amount of time and energy that we have to put into a project ...[the clients] have no idea” (01:1000)</p>
Compromise	<p>“the consequence of the compromise means that the learners suffer” ... “you need to be able to say ‘OK, I don’t think it’s the right way to go, but if that’s what you want... we need to go forward” (01:900; 1300)</p>
Show leadership	<p>“..work with these [different collaborators] to make sure we are leveraging them in the right way to have them function to the best of their abilities” (01:3000)</p> <p>“ sometimes you need to be able to let people know that that’s not the only way to do [the work]</p> <p>“for some people it’s a constant reminder: this is where we’re going” (01:3230; 3500)</p>

Social Skills	Sample quotations from interviews*
Build relationships	“you have to build a relationship...where you know how the [client] thinks...time is a big issue” (01:2100)
Mentor client	<p>“my role has been to delay commitment to a certain path..not going in and saying ‘this won’t work’ because the client is pretty sure of what they want...[but] just saying ‘well, let’s not script it completely until we’ve seen whether it works’” (03:750)</p> <p>“Can [the client] ask for help?” (03:3240)</p> <p>“[clients] come to the support unit to be supported, not guided ...they expect you to tell them how to do what they want to do...they don’t expect you to ask why they are doing it” (03:3100) (03:3130)</p>
Teach subtly	<p>“novices may tend to say “OK if that’s what you want to do”... “how do you instruct [the client] in a respectful way? Does the client even want to know?...there’s an opportunity for instruction” (03:900)</p> <p>“how do you get [the client] to think along the right track [as pedagogues]’ (02:1340)</p> <p>“we referred to ourselves as ‘devious pedagogues’, giving them ideas’”. (01:700)</p> <p>“[the client says]’you’re never going to get me to use the discussion tool ever unless you prove they’re useful’... almost like a challenge” “it’s expanding what they may already be doing” (01:5200)</p>
Use learner feedback to persuade	<p>‘Our SMEs were, like, OK this could work ... then we had a formative evaluation...the students said this doesn’t work, this doesn’t represent the [working] context” (03:1800)</p> <p>“I’m surprised the clients...find it very difficult to put themselves in the end-user’s position...something I’d assumed... they’re focused on what they want (03:2320)</p>
Manage resources	“it’s really thinking through the process of how you want to be able to do [the work] and who you want to be able to do it with” (01:2700)

*Numbers refer to interview (02) and tape location (1450). Interview 01 = ‘senior’ group; 02 and 03 = ‘junior’ groups.

Building Sense

A good working relationship enables the designer to focus on building a sense of what the client wants to accomplish, and what the means to this end might be. Some of our respondents’ reflections dealt with tactics that we have labelled ‘cognitive tools’. Our designers reported using these tools to explore the potential for effective instructional interventions. Sometimes subject matter experts have a well-developed sense of their

material but have not formulated interventions in clear pedagogical terms or SMEs do not have any idea of how technology might advance their plans. Sometimes the SME does have a sophisticated pedagogical plan that might or might not transfer to a preferred medium. Working across the spectrum between these poles, the designer must tease out the essentials, propose solutions and present a convincing argument for what will or will not work. Table 2 lists the set of cognitive skills we distilled from what our designers reported using as they shaped the design concept in discussions with their clients. The table also provides illustrative examples drawn from the interview transcripts.

Table 2. *Shaping the design concept: ‘cognitive tools’ used by our designers to explore content, to propose and to evaluate instructional interventions*.*

Cognitive tools	Examples of design activities & quotations from interviews
Visualize	<p>Create sketches, diagrams, lists, concept maps</p> <p>They need to see it...Are [they] putting stuff in there that’s intuitive [to them] but maybe totally ‘gone’ from the students’ point of view (02:2540)</p> <p>We try to teach the client what [graphic design] is all about... offering scenarios (03:300)</p> <p>Let’s go to the graphic designer and...we’ll play with all the elements (02:3950).</p>
Role play	<p>Assume perspective of teacher, student</p> <p>You think through scenarios as a learner... You put your self in multiple perspectives (01:3700).</p> <p>You are the ‘first learner’...you have to know what’s going on in order to realize instruction (01:6451)</p>
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Think laterally	<p>Deconstruct intuition with analogy, variations, past practice</p> <p>Imagine the learning module to be a binder (02:4600)</p> <p>Giving some options was very useful (03:3000).</p> <p>The more frequent the brainstorming... you're going to get someone who says "that makes no sense to me" (03:3540).</p> <p>You're really helping [SMEs] deconstruct their own ideas (01:1630).</p> <p>We need to be able to say... "look in a different direction" (01:3220).</p> <p>It's like designing a kitchen... organizing all the [pieces] but you have a game plan (01:4000).</p> <p>You need to centre the [pottery] clay... you need to be able to build the structure at the very very beginning (01:5850).</p>
Prioritize	<p>Create prioritized lists, decide what is important</p> <p>Draw out what you want to do, then prioritize the list (02:1600).</p> <p>You have to be able to make decisions by prioritizing the client the feedback (03:4500).</p> <p>You have to know what's important (01:6030).</p> <p>Identify the key concepts, ideas and facts (01: 6040).</p>
Rapid prototype	<p>Use storyboards, good/bad examples. counter-examples</p> <p>OK, let's draw a storyboard about what you want to do... I see them drawing little models of what they want to do (02:1515).</p> <p>We started trying to offer solutions, which the client didn't like... we're actually having to create bad designs so we can point out what's bad (03:300).</p> <p>When you show them something, it's like, 'no no no, not like that' (01:2020).</p> <p>It's really thinking through the process of how you wan to do it (01:2800).</p> <p>As you are building a prototype you have to be not personally attached to it (01:4050).</p>

Cognitive tools	<i>Examples of design activities & quotations from interviews</i>
Evaluate	<p>Feedback: formative evaluation from client and from learners</p> <p>Then you step back and think “how do I know they are meeting [the objectives]?” (02:4224).</p> <p>[the ID] has to mirror what we have at the hospital (03:1700).</p> <p>Clients find it very hard to put themselves in the end-users’ position (03:2330).</p> <p>The needs analysis was very much set in stone by the client, but the feedback from the first users was so contradictory (03:3830).</p> <p>How’s this going to work? (03:4323).</p> <p>Alignment. I mean aligning your objectives with your methods of evaluation (01:920).</p>

**Numbers refer to interview (02) and tape location (1450) Interview 01 = ‘senior’ group; 02 and 03 = ‘junior’ groups.*

As Table 2 shows, we identified a series of intellectual techniques our designers used to elicit, refine and evaluate ideas from their SMEs: Visualize, Role Play, Think Laterally, Prioritize, Rapid Prototype, Evaluate. In a very broad sense, four of these cognitive skills – visualize, role play, think laterally, rapid prototype – approximate the function that ‘sketching’ serves in more visual design domains, that is, to turn poorly formed notions into more concrete and hence more easily discussed concepts. The other two cognitive skills – prioritize, evaluate – typically form part of the discussion that helps the designer-SME team reach consensus on a final design.

The Designer as Instructional Conscience

The notion of the designer as instructional conscience arose spontaneously as we discussed, with one of the junior interview groups, the questioning strategies instructional designers used to elicit from their clients some idea of what they wanted their students to learn. One designer recalled an instructor who wondered why students were not using a website loaded with dozens of icons offering what should have been useful resources. The designer began a successful revision of the site with a simple question: “What is it you’re trying to do with all these things?” In a similar situation, another designer asked “What’s the instructional value of doing an introduction here? Does it need to be video?” in a series of questions intended to keep the client reflecting on design issues, helping the client draw out her own ideas. The notion of conscience appropriately describes the neutral stance of the designer, who must deploy her own abilities to shape the expertise of the client into a sound pedagogical structure. Our interviews indicated that these abilities include the social skills required to establish an effective working relationship between two or more people who typically have disparate sets of knowledge, skills and attitudes; and the cognitive skills required to build those disparate sets into an effective communication system.

Discussion

In this exploratory study we uncovered a range of social and intellectual skills that our sample of working instructional designers deployed in their daily efforts to collaborate with their clients to create effective instruction. None of these skills are explicitly prescribed in any of the extant 'instructional design models'. In fact, some of these activities are the sorts of things the designer must do to fill one of those boxes ('Analyse', for example in the ADDIE model), and some are things that fill the "white spaces" (Rummler & Brache, 1995) that the designer crosses in moving on to the next box ('Design'). In short, while the models may list milestones or deliverables in the design of instruction, the skills we have uncovered are the means of reaching these milestones and producing these deliverables.

Our interviews appear to confirm the findings of Kenny, Zhang, Schwier, and Campbell (2004) that instructional designers do not do their work by following established models, nor by basing actions on theory. Instead, our designers' tactics suggest they view design as an "ill-structured problem" (Jonassen, 2002; Schön, 1987) or "wicked problem" (Becker, 2007) with many possible solutions, which they pursue with a large repertoire of social and cognitive skills.

This type of "wicked problem" has been addressed extensively in the literature on 'theory of mind' ("the ability to imagine what is in the minds of others and use that information in assessing both how they might behave and how they [might] be persuaded to behave", (Barrett, Dunbar & Lycett, 2002, p. 247). As we have noted above, this ability appears to consist of two distinct components, a social-perceptual component and a social-cognitive component. Normal functioning of these two components enables individuals to accurately assess the emotional and cognitive states of people with whom they are interacting. Further, research indicates that "social reasoning is not a purely cognitive activity, but relies heavily on understanding and representing emotional as well as mental states" (Barrett et al., p. 317).

In the instructional designer's situation, developing a 'theory of mind' involves a complex three-way interaction among the designer, the instructor or subject-matter expert, and the learner, as indicated in Figure 1.

As the figure indicates, the relationships among designer, subject matter expert (or instructor) and learner are almost perfectly symmetrical: the designer seeks to understand the mental models of the SME and the learner; the SME wants to ensure that the designer's mental model and the learner's understanding approximates his own; but the learner only wishes to grasp what's in the SME's mind, unaware of the designer's interventions. Ideally, the mental models of all three converge. The instructional designer can play a key role in reaching this ideal.

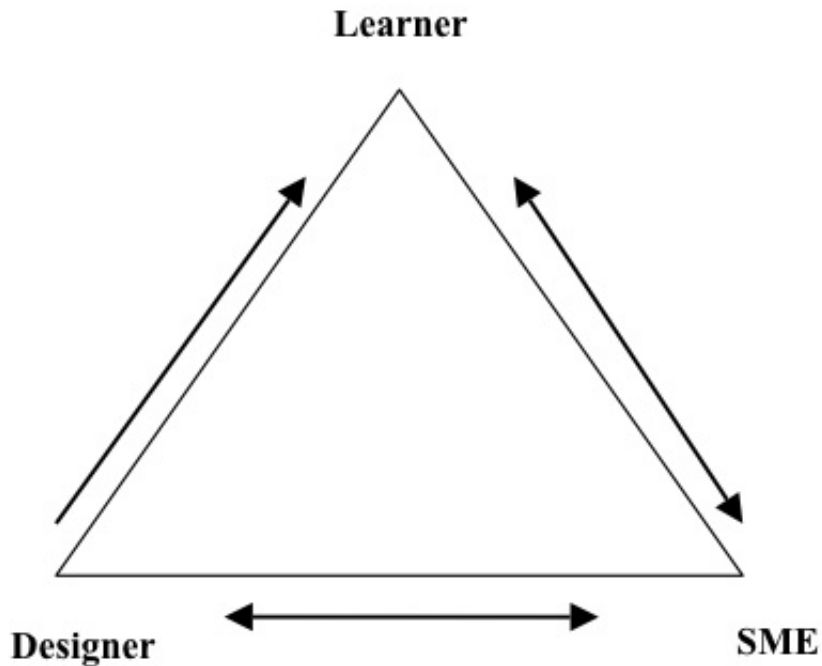


Figure 1. Diagrammatic representation of the 'theory of mind' interactions among designer, learner and subject-matter expert (or instructor). (Designers try to imagine what is in the mind of the learner; designers and SMEs each try to imagine what in the mind of the other; similarly learners and SMEs try to imagine what is in the mind of the other; but the relationship between designer and learner is not reciprocal.)

Interestingly, this relationship has been conjured in other design contexts. For example, in *The Elements of User Interface Design*, Mandel (1997) examines the similar roles of *designers*, *users* and *programmers*. However, in the situation described by Mandel, probably the only relationship that is reciprocal is that between designer and programmer (as SME), since in transparent applications the user should be unaware of the interventions of both designer and programmer. This tells us that the instructional designer may play a uniquely powerful role in linking the SME, as the source of content, and its user, the learner, in a unified whole.

How can the instructional designer approach the challenging task of interacting between SME and learner? One thing all these skills have in common is that they are considered 'soft'; they neither have objectively defined attributes nor performance criteria, and they cannot be observed or evaluated in concrete terms. This tells us that they cannot be learned and honed without the role-modeling, practice and shaping that can be provided by a mixture of studio teaching, apprenticeship, reflection and experience, a format more likely to be found in the non-traditional approaches to teaching instructional design (for example, Ertrem & Cennamo, 1995; Moallem, 1998; Rowland, Parra & Basnet, 1994). This also tells us that the effective instructional designer will have to spend a lot of time plumbing the SME's mind, learning as much as possible about the material, and trying to understand the learners' perspectives, rather than relying upon the classical ID models to provide the requisite insight. Of course, practicing instructional designers already know

this: the textbook is no substitute for experience!

Further Research

We have derived, from information provided by experienced instructional designers, a snap-shot of the social and cognitive skills they employ in working with clients to resolve problems in pedagogical presentation. The group is not large, its members work in a specialized environment, and the researchers have close relationships with all of them. So a study that attempts to replicate or build upon these findings would be helpful. Nonetheless, we believe we have established the ground for a subsequent, more focused, microscopic study that actually observes instructional designers at work with real problems and real clients. Our plan for such a study (or a series of studies) would involve using action or design-based research methodology to observe a similar sample of experienced instructional designers as they work with a real client on a real pedagogical problem. We would use an activity-reporting technology or visualization software, design document records (e.g., blog or wiki), video recording and key-stroke tracking to capture the evolving 'design dialectic'. We would also collect informal evaluations of the design solutions from both designer and client, and even better, from the learners. We believe that further research in this direction will reveal how successful instructional designers deploy sets of social and cognitive skills to generate truly reflective practice.

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