

Chapter 13

Why Basic Principles of Instruction Must Be Present in the Learning Landscape, Whatever Form It Takes, for Learning to Be Effective, Efficient and Engaging

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Abstract While today's opportunities and contexts for learning are far more varied than they were only a decade or two ago the underlying learning mechanisms of individual learners have not changed. It is important as we explore these different learning landscapes that we don't naively assume that because the landscape has changed dramatically the learners have also changed. There are fundamental instructional strategies, determined primarily by the type of content to be taught rather than by learning styles or by the form of instructional affordance, that are necessary for effective, efficient and engaging learning of specified knowledge and skill to occur. Those learning activities that best promoted learning in the past are those learning activities that will best promote learning in the future. Yet, we have all observed that many instructional environments fail. However, on close examination it is also evident that these learning environments also fail to implement these known instructional strategies resulting in ineffective and inefficient learning outcomes. As we explore the shifting learning landscape it is critical that we don't assume that because existing instructional environments often fail that the fundamental strategies of instruction have also failed. Most often these strategies have never been adequately implemented in the first place.

13.1 Introduction

*The thing that hath been, it is that which shall be and that which is done is that which shall be done and there is no new thing under the sun....
There is no remembrance of former things....*

Ecclesiastes 1:9, 11

I take this opportunity to restate some of my underlying assumptions about instruction (Merrill, Drake, Lacy, Pratt, & ID2_Research_Group, 1996):

- There are known instructional strategies. If an instructional experience or environment does not include the instructional strategies required for the acquisition of the desired knowledge or skill, then effective, efficient, and engaging learning of the desired outcome will not occur.

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- Appropriate instructional strategies can be discovered. They are natural principles which do exist, and which nature will reveal as a result of careful scientific inquiry. These instructional strategies can be verified by empirical test.
- *Students* are persons who submit themselves to the acquisition of specific knowledge and skill from instruction, *learners* are persons who derive meaning and change their behavior based on their experiences. All of us are learners, but only those who submit themselves to deliberate instructional situations for the purpose of acquiring specified knowledge and skill are students.
- Learners today are not significantly different from those of a decade ago, a generation ago, or a century ago. The basic learning mechanisms by which learners acquire knowledge and skill have remained constant amid societal change. While far less understood, the science of instruction is just as stable as the science of biology, physics, or chemistry. The principles of biology do not change with changes in society; neither do the principles of learning and instruction.

I am not naïve about the dramatic changes that have occurred in the *learning landscape* as identified by the papers in this collection. But it is important that we asked ourselves what has changed and what has remained the same? The opportunities for learning and instruction are certainly much more varied than a generation ago. The amount of information available is many times greater than was true for previous generations. Thanks to the Internet the easy access to this information would have been inconceivable to our grandparents. But does this mean that the basic mechanisms of learning have changed? Does this mean that learners today learn differently than their parents or grandparents?

13.2 Learners Are Not Significantly Different

I disagree with Prensky (2001, cited by Hall in this volume). In the quotation that follows I have thus modified his assertion by adding the words *do not* in square brackets. “Children raised with the computer [do not] think differently from the rest of us. They [do not] develop hypertext minds.” They certainly have much MTV experience with its jumps from image to image but such a technique has neither been demonstrated to be effective instruction nor to promote goal directed learning. In 1991 IBM spent millions of dollars to produce a multimedia *CD-ROM*, *Columbus: Encounter, Discovery and Beyond*. They hired a former Hollywood filmmaker, Robert Abel, who was familiar with MTV type entertainment. It was a very high quality hypermedia presentation. Most informal reports¹ indicate that it didn’t

¹I searched diligently for any research that was done demonstrating the effectiveness of this product. When the product was released there were a number of articles praising this work as the ultimate in multimedia education. But after this initial flurry of hype there is a significant silence about this product in the literature. The only research report that mentions this product was a dissertation done at the University of Georgia under the direction of Tom Reeves. In personal communication Dr. Reeves indicated that lack of cooperation in the use of the product caused them to drop their investigation. I contacted IBM Education who indicated that the product has been dropped and they were unable to identify any reports investigating its effectiveness.

work. MTV is great for entertainment but it is not good instruction. The label ‘*digital natives*’ makes good press, sells books and promotes lectures but the scientific data used to back-up Prensky’s claims is questionable at best. It is very unlikely that these young people have significantly different learning mechanisms than their parents. Adaptation by evolution takes thousands of years not a single generation.

13.3 There are Known Instructional Strategies

I have previously articulated empirically supported instructional principles (see Table 13.1) that have been found to facilitate effective, efficient and engaging goal-directed learning of complex tasks (Merrill, 2002a, 2007, in press). Similar principles are also

Table 13.1 First principles of instruction²

Task-centered principle

- Learning is promoted when instruction is in the context of **whole real-world tasks**.
- Learning is promoted when learners are engaged in a **task-centered** instructional strategy involving a **progression** of whole real-world tasks.

Activation principle

- Learning is promoted when learners **activate** relevant cognitive structures by being directed to recall, describe or demonstrate relevant **prior knowledge** or experience.
- Activation is enhanced when learners recall or acquire a **structure** for organizing the new knowledge, when this structure is the basis for guidance during demonstration, is the basis for coaching during application, and is a basis for reflection during integration.

Demonstration principle

- Learning is promoted when learners observe a **demonstration** of the skills to be learned that is **consistent** with the type of content being taught.
- Demonstrations are enhanced when learners are **guided** to relate general information or an organizing structure to specific instances.
- Demonstrations are enhanced when learners observe **media** that is relevant to the content and appropriately used.

Application principle

- Learning is promoted when learners engage in **application** of their newly acquired knowledge or skill that is **consistent** with the type of content being taught.
- Application is effective only when learners receive intrinsic or corrective **feedback**.
- Application is enhanced when learners are coached and when this **coaching** is gradually withdrawn for each subsequent task.
- Application is enhanced when learners observe **media** that is appropriately used.

Integration principle

- Learning is promoted when learners **integrate** their new knowledge into their everyday life by being directed to reflect-on, discuss, or defend their new knowledge or skill.
 - Integration is enhanced when learners create, invent, or explore **personal ways** to use their new knowledge or skill.
 - Integration is enhanced when learners **publicly demonstrate** their new knowledge or skill.
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identified in the present volume (Bransford, Slowinski, Vye, & Mosborg, in this volume; Van Merriënboer & Stoyanov, in this volume). Building on the work of Gagne (1985) Component Display Theory (Merrill, 1983, 1994, 1997) identified necessary conditions (strategies) for effective, efficient and engaging instruction for information-about, parts-of, kinds-of, how-to and what-happens instructional outcomes. This content by strategy interaction takes precedence over learning styles and delivery system (Merrill, 2002b). After trying to determine if there are new online competencies required, De la Teja & Spannaus (in this volume) state that "...the specific set of competencies required in any setting for a particular learning event is driven by the strategy of the event, not whether it is online or face-to-face" (p. 187). Instruction that implements these principles has been found to be more effective, efficient and engaging when compared to instruction that does not (Frick, Chadha, Wang, Watson, & Green, 2007; Mendenhall et al., 2006; Thomson, 2002).

How do these principles of instruction impact the changing learning landscape? The thesis of this paper is that these basic principles of instruction must be present in the learning landscape whatever form it takes for goal-directed learning to be effective, efficient, and engaging.

13.4 Instruction is a Goal-Driven Activity

Do the categories *effective*, *efficient*, and *engaging* constitute appropriate criteria for instruction? Learning always occurs. Learning may be incidental. Learning is not necessarily goal directed. On the other hand instruction is a goal-directed activity. Instruction is a deliberate attempt to structure a learning environment so that students will acquire specified knowledge or skill. The purpose of instruction is to facilitate learning. Facilitate means that the learning is more efficient, effective and engaging than learning that might occur without this intervention. Obviously we are all *feral* learners, but such learners are unlikely to have either the previous knowledge of the content or sufficient skill in applying principles of instruction to efficiently direct their own learning. All of us are feral learners in many things but when it is necessary to acquire specific knowledge and skill directing our own learning is likely to lead to chaos and anarchy.

Does this definition mean that instruction is always an instructor directed activity? Certainly not! Learners can select the goals to be accomplished either from a menu of options or in more open ended learning situations (*student-centered* versus *learner-directed* (Stirling, in this volume). But selecting goals is significantly different from selecting the learning strategies to accomplish these goals. Research on learner control has demonstrated that only learners with high previous knowledge or highly developed metacognitive skills are effective in directing their own learning and that guided learner control is better than open-ended control (Clark & Mayer, 2003; Merrill, 1980, 1984). Does this mean that only tutorial instruction is effective instruction? Again, certainly not! However, it does mean that when there are more open learning environments there is even a greater need to be sure that the learners are guided by established principles of instruction.

13.5 Guided Instruction Works Best

There have been a variety of demonstrations of open-ended, learner-led learning environments. Unfortunately when these experiments are carefully scrutinized the data show that they don't work (Kirschner, Sweller, & Clark, 2006; Mayer, 2004).

Although unguided or minimally guided instructional approaches are very popular and intuitively appealing, ... these approaches ignore both the structures that constitute human cognitive architecture and evidence from empirical studies over the past half-century that consistently indicate that minimally guided instruction is less effective and less efficient than instructional approaches that place a strong emphasis on guidance of the student learning process (Kirschner et al., 2006, p. 75).

The author's thesis is that there is sufficient research evidence to make any reasonable person skeptical about the benefits of discovery learning—practiced under the guise of cognitive constructivism or social constructivism—as a preferred instructional method. ... Overall, the constructivist view of learning may be best supported by methods of instruction that involve cognitive activity rather than behavioral activity, instructional guidance rather than pure discovery, and curricular focus rather than unstructured exploration (Mayor, 2004, p. 14).

I have often chided my colleagues who are studying communities of learners that they are studying “pooled ignorance.” Why would I make such a pejorative comment? Let me explain. If the community consists of solely naïve learners, who have neither previous knowledge of the content under consideration nor any previous knowledge of effective instructional strategies then it is unlikely that specified learning will occur unless they add to their environment someone or some source who has the necessary content knowledge and who provides strategies that are required for effective learning. At their best such communities are extremely inefficient while they struggle to find the necessary knowledge and skill to promote learning.

My colleagues counter by citing many successful such learning communities. But who make up these communities? Usually they consist of knowledgeable folks who are drawn together by some common interest for which members of the community already have considerable expertise. This is not the appropriate comparison group for the initial acquisition of knowledge and skill. There is no question that such communities of knowledgeable individuals are valuable to share information and to help one another solve problems. But is this instruction?

Can open ended learning environments be instructional? According to my definition they are instructional only if learners in such an environment seek to acquire specific knowledge and skill, that is, they establish for themselves a learning goal. As soon as learners seek to acquire a specific learning goal then such environments can only be effective and efficient if they are structured in such a way that the desired content is readily available and that this content is available in ways that implement effective strategies for efficient, effective and engaging learning. Setting up such an open environment that supports goal driven learning takes even more sophisticated instructional design than the design of more direct instruction. Do participants in such environments have sufficient knowledge and skill to structure effective instructional experiences for themselves? Is it necessary that open learning

environments that support the acquisition of specific learning goals require design by a source outside the participants? Too often such open ended environments are unstructured and result in a “sink or swim” learner-directed problem solving which, as previously noted, when submitted to careful scrutiny fail to produce sufficient learning outcomes. Of course some learning does occur but do the learners acquire the knowledge and skill they desire in an expedient way? Too often not!

13.6 Education Versus Training

Direct instruction is often equated with training and training is contrasted with education. Training is seen as the less desirable option appropriate only for vocational education in the work place. But is this a meaningful contrast? The best education always involves some training. The best training always involves some education. Training is involved with the acquisition of specific knowledge and skill. Some would say that the world changes so fast that the skill needed is how to acquire skills rather than the skills themselves. But isn't learning how to acquire skill itself a skill? Don't we learn how to acquire skill by acquiring specific skill? Is it possible to acquire the ability to acquire skill in the abstract without learning some specific skill? If education is the development of the “whole person” or the development of character don't these goals also require the acquisition of knowledge and skill?

Schools are often seen as ineffective, inefficient and even debilitating. It is difficult to argue with this assessment. However, failure to implement effective instructional strategies should not be equated with an inappropriate philosophy but rather with an ineffective implementation of any philosophy. The claim that so called “instructivism” believes in passive learners waiting for information to be poured into their open minds is at best a straw man. Those of us who have spent our careers trying to find ways to develop effective direct instruction never believed in the *tabula rasa* view of human learning, i.e. that direct instruction is an attempt to pour information into the head of the student without active involvement on their part, nor that those involved in instructional design have ignored the learner and concentrated solely on the instructor or the instructional system. Most of my instructional design colleagues would acknowledge that knowledge is constructed by active participation on the part of the learner. But it does not follow that learners should direct their own learning, can only learn in open ended environments, and that all learning is a result of social interaction. In our view instructional design is not just about teaching but rather it is all about facilitating learning in structured as well as less structured environments.

13.7 Resources for Further Exploration

Online presentations concerning first principles are available at two Web sites.

The first was delivered in Utrecht, The Netherlands, February 17, 2006. The presentation is available in three parts at the following URLs: (1) <http://cito.byuh>.

edu/merrill/Merrill_1/Merrill-1.html; (2) http://cito.byuh.edu/merrill/Merrill_2/Merrill-2.html; and (3) http://cito.byuh.edu/merrill/Merrill_3/Merrill-3.html.

The second presentation was to a group of faculty and students at Florida State University on April 6, 2007. It can be accessed at the following URL: <http://mediasite.oddl.fsu.edu/mediasite/Viewer/?peid=5625589e-436b-4fd8-9282-53131a64fc71>.

For additional papers on First Principles of Instruction see the author's web sites at <http://cito.byuh.edu/merrill> and <http://www.mdavidmerrill.com>.

There are also several recent books that I would recommend that argue for principles for effective instruction. The following sources present principles for effective, efficient and engaging instruction.

Allen, M. W. (2003). *Michael Allen's guide to e-learning*. New York: Wiley.

Clark, R. C., & Mayer, R. E. (2003). *E-Learning and the science of instruction*. San Francisco: Jossey-Bass/Pfeiffer.

Foshay, W. R. R., Silber, K. H., & Stelnicki, M. B. (2003). *Writing training materials that work: How to train anyone to do anything*. San Francisco: Jossey-Bass/Pfeiffer.

Mayer, R. E. (2001). *Multimedia learning*. Cambridge: Cambridge University Press.

Van Merriënboer, J. J. G. (1997). *Training complex cognitive skills: A four-component instructional design model for technical training*. Englewood Cliffs, NJ: Educational Technology Publications.

Van Merriënboer, J. J. G., & Kirschner, P. A. (2007). *Ten steps to complex learning*. Hillsdale, NJ: Lawrence Erlbaum.

13.8 Questions for Comprehension and Application

1. The author argues for the importance of implementing principles of instruction whether in direct instruction or more open ended learning environments. Do you feel that the principles stated agree with the literature and your experience? What principles do you feel might have been omitted?
2. The author argues for implementing principles of instruction in open-ended learning environments. This poses a challenge for a new type of instructional design. As a designer of an open-ended learning environment how would you implement such principles? How would you evaluate learning outcomes in such learning environments?
3. The title of this book expresses an overall concern with and interest in the implications for learning and learners of changes in the learning landscape. Using a quote from Ecclesiastes at the beginning of the present chapter, the author posits—by way of a counterpoint to the central concern of the book—a different concern, arguing that we should be cautious with getting overly excited about the changes we are witnessing. Reflect on, and, if possible, discuss with co-readers of this book the merit of the author's argument, relating it to your own learning experience and the existing knowledge base about learning and instruction. What, when contemplating change in the learning landscape, is mere hype and what is not? Argue your point, consulting also earlier chapters in this book.

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