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ABSTRACT

A view of situated instructional development (ID) is presented which incorporates a constructivist, situated view of learning and expertise, while at the same time viewing the ID process itself in situated terms. The purposes of this paper are to offer several reflections about the relationship between design and implementation of learning environments and instructional products, and to offer a number of specific recommendations for practicing ID from a situated/constructivist perspective. Several points of reflection are offered pertaining to the practice of ID as it relates to real-world contexts: (1) implementation and design are ultimately inseparable; (2) questions of curriculum and value are central; (3) deciding upon a design solution and making decisions within that framework is a highly situated activity; (4) instruction should support learners as they become efficient in procedural performance and deliberate in their self-reflection and understanding; and (5) successful programs must seek to make complex performance do-able while avoiding the pitfalls of simplistic proceduralization. A workable ID model must combine the two critical factors of effective, creative design and efficient management and control. Situated ID mixes up the traditional roles of subject matter expert, designer, and teacher and student in the design process. Guidelines for doing situated/constructivist ID are presented in terms of: general methodology; needs assessment; goal/task analyses; instructional development strategy; media selection; and student assessment. In conclusion, the pros and cons of the situated model are outlined. One table and one figure illustrate the concepts. (Contains 36 references.) (MAS)

Title:

Situated Instructional Design: Blurring the Distinctions Between Theory and Practice, Design and Implementation, Curriculum and Instruction

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Situated instructional design could mean a couple of different things:

1. The kind of instructional design (ID) that rests upon a situated-cognition view of human learning and performance. Situated cognition is a powerful metaphor for human learning that incorporates elements of everyday cognition, informal learning, authentic learning experiences, and cultural influences (Brown, Collins, & Duguid, 1989). Many ID theorists are heavily influenced by situated cognition and constructivism (e.g., Wilson & Cole, 1991, in press), resulting in corresponding changes in ID prescriptions.
2. The kind of ID that adapts itself to the constraints of particular situations in ways that traditional ID models do not. Traditional ID is sometimes criticized for being overly proceduralized and rigid. A situated approach to ID would be more sensitive to local conditions in prescribing both methods and outcomes for instructional design.

I have in mind a view of situated ID that incorporates both of these notions. Much of the literature on constructivist ID relates to the first emphasis, while methodological critiques (e.g., Winn, 1990; Wilson, Jonassen, & Cole, 1993) relate more to the second emphasis. Thus situated ID may be seen as an approach that incorporates a constructivist, situated view of learning and expertise, while at the same time viewing the ID process itself in situated terms.

My purpose in this paper is twofold:

1. to offer several reflections about the relationship between design and implementation of learning environments and instructional products; and
2. to offer a number of specific recommendations for practicing ID from a situated/constructivist perspective.

SITUATED DESIGN: BLURRING THE DISTINCTIONS

Several points of reflection are offered in this section pertaining to the practice of instruction design as it relates to real-world contexts.

1.*Implementation and design are ultimately inseparable.* Some of the most valuable lessons learned about instructional design comes from the experience gained in setting up and administering programs. Real-world implementation can be just as important as theory-guided design.
An example may be taken from the 1970s research in computer-assisted instruction. One program, the TICCIT project, was shown by an NSF evaluation to achieve its objectives more successfully than traditional classroom instruction (Merrill, Schneider, & Fletcher, 1979). The program failed, however, in getting students to stay with the program; the dropout rate was unacceptably high when compared to traditional classrooms. In this case, the actual development and tryout of a program produced knowledge that was not anticipated ahead of time.

Another example is Clancey's Guidon-Manage research in intelligent tutoring systems (ITS). In a remarkable example of self-reflection, Clancey (1993) concludes: "After more than a decade, I felt that I could no longer continue saying that I was developing instructional programs for medicine because not a single program I worked on was in routine use..." (p. 7). This lack of successful implementation was

attributable to the researchers' emphasis on the design of systems at the expense of meeting the needs of identified groups of practitioners. While Clancey and colleagues were successful in the development of improved methods of knowledge representation, they clearly failed in getting practitioners to notice. "*[R]esearchers must participate in the community they wish to influence*....[S]ome members of our research community must necessarily broaden their goals from developing representational tools to *changing practice*—changing how people interact and changing their lives... (p. 9, italics retained). Clancey reflects on how he might approach the Guidon-Manage research differently today:

- participating with users in multidisciplinary design teams versus viewing teachers and students as my subjects,
- adopting a global view of the context...instead of delivering a program in a...box,
- being committed to provide cost-effective solutions for real problems versus imposing my research agenda on another community,
- facilitating conversations between people versus only automating human roles,...
- relating...ITS computer systems to...everyday practice...versus viewing models...as constituting the essence of expert knowledge that is to be transferred to a student, and
- viewing the group as a psychological unit versus modeling only individual behavior. (Clancey, 1993, p. 17)

Clancey's ITS work was research with a design focus. Although the specific agenda is different, the lessons Clancey learned apply very well to users of ID models. Instructional designers, too, should "participate in the community they wish to influence."

Like the TICCIT and Guidon projects, design innovations sometimes result in negative outcomes. Failures of ID projects, however, become particularly valuable items because they can indicate areas of weakness not just in the current project but in the ID model underlying the project. Information gleaned from negative findings can serve as formative evaluation data, feeding back into future implementations of the model and into future version of the model itself.

2.*Questions of curriculum and value are central.* Perkins (1992) warns of a common fallacy implied by the statement: "What we need is a new and better method. If only we had improved ways of inculcating knowledge or inducing youngsters to learn, we would attain the precise...outcomes we cherish" (p. 44). Instead, Perkins believes that "given reasonably sound methods, the most powerful choice we can make concerns not method but curriculum—not how we teach but what we choose to try to teach" (p. 44). This comment reaffirms that a fundamental step in instructional design involves the serious consideration of learning goals. A variety of constituencies should be included in this process, including sponsors and members of the learning community itself. Once consensus is reached about the *kind* of learning being sought, certain teaching models become unfeasible while others become more attractive.

As Reigeluth (1983) acknowledges, curriculum and instruction cannot be completely separated. There is a tendency among many institutions to give lip service to higher-order outcomes while maintaining teaching methods that specifically suppress such outcomes. Medical schools that teach students to simply memorize and take tests are an example. Another example is a military school whose mission statement prizes "creativity" in students, yet whose teaching mehtods and authoritarian culture strictly reinforce conformity and transmission of content.

A basic lesson learne from observing schools is that two teachers may be covering the same ostensive curriculum while what *really* is taught differs raically between them. At its base, the constructivist movement in education involves curriculum reform, a rethinking of what it means to know something. A constructivist curriculum is reflected in many of the design innovations being discussed in the literature (Hanaffin, 1992). Thus, if a commitment is made toward rethinking curriculum to expand the roles of knowledge construction and learning communities, then a corresponding commitment needs to be made in rethinking learning activities. Deciding upon a teaching strategy is not a value-neutral activity. Recognizing this puts the selection of an ID model squarely into the political realm of policymaking. New issues become important, such as access, equity, representation, voice, and achieving consensus amid diverse perspectives.

3.*Deciding upon a design solution and making decisions within that framework is a highly situated activity.* The success of a given implementation will depend more on the local variables than on the general variables contained in the ID model chosen to guide design. Put another way, "the devil is in the details." There is a way to succeed and a way to fail using a whole host of teaching models. Teachers and students must see the sense of what they are doing, come to believe in the efficacy of the program, and work hard to ensure that the right outcomes—that is, outcomes that are consensually agreed upon—are achieved.

This situational perspective conflicts with traditional views. Thinking of instructional design as a technology would lead us to think that a situation gets analyzed, which leads to a technical fix to be implemented, which leads either to a measured solution to the problem or a revision in the fix for the next cycle of intervention. A situated view of instructional design would lead to a different process, something perhaps like this:

1. A learning community examines and negotiates its own values, desired outcomes, and acceptable conventions and practices.
2. The learning community plans for and engages in knowledge-generating activities within the established framework of goals, conventions, and practices.
3. Members of the learning community, including both teachers and students, observe and monitor learning and make needed adjustments to support each other in their learning activities.
4. Participants occasionally re-examine negotiated learning goals and activities for the purpose of improving learning and maintaining a vital community of motivated learners. This may lead to new goals and methods and cultural changes at all levels, from cosmetic to foundational.

This situated, community-oriented view of instruction takes a more holistic view to the design of instruction. The community is opportunistic in addressing "design" issues at any stage of planning and implementation. Community members, including students, have some voice in determining what happens to them in instruction. In return, they must show the needed commitment and disposition to behave responsibly and in support of learning.

If community members have participated in the establishment of a program, they are more likely to believe in it. If they believe in the program, the chances of success increase dramatically. As Perkins (1992) suggests, even very imperfect instructional methods can work if the commitment is made to work together and ask the right questions in designing curriculum.

analysis—implicit or explicit—happens in designing educational programs. A survey of instructional models reveals that some have demonstrably high development costs. *Sherlock* , an electronics troubleshooting tutor developed for the military, has taken a decade of patient research to achieve its present form (Gott, Lesgold, & Kane, in press), resulting in impressive learning gains. Once developed, however, the program may be replicated at a reasonable cost. Other models, such as problem-based learning, may pose heavy demands in terms of time in the curriculum (cf. Savery & Duffy, in press). Instructional designers (or learning-community members) must then face the question of how and whether to implement such resource-demanding teaching methods into an existing system and curriculum.

Every decision to adopt one teaching approach over another involves such weighing of pros and cons. However, while costs may be objectively measured and estimated, learning benefits are notoriously difficult to reduce down to a number. This inequity of measurability results in a common bias: The cost differences become exaggerated while the potential benefits, because they are harder to measure, tend to be undervalued or ignored. Comparison of alternative teaching models must give full consideration to qualitative differences in learning outcomes in addition to the more visible cost differences in time and money.

Some ideas may be borrowed and inexpensively incorporated into related products or programs. For example, if an instructor becomes excited by Schank's case-based scenarios (Schank, Fano, Bell, & Jona, 1993/94), she may choose to incorporate case histories and classroom simulations into her teaching. While the resulting lessons may bear only a passing resemblance to the computer-based scenarios, they are heavily

influenced by Schank's principles of case-based, interactive instruction. Many important design principles, including those of cognitive apprenticeships and intentional learning communities, can be efficiently adapted into instruction in a number of ways, depending on local circumstances and resources.

5.*Instruction should support learners as they become efficient in procedural performance and deliberate in their self-reflection and understanding*. Most current ID theories emphasize the grounding of instruction in complex problems, cases, or performance opportunities. Yet organizing instruction around problems and cases should not mask the importance of perception, reflection, and metacognitive activity. Indeed, these two aspects of human performance (problem solving and perception) can be seen as inherently complementary and equally necessary. Experts are more than mere automatic problem-solvers. Rather, experts become experts through a progressive series of encounters with the domain, each involving an element of routine performance and a corresponding element of reflection and deliberation. This is the process of expertise spoken of by Scardamalia and Bereiter (1994).

Prawat (1993) makes this point well. While there is a tendency among cognitive psychologists to make problem solving central to all cognition, Prawat reminds us that schemas, ideas, and perceptual processes hold an equally important place. *Learning how to see* —from a variety of points of view—is as important as solving a problem once we do see. Principles of perception, whether from ecological psychology (Allen and Ott, in press), connectionism, or aesthetics, need to have a place within successful ID models. This includes teaching students how to represent problems and situations, but also how to appreciate and respond to the aesthetic side of the subject, how to reflect upon one's actions, and how to "raise one's consciousness" and recognize recurring themes and patterns in behavior and interactions.

6.*Successful programs must seek to make complex performance do-able while avoiding the pitfalls of simplistic proceduralization*. The art of "scaffolding" complex performance is a key problem area that surprisingly is still not well understood. How does a coach entice a young gymnast to perform just beyond her capacities, overcoming the fear and uncertainty that normally accompany new performances? How does the coach know just when and where to step in, preserving the integrity of the task (and the learning) while not letting the athlete fall on her head? These are questions of appropriate scaffolding or support for learning. Once a teacher begins believing the constructivist agenda and the importance of authentic, meaningful tasks, then the challenge of supporting novice performance within a complex environment becomes a central concern. As Sweller's (1989) research makes clear, poorly supported problem-solving activities force learners to rely on weak methods that they already know. The result is a lot of wasted time and frustrated learners. Appropriate and wise scaffolding makes problem-solving activities more efficient because learners stay focused within the critical "development" zone between previously mastered knowledge and skills beyond their reach (Vygotsky, 1978). Developing a technology for optimizing this kind of support is an area in need of further research and development.

This same concept of scaffolding can be directed to the implementation of ID models themselves. Instructional designers and teachers need proper supports and aids in designing according to a particular model or tradition. At the same time, they should be cautioned against simplistically "applying" a model in a proceduralized or objectivist fashion. Postmodernists would say that in such cases, the model "does violence" to the situation. The complexities of a situation should not be reduced down to the simple maxims of a teaching model. Any model that is forced upon a situation and made to fit, will lead inevitably to unintended negative consequences. The negative fallout will happen at those points of disjuncture or lack of fit between model and situation. As I have stressed, the details of the situation need to be respected and taken into account when adapting a model to a situation.

This, perhaps, is a more appropriate way of thinking about implementation: Rather than *applying* a particular instructional theory, a teacher necessarily *adapts* that theory to present circumstances. Learning how to adapt abstractions to concrete realities is a worthy task for both students and teachers, and indeed, may lie at the heart of some forms of expertise. This process of adaptation and using conceptual models as tools in a given situation is an essential ingredient of a situated approach to instructional design.

MANAGING CONSTRAINTS TO DESIGN

Consider what it means to design something (e.g., to fashion something from a well-developed plan). ID shares with all design activities the challenge of creating something that accomplishes a given purpose within the constraints and parameters of the situation. Constraints are a natural part of the creative design process, despite our yearnings for unlimited budgets, motivated learners, and relaxed deadlines. The realities of the situation, the goals of instruction, and limited resources constitute the "raw material" from which effective designs can take shape (Wedman & Tessmer, 1991). Failure to consider key constraints can result in the failure of a project.

On the other hand, ID sometimes imposes unnecessary constraints upon itself (Thiagarajan, 1976; Rowland, 1993). Is ID always served by a plodding, linear methodology, a rigid taxonomy of learning outcomes, or a fixed pool of instructional strategies? Such internally imposed constraints can become an obstacle to creativity and an unnecessary burden to the practitioner and to learners. Rapid prototyping (Tripp & Bichelmeyer, 1990) is an example of an innovation that changes the sequence of design steps, allowing the designer to redefine ID processes to better suit the situation and the tools available. The trick, course, is knowing which constraints are genuine and which can safely be discarded as new possibilities present themselves.

Traditional ID models succeed largely because they help in the management of a team of workers engaged in a complex project. The critical management functions of monitoring work and ensuring accountability are handled by a set of checkpoints or signoffs—with little regard for their impact on the design process itself. Indeed, management goals and design goals are often in tension with each other. For an ID model to work in the real world, it must combine these two critical functions into a workable methodology: effective, creative design and efficient management and control, as illustrated below:

Effective Creative Design	Efficient Management and Control
• What do the learners learn—really? • Are learners motivated by instruction? Do they see the value and relevance of instruction? • Do learners use their knowledge to solve problems in authentic performance settings? • Are learning environments rich in information, guidance, and support?	• Will the instructional product reflect a return on investment? • Is the development process efficient? Are resources being well utilized throughout the design process? • Is there systematic planning, decision-making, and accountability in the design process?

Table 1. Two competing functions of instructional design models.

Because of the tension between these competing functions, one will often predominate over the other. If the management function is emphasized, the project may come in under budget, but tend toward mediocre strategies and mundane learning outcomes. If creative design dominates, the project may be pathbreaking but remain forever in a state of partial completion.

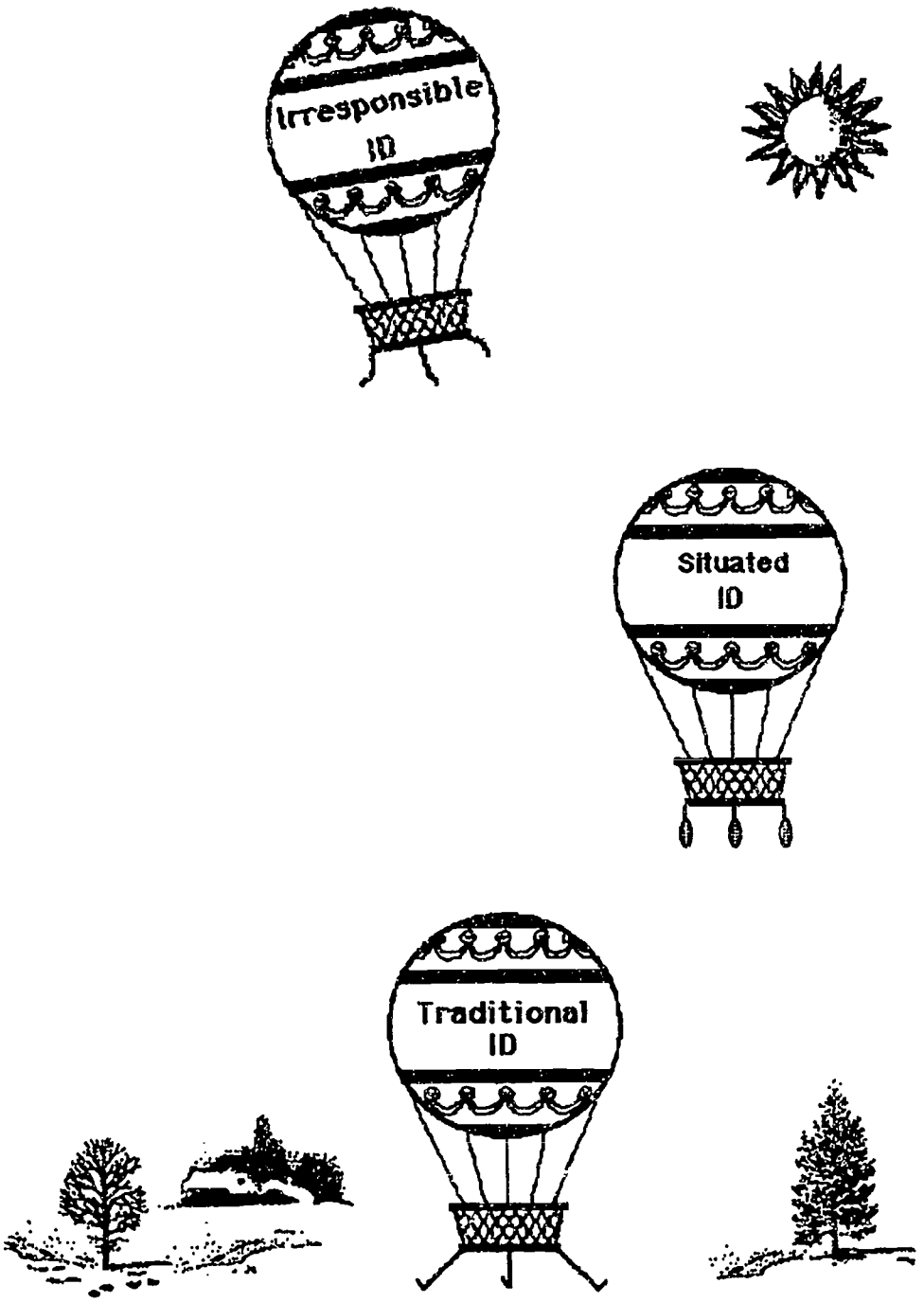

Figure 1. Hot air balloon analogy.

Figure 1 illustrates this tension by reference to a hot air balloon trying to reach upward, but being tethered down by a number of constraints—some real, some artificial. Ignore the constraints entirely and project costs rise into the stratosphere. The point is that we need a balanced set of safeguards and constraints that assure careful design and accountability but which are flexible enough to allow the project to safely "fly."

WHO DOES THE DESIGN?

A key element in effective ID is the nature of the design team. Instead of a designer and subject expert working in relative isolation, situated ID suggests that all major constituencies be represented on the design team, including teachers and students. These end users—the "consumers" of the instructional "product"—should contribute directly to the project's design and development. Greenbaum & Kyng (1991) refer to this as *participatory design*, and Clancey (1993) recommends "we must involve students, teachers, administrators, future employers, and the community as participants in design..., working with students and teachers in their setting—not just calling them into the...lab to work with us" (pp. 9, 20).
An instructional designer might complain: "But we've always incorporated the end user in our ID models; this sounds like warmed-over formative evaluation." I would respond: "If formative evaluation got done a tenth as much as it gets talked about, ID practice would be in much better shape." In many ways, a constructivist or situated approach to ID takes old ideas and gives a new impetus to them. Consider the traditional roles of team members:

- *Subject matter expert (SME).* Provides the content and expertise.
- *Designer.* Figures out a way to extract (milk?) expertise from the SME and encode it into instructional materials. Selects instructional strategy appropriate to the content and the situation to effectively teach the content to the learner.
- *Teacher and student.* At formative evaluation stages, serve as subjects for tryout tests to maximize usability and learnability. At implementation stage, teachers and students take the instructional materials and carefully use them as directed. Something like a doctor's prescription.

Situated ID mixes up the roles much more. SMEs can help design learning experiences; designers manage projects, build teams, check for content accuracy, and serve as model learners and teachers. Teachers and students may help define or select content and design their own learning experiences. Poorly implemented, the redefinition and blurring of roles can lead to chaos and confusion; well implemented, a flexible team orientation can result in a synergy or a fusion of multiple perspectives that improves the design.

GUIDELINES FOR DOING SITUATED/CONSTRUCTIVIST ID

This section is composed of a laundry list of tips for viewing ID from a situated perspective, organized according to generic ID phases. Issues of implementation, discussed at the beginning of the paper, are not addressed in detail. Some of the tips are abstract and conceptual; others are simple and practical. Some depart radically from current practice; others reflect how most practitioners already view their jobs. Collectively, they provide a clearer picture of what it means to do situated ID.

GENERAL METHODOLOGY

- *Include end users (both teachers and students) as part of the design team.* Incorporate participatory design techniques, with design activity moving out of the "lab" and into the field.
- *Configure a design model appropriate to the task at hand.* Several constructivist models of instruction present six or seven key principles. Why not let a design team themselves select or develop the principles that best reflects their values? Each design team needs to configure a model—cutting and pasting from extant literature and practice—that is tailored to their community and the constraints of the project.

NEEDS ASSESSMENT

- *Consider solutions that are closer to the performance context* (job aids, just-in-time training, performance support systems, etc.). This is consistent with situated models of cognition and with the notion of distributed cognition (Perkins, 1993).
- *Resist the temptation to be driven by easily measured and manipulated content.* Many important learning outcomes cannot be easily measured.

- *Ask: Who makes the rules about what constitutes a need? Are there other perspectives to consider? What (and whose) needs are being neglected?* These questions arise out of the postmodern notion of the ideological base of all human activity.

GOAL/TASK ANALYSES

- *Use objectives as heuristics to guide design.* Don't always insist on operational performance descriptions which may constrain the learners' goals and achievement. Pushing goal statements to behavioral specifications can often be wasted work. The "intent" of instruction can be made clear by examining goal statements, learning activities, and assessment methods. Goals and objectives should be specific enough to serve as inputs to the design of assessments and instructional strategies.
- *Don't expect to "capture" the content in your goal- or task analysis .* Content on paper is not the expertise in a practitioner's head, hands, and feet. The best analysis always falls short of the mark. The only remedy is to design rich learning experiences where learners can pick up on their own the content missing between the gaps of analysis.
- *Allow for instruction and learning goals to emerge during instruction.* Just as content cannot be fully captured, learning goals cannot be fully pre-specified apart from the actual learning context. See Winn (1990) for a thorough discussion of this issue.
- *Consider multiple stages of expertise.* Expertise is usually thought of as having two levels: Expert or proficient performance and novice or initial performance. Of course, a two-level model is insufficient for accurate modeling of student growth over time. A series of qualitative models of expertise may be needed for modeling students' progression in learning critical tasks (White & Frederiksen, 1986). Be prepared to confront learners' naive, intuitive theories and to scaffold their learning.
- *Give priority to problem-solving, meaning-constructing learning goals.* Instead of rule-following, emphasize problem solving (which incorporates rule-following but is not limited to it). Instead of simple recall tasks, ask learners to make sense out of material and demonstrate their understanding of it.
- *Look for authentic, information-rich methods for representing content and assessing performance (e.g., audio, video).* High-resolution methods for representing content can be useful throughout the ID process. Whereas we usually associate audio and video representations only with *presentation* of material to students, the same representation tools may be useful for documenting expertise and assessing student understanding.
- *Define content in multiple ways. Use cases, stories, and patterns in addition to rules, principles, and procedures.* Rich cases, stories, and patterns of performance can be alternative metaphors for finding and representing content.
- *Appreciate the value-ladenness of all analysis.* Defining content is a political, ideological enterprise. Valuing one perspective means that other perspectives will be given less value. One approach is given prominence; another is neglected. Somebody wins, and somebody loses. Be sensitive to the value implications of your decisions.
- *Ask: Who makes the rules about what constitutes a legitimate learning goal? What learning goals are not being analyzed? What is the hidden agenda?* Twenty years ago, a designer using "understanding" in a learning objective would have been laughed out of the office. "Understanding" was fuzzy; it was forbidden. Are there other expressions of learning outcomes that remain taboo? Are there other dimensions of human performance that remain undervalued? Good postmodern ID would pursue answers to these questions and be unafraid of reexamining current practice.

INSTRUCTIONAL STRATEGY DEVELOPMENT

- *Distinguish between instructional goals and learners' goals; support learners in pursuing their own goals.* Ng and Bereiter (1991) distinguish between (1) task-completion goals or "hoop jumping," (2) instructional goals set by the system, and (3) personal knowledge-building goals set by the student. The three do not always converge. A student motivated by task-completion goals doesn't even consider learning, yet many students' behavior in schools is driven by performance requirements. Constructivist instruction would nourish and encourage pursuit of personal knowledge-building goals, while still supporting instructional goals. As Mark Twain put it: "I have never let my schooling interfere with my education."

- *Allow for multiple goals for different learners.* ID often includes the implicit assumption that instructional goals will be identical for all learners. This is sometimes necessary, but not always. Hypermedia learning environments almost by definition are designed to accommodate multiple learning goals. Even within traditional classrooms, technologies exist today for managing multiple learning goals (Collins, 1991).
- *Appreciate the interdependency of content and method.* Traditional design theory treats content and the method for teaching that content as orthogonally independent factors. Situated ID says you can't entirely separate the two. When you use a Socratic method, you are teaching something quite different than when you use worksheets and a posttest. Teaching concepts via a rule definition results in something different than teaching the concept via rich cases. Just as McLuhan discerned the confounding of "media" and "message," so designers must see how learning goals are not uniformly met by interchangeable instructional strategies (see Wilson, in press a).
- *Look for opportunities to give guided control to the learner, encouraging development of metacognitive knowledge.* Encourage growth in students' metacognitive knowledge, what we often call "learning how to learn." Don't assume that students know how to exercise effective learning control; instead, establish metacognitive skills as a learning goal for instruction to achieve.
- *Allow for the "teaching moment."* Situations occur within instruction where the student is primed and ready to learn a significant new insight. Good teachers create conditions where such moments occur regularly, then they seize the moment and teach the lesson. This kind of flexibility requires a level of spontaneity and responsiveness not usually talked about in ID circles.
- *Think in terms of designing learning environments rather than "selecting" instructional strategies.* Metaphors are important. Does the designer "select" a strategy or "cultivate" a climate conducive to learning? Wilson (in press b) argues for learning environments to complement our product, process, and systems metaphors for instruction. More often than not, teachers and designers create or adapt an instructional strategy rather than "selecting" one.
- *Think of instruction as providing tools that teachers and students can use for learning; make these tools user-friendly.* This frame of mind is virtually the opposite of "teacher-proofing" instructional materials to assure uniform adherence to designers' use expectations. Instead, teachers and students are encouraged to make creative and intelligent use of instructional tools and resources.
- *Appreciate the value-ladenness of instructional strategies.* Sitting through a school board meeting is enough to convince anyone of this. Instructional strategies grow out of our philosophies of the world and our value systems. Not only the content, but the strategy can be a threat to particular ideological positions or to learner motivation. Good designers will be sensitive to the "fit" between their designs and the situation.

MEDIA SELECTION

- *Consider media factors early in the design cycle.* Practical and cost constraints typically dictate that tentative media decisions will be made relatively early in the design process. Media then becomes one of the instructional factors that receives increasing attention through iterations of analysis.
- *Include media literacy and biases as a consideration in media decisions.* Different media send different "messages" to an audience, independently of the instructional content. Look for any "hidden curriculum" elements in different media choices. Avoid negative stereotypes and cultural biases. Consider the rhetorical goodness of fit between media choice and overall instructional purposes. Also, design messages that are sensitive to an audience's media sophistication and literacy, paying particular attention to humor, media conventions, and production values.

STUDENT ASSESSMENT

- *Incorporate assessment into the teaching product where possible.* Technologies are available for incorporating continuous, "dynamic assessment" into learning materials (Lajoie & Lesgold, 1992). Assessment can then be seamlessly integrated into meaningful learning experiences and not tacked on at the end (Frederiksen & Collins 1989).
- *Critique and discuss products grounded in authentic contexts, including portfolios, projects, compositions, and performances.* Use of work products can complement more direct, traditional measures of knowledge acquisition and understanding (Cates, 1992). Include different perspectives in the critiquing process.

- *Evaluate processes as well as products.* The cognitive apprenticeship model offers a number of strategies for reflecting on process: debriefings, abstracted replays, dramatizations, interviews, group discussions, knowledge telling, co-investigation, and post-mortems of problem-solving activities (Collins & Brown, 1987; McLellan, 1993; Gay & Mazur, 1993).
- *Use informal assessments within classrooms and learning environments.* Informal assessments refer primarily to teacher observations of eye contact, body language, facial expressions, and work performance. These observations can complement formal assessments as a basis for instructional adjustments.

At this point, we should consider the pros and cons associated with following a more situated model of design. Here is a list of possible advantages:

- more meaningful learning outcomes that are likely to be used in relevant contexts
- more meaningful participation of the learner in the learning process
- more independent problem-solving capability
- more flexibility in design activities
- more flexibility in instructional activities
- more acknowledgment of social and motivational factors in learning.

Here are some possible risks:

- more costly instruction
- greater need for instructional resources and information management
- less coverage of material
- less demonstration of specific skill mastery
- chaos and confusion if poorly implemented.

The point is: (1) we really don't know all the pros and cons of new approaches, because we've never fully tried them out, and (2) as any situationist would say, it depends on the situation, on how it's done. There are good ways to do situated ID and bad ways, just as one can point to excellent and poor examples of training developed with an objectivist philosophy. We will learn more about the real pros and cons of doing situated ID as more design models become available and as they become more widely used. Obviously, the details of situated approaches to instructional design have not yet been thoroughly worked out. At a time of such basic re-thinking about the nature of cognition, it is hard to be dogmatic about what teaching strategies comprise the "optimal" design in any subject matter. Perhaps the main lesson for now is that the discussion should be followed with a certain degree of skepticism, with an eye toward implications for professional practice. Our knowledge base in cognition and instructional design really is fragile, depending on a shifting foundation that will likely continue to change in the years to come.

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