AN ECOLOGY OF LEARNING AND THE ROLE OF eLEARNING IN THE LEARNING ENVIRONMENT

A DISCUSSION PAPER

Arthur Richardson
Sun Microsystems

Where Today's Learning Fails

The majority of today's formal workplace learning is delivered using one or more of the following common methods:

- The classroom model of learning;
- Technology-based learning; and
- Blended learning.

Although these methods are common, they all fail to deliver effective learning that helps students improve their performance in the workplace. The following sections explore these methods and how they fail.

The Classroom Model of Learning

IN HIS BOOK, *Designing World-Class E-Learning*, Roger Schank says, "Everything that's wrong with training can be stated in four words: *It's just like school*. The educational model of learning pervades most businesses today. The fact that the educational model fails to deliver measurably improved performance has not deterred business from continuing to implement this model."

Schank is referring to the traditional classroom model of instruction and learning. The classroom model continues as a delivery model because it is such a familiar and accepted environment. However, the classroom model of instruction and learning has numerous weaknesses. A significant weakness is that classroom learning is separated from and has little or no relevance to work-based tasks. There is too much emphasis on teaching tangential, irrelevant information or low order facts, concepts, and rules. The learning that does occur is decontextualised from the workplace and is not completely learned by the students. Consequently, students are unable to apply their learning when they return to their job.

Technology Based Learning

Technology-based learning is seen as an alternative to the traditional classroom model of learning. Rather than attending traditional classes, students receive their learning through a computer, at a time and place that is most convenient for their schedule. Much of the justification for implementing technology-based learning is based on reducing employee time away from the job, reducing travel expenses, and shortening the amount of time students spend in their learning experience.

A major weakness of technology-based learning is that little consideration given to delivering effective instruction with the medium. Most technology-based learning is little more than an electronic form of instruction guides. Etienne Wenger (1998) describes technology-based learning as "computer-based training programs that walk students through individualized sessions covering reams of information and drill practice."

Another significant weakness of technology-based learning is its failure to provide effective social transactions for learners. Brown and Duguid (2000) describe learning as "a remarkably social process. Social groups provide the resources for their members to learn." In a traditional classroom students are able to interact with each other and their instructor to socially construct their knowledge. In technology-based learning, this social aspect of learning is significantly reduced or is completely unavailable to students. The learning interaction is a one-on-one relationship between the student and the instructional content.

Blended Learning

The traditional classroom is the original blended learning environment. In the classroom, the instructor provides familiar learning methods such as lectures, discussions, media access (the Web, reading, video, audio), activities (labs, experiments, teams, problem-solving), and access to experts. Students in the classroom learn through social interactions by having discussions, exchanges of ideas, and sharing their experiences with their classmates.

The concept of technology-based blended learning environments has enjoyed a significant amount of press in recent years.

Blended learning environments attempt to bring together aspects of classroom teaching with the technology elements of eLearning to emulate classroom instruction. Blended learning solutions typically present a course of study that is serialized between technology-based and traditional (or virtual) classroom delivery, supported with additional technologies that facilitate interaction between students and instructors.

As an example, in a blended learning course of study, a student may be asked to:

- Download and read a chapter from a reference manual;
- Complete a module of web-based instruction by a scheduled date;
- Attend a scheduled conference call review session with other learners and an instructor;
- Participate in a scheduled online synchronous web conference where a presenter delivers more information;
- Collaborate in an asynchronous online activity with other students;
- Take an online quiz to demonstrate understanding; and
- Follow up the blended learning event by subscribing to an email discussion forum.

This type of serialized blended learning, a technology-based attempt to duplicate the classroom, is also an insufficient response to learner needs.

How Do People Learn?

We have just examined three different ways of delivering learning, and have seen that each method contains inherent weaknesses that prevent people from receiving effective instruction that improves their performance in work settings. The ineffectiveness of these well known learning models suggests we must reconsider how to best support peoples' learning. How do people learn? The simple answer is that people learn in many different ways. Here are a few examples:

- Formal settings such as participating in a class;
- Informal settings such as a discussion with coworkers or an expert;
- At the point of need such as being confronted with a problem in the workplace;
- When reading a book;
- Practicing a critical procedure;
- Fixing a problem through trial and error; and
- As a team member researching information to find answers to a question.

Etienne Wenger (1998) suggests, "For many of us, the concept of learning immediately conjures up images of classrooms, training sessions, teachers, textbooks, homework, and exercises. Yet in our experience, learning is an integral part of our everyday lives. It is part of our participation in our communities and organizations."

Brown and Duguid (2000) provide additional insight into how people learn, saying, "People learn in response to need. When people cannot see the need for what's being taught, they ignore it, reject it, or fail to assimilate it in any meaningful way. Conversely, when they have a need, then, if the resources for learning are available, people learn effectively and quickly." In their statements, Wenger, Brown and Duguid point out the key elements needed to create an effective model for learning – learning is an integral part of our daily lives, and people learn in response to need.

Toward an Ecology of Learning

In his article, *Growing Up Digital: How the Web Changes Work, Education, and the Ways People Learn*, John Seely Brown uses ecology as a metaphor to describe an environment for learning. Brown says, "An ecology is basically an open, complex adaptive system comprising elements that are dynamic and interdependent. One of the things that makes an ecology so powerful and adaptable to new contexts is its diversity." Brown further describes a learning ecology as, "a collection of overlapping communities of interest (virtual), cross-pollinating with each other, constantly evolving, and largely self-organizing."

Brown's ecology concept requires the creation and delivery of a learning environment that presents a diversity of learning options to the student. This environment must offer students opportunities to receive learning through methods and models that best support their needs, interests, and personal situations.

A successful learning ecology offers a ubiquitous learning environment. Students have open, immediate access to the ecology where they can search for, locate, and quickly access elements of learning that address their immediate needs. Students use the ecology to construct and organize personalized, unique interactions with the content.

A learning ecology must also support social learning in the workplace. The environment needs to offer technologies for students to form learning teams for collaborative activities, or to self-organize into discussion groups where students can explore learning topics. The ecology should also enable people to discuss and share insights within their specialized communities of practice.

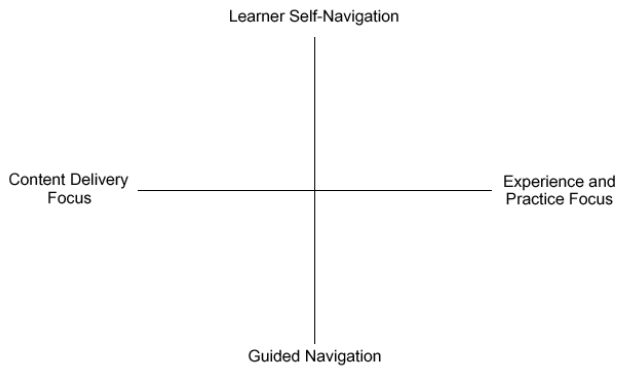
The instructional design and content elements that form a learning ecology must be dynamic and interdependent. The learning environment should enable instructional elements designed as small, highly relevant content objects to be dynamically reorganized into a variety of pedagogical models. This dynamic reorganization of content into different pedagogical models creates a learning system that adapts to varying student needs.

Creating a Learning Ecology

As we have seen, people learn through a variety of resources and activities. The challenge for developing a learning ecology is to define and create an environment that balances the many resources and methods people may apply to their learning.

The design and creation of a learning ecology cannot be developed based on general considerations of individual and social learning. A learning ecology requires a unifying model of instructional theory that, in turn, drives the architecture of such a learning environment.

The following matrix forms the foundation of a theoretical model for a holistic learning environment.

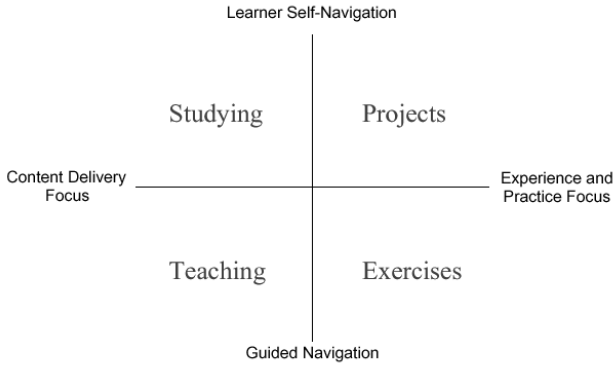


In this matrix, the X-axis illustrates a "focus" on the delivery of instruction. The left end of the X-axis targets delivery of instructional content. Content includes factual information delivered in a variety of methods. Some delivery methods are documentation, a lecture, demonstration of a procedure, a job aid, or a guided discussion. The right end of the axis targets delivery of instructional experiences through activities and experiences such as hands-on lab exercises, case studies, collaborative team activities, and coached problem-solving activities.

The Y-axis in the matrix illustrates who controls "navigation" of the learning process. At the bottom of the Y-axis, navigation of the learning process is controlled by a "guide". The guide may be a human agent (instructor or facilitator) or a machine-based agent (intelligent tutoring system). The guide makes decisions on the selection and delivery of information and learning events to the student. At the top of the axis, navigation of the learning process is controlled by the learner. Self-directed learners own the responsibility for identifying their learning needs, and implementing their unique learning paths. In this environment, students actively locate, select, and initiate their learning from various sources of information and activities.

The Danish psychologist, Knud Illeris, developed a model of learning (1995) derived from Kolb's experiential learning model. Illeris classifies four different ways that people accomplish learning – by studying, receiving teaching, performing exercises, and working on projects.

This classification of instruction and activities fits the four quadrants of the focus/navigation matrix.



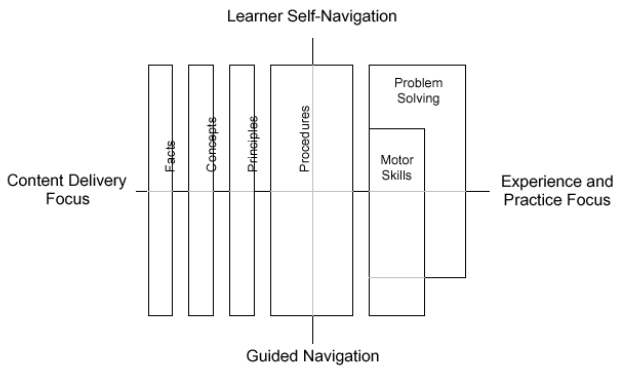
In the "studying" quadrant, a student spends time working with and learning from information. The information may or may not be designed as instructional content. Examples of studying include: A student reading a white paper or book, or working through a technology-based training module.

The "teaching" quadrant offers a presentation of content to students. Examples of teaching include an instructor presenting a lecture to a group of students using a whiteboard and digitally projected slides, a videotaped presentation made available to employees or a teacher demonstrating how a software application works.

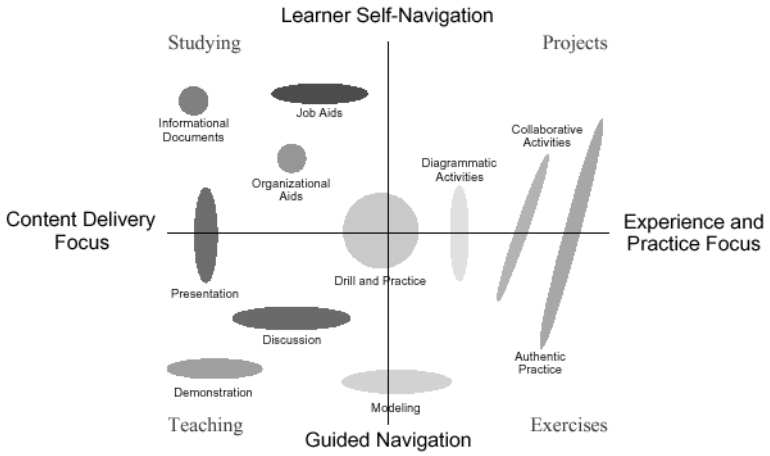
In the "exercises" quadrant, students are given the opportunity to practice skills through structured lab activities that are supported and facilitated by an expert. Examples of exercises include students working with an instructor on simple drill and practice activities, an instructor mentoring students in authentic problem-solving lab scenarios or a group of learners participating in a collaborative problem-based learning exercise that is facilitated by a subject matter expert.

In the "projects" quadrant, students learn from problems or project requirements they encounter in their job role. Examples of projects include students working through case studies and authentic scenario-based activities that address problems they are likely to encounter in their work role and students working on real job-centered projects with their peers.

Another theoretical lens that can be used to look at the focus/navigation matrix is Robert Gagné's taxonomy of learning out-



comes. The illustration overlays the hierarchy of learning onto the matrix.



Facts, concepts, principles, procedures, and problem solving fall within Gagné's "intellectual skills" learning domain. The motor (psychomotor) skills learning domain has been included in this overlay because of its inherently close relationship to procedural and problem solving skills. The other Gagné learning domains (cognitive strategies, verbal information, and attitudes) are all seen as supporting learning in the intellectual skills domain.

The Gagné hierarchy relates very specifically to the Focus axis of content versus experience. Basic information such as facts and concepts are content based. Much of learning is composed of learning rules, represented by both principles and procedures. While principles are mainly fact based, procedures move into the experience and practice side of the axis. Procedures are best learned through physical practice and repetition. Motor (psychomotor) skills are mainly physical skills but also have a thought component that organizes the sequence and type of actions involved in the physical skill. Motor skills must be physically practiced to be learned. Although problem solving is supported by facts, principles, and procedures, it cannot be learned from the content. Skill in problem solving is developed through experiencing and practicing authentic work-based tasks.

Another critical consideration is to place high-level categories of instructional strategies onto the matrix. These categories are identifiers that describe the types of instructional strategies they contain. As an example, one of the categories positioned on the matrix is "Presentation. " Some familiar strategies in the presentation category are lecture, video, web-based content, and audio.

The positioning of the categories on the matrix suggests relationships to the quadrants. Some instructional strategy categories better align with the studying/teaching quadrants, while other strategy categories are more closely aligned with the exercises/projects quadrants. Continuing to use the presentation category as an example, the category is positioned in both the teaching and studying quadrants because the presentation instructional strategies can be applied in a classroom teaching environment or in a learner-directed studying environment.

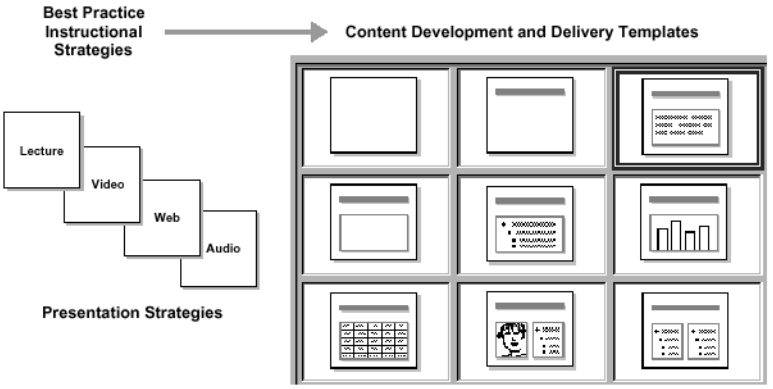
Each of the high-level instructional categories on the matrix contains a number of distinct instructional strategies. These strategies can be developed into models of best practice standards for delivering different types of learning events. Koper (2001) refers to these instructional strategies as "units of study, the smallest unit providing learning events for learners, satisfying one or more interrelated objectives."

Best practice instructional models form the basis for creating development and delivery templates. Development templates are best practice frameworks instructional developers use to create consistently structured instructional models. Delivery templates are presentation interfaces for the various instructional models

The value of this methodology is that much of the content created for the various instructional strategies can be reused between the category models. Continuing with the presentation strategies example, the contents of a lecture template can be associated with a video script and also a web-based presentation layout. Video components may be developed for use within a lecture or a web product. An audio version of the video presentation may be produced as an alternative media.

The Role of eLearning

The role of eLearning is as an enabling technology that supports student interactions with the resources contained in the learning ecology. The ecology offers a very learner-centered experience in which students locate, select, and access instructional strategies and models that address unique and specific learning needs. For any given topic, the learning ecology will present students a variety of learning options in the studying, teaching, exercises, and projects categories of the focus/navigation matrix. Many times, learners will access the



learning ecology to satisfy a more formal educational requirement. In the workplace, employees participate in learning to assume a new role in the organization. Role specifications define the knowledge, skills, and performance employees must accomplish to demonstrate proficiency in a new role. Instructional content that supports the role acquisition is maintained in the learning ecology. As part of the formal curriculum, students may attend a classroom teaching session, make use of technology-based instructional components, work through lab exercises, and do job-related projects. eLearning technologies and a learning management system provide students the capability of delivering instructional strategies, and tracking the completion and assessment of the learning.

A person also encounters unfamiliar tasks on job. In this situation, the learning ecology becomes a performance support tool and learning environment. The employee may search the ecology to locate a job aid or procedure list for performing the necessary task at hand, and then return at a later time to receive more detailed instruction about the procedure. Again, eLearning technologies and the learning management system tracks the individual's access and learning activities.

Conclusion

At the beginning of this paper we examined the pedagogical shortcomings of the classroom instruction model, the technology-based learning model, and blended learning. We then explored the concept of a learning ecology, and suggested a theoretical basis for creating a learning ecology. Finally, we suggested that eLearning is an enabling technology that supports student interactions with the resources contained in the learning ecology.

A challenge for building effective learning ecologies and eLearning systems is the creation of enhanced information navigation models that simplify and facilitate learners locating and accessing contextually relevant instructional content. John Seely Brown says, "The new literacy, the one beyond just text and image, is one of information navigation. I believe that the real literacy of tomorrow will have more to do with being able to be your own private, personal reference librarian, one that knows how to navigate through the incredible, confusing, complex information spaces and feel comfortable and located in doing that."

Koper (2001) says the promise of eLearning is "to make learning experiences in all types of settings more effective, efficient, attractive, and accessible to learners. " While the Internet has become the core medium for eLearning, it is not the medium that is accountable for accomplishing the promises of eLearning.

Based on research resulting from the media versus methods debates of the 1980s and 1990s, Koper delivers a key message that resonates for learning ecologies. "We should concentrate on the quality of the pedagogical design and its relationships to the Internet if we want to accomplish the promises of eLearning."

Biography

Arthur Richardson is the Asia and Pacific Education Consulting Services Practice Manager.

Bibliography

Brown, J.S. (2000). Growing up digital: How the web changes work, education, and the ways people learn. Change Magazine, March/April, pp. 11-20.

Brown, J.S. & Duguid, P. (2000). The social life of information. Boston, MA: Harvard Business School Press.

Illeris, K. (1995). Læring, udvikling og uddannelse - udarbejdelse af en Piaget inspireret pædagogisk forståelsesrammen (Voksenliv og lærerprocesser i det moderne samfund, ch. 12) Reference: http://www.hascoll.dk/HSFOulu/mediatech/KolbsModel.html

Koper, R. (2001). Modeling units of study from a pedagogical perspective: the pedagogical meta-model behind EML. Open University of the Netherlands. Reference: http://eml.ou.nl/introduction/articles.htm

Schank, R. (2002). Designing world-class e-learning. New York, NY: McGraw-Hill Publishers.

Wenger, E. (1998). Communities of practice: learning, meaning, and identity. Cambridge, UK: Cambridge University Press.