Where is the Learning in e-Learning?: a critical analysis of the e-learning industry

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"Learning… is not making *deposits* in one's *data bank*. It is more like mixing a new ingredient into the *soup* of perception and cognition." (Davis, Sumara, and Luce-Kapler, 2000, p. 197)

The Failure of e-learning

By its very name, e-learning[1] *must* involve learning. That is certainly the hope and message of e-learning providers, who want to sell their products and services to corporations, educational institutions, and the general public. The web sites of e-learning providers are replete with claims of effectiveness, huge savings, and transformations in individuals and organizations. One e-learning provider even claims that the use of its services will result in "shock and awe"!

Yet, the e-learning industry is in crisis, and, there is a rapidly growing literature on "the failure of e-learning." For example, a 2000 study of 40 Global companies by the Forrester Group found that, unless forced, the majority of workers in the study (68%) would not sign up for voluntary online courses. Even when online courses were compulsory, over 30% refused to sign up (cited by Dublin and Cross, 2003). Another study indicated that, of those who do sign up for a course, between 50% and 80% never finish the course (Delio, 2000). A recent detailed analysis of the literature (over 100 articles) on the failure of e-learning indicated many different problems at all stages of implementation (Romiszowski, 2004). These included:

- Initial Design Issues
    a. Lack of identification of a real problem or need for e-learning
    b. Lack of analysis of the problem or need even when it was identified
    c. Poor overall strategic design decisions in areas such as structure of the course, methods and media to be used, and course management and evaluation

- Instructional Design and Development Issues
    a. Lack of detailed instructional design
    b. Failure to develop important instructional design elements such as authoring or graphic design
    c. Lack of evaluation and revision of the instructional design resulting in no reiterative improvements

[1] By "e-learning" I mean any intentional learning activity delivered via interactive electronic media. Media includes CD-ROMs, DVDs, and the Internet. It includes both synchronous and asynchronous modes of delivery.

- Dissemination and Implementation Issues
    a. Problems in production, reproduction and distribution
    b. Poor implementation and use of the e-learning that was delivered
    c. Long term management and evaluation problems

The failure of e-learning to date was recently summarized by Bunis (2003):

> "A review of the first wave of the e-learning revolution is not pretty. The landscape is littered with poor products and a lot of disillusioned learners… There are also big lessons for the software providers, who gave technology-obsessed course developers free rein to create glitzy, highly interactive, very expensive multimedia courseware that too often dazzled the eye without ever informing the mind. On the opposite end of the courseware spectrum, we find a plethora of brain-numbing online page-turners that are little more than PowerPoint presentations slapped up on the Web. They may have been cheap and easy for the vendors to produce in mass-market, but they cost the buyer far more than they were worth in employee time wasted using them. At either end of the spectrum, most of the products that failed to live up to their promise did so because they were not based on sound educational principles - they simply didn't account for how people actually learn. To add insult to injury, many of them also wrote on software platforms that did not perform well for users." (Bunis, 2003, p. 29)

To state that a specific e-learning initiative is a failure, suggests that *the intended learning did not take place* (although other types of failure may also be evident). In order to sort out the reasons for such a failure, we need to distinguish between the technology for launching and tracking instructional activities from the instructional activities themselves. Technologies such as Learning Management Systems (LMS) and Learning Content Management Systems (LCMS) are like vending machines. While it is important that they work well, what is more important is what they dispense. Having a LMS or a LCMS *without* effective online instruction will *not* produce any significant learning results, in spite of industry hype to the contrary. The problems of e-learning are not about the quality of the software that launches, tracks and reports on educational materials (although there are great variations in the features and quality of such software), but lie elsewhere.

In my view, there are several inter-related reasons for the failure of e-learning to date. These include:

- **Speed to market** – In the several years before the "dot-com crash" that began in March 2000, there was a rush to market by vendors, and a rush to adoption by technophiles and early adopters in a number of large companies. For the most part, the e-learning industry has not bridged the gap between marketing to early adopters and the more skeptical and pragmatic majority of business executives and institutional leaders. The e-learning industry is stuck in the "chasm" (Moore, 1999) at the front end of an emerging technology adoption curve. The skeptics are able to point to its many shortcomings, thereby slowing the momentum of adoption of e-learning systems and content.

- **Focus on new technology, not on instructional design** – I carried out an informal content analysis of the web sites of all 1080 "e-learning providers" in the directory found at www.brandon-hall.com. Seventy-six companies have disappeared or merged, leaving 1004 company web sites to analyze. The most startling result of my scan was finding that of the 1004 companies, only 73 mentioned learning theory, instructional design, instructional strategies, pedagogy, or teaching methods. Yet, 100% of the sites talked about their innovative technologies or services. While the term learning is used everywhere in the industry, there is little evident interest in or exploration of the nature of learning or teaching. I also reviewed most of the leading texts on e-learning, and found that, with a few notable exceptions, the same pattern of lack of focus on instructional design also holds true.

- **Boredom –** we know how to bore people in a classroom, now we know how to bore them online! The principal reason why most people have trouble suffering through an e-learning course is that there is usually nothing to do but read, look and take a multiple choice test. There are usually no instructional activities that deeply engage the mind of the learners, and "interactivity" mostly consists of turning from one screen to another. This is especially problematic for the under-40 generation, which has grown up with fast-paced videogames, movies, and television programs. Reading a lot of text on a screen simply doesn't cut it for them.

- **Lack of understanding of learning and teaching –** learning is a complex activity, and good teaching is a craft that takes many years to hone. The skill of a good teacher is in knowing the best

thing to do to advance a given learner to the next stage of understanding a specific kind of learning task. Yet much e-learning content is *not* designed by educators and experienced educators are often *not* part of the development team.

- **Lack of understanding of the unique teaching advantages of electronic media –** teaching with interactive electronic media can produce learning environments that are unlike any that have been produced in traditional classrooms. The use of high speed networked computation, available on a 24 hour basis, can simulate both real and imaginary worlds. The possibilities of world-wide (or local) collaboration with anywhere from two to millions of people on any topic raises the issue of how to build positive collective intelligence in a world that desperately needs it. The use of algorithms and massive storage and retrieval facilities allows the growth of "adjunct intelligence", an external repository of knowledge that can improve human capabilities and performance.

These five issues are explored in this paper, along with the following five steps that I believe need to be taken in order for e-learning to succeed:

- Learners and instructors must each be prepared for working with e-learning.

- The focus of the industry must shift from electronic technologies to electronically mediated teaching methods.

- New instructional activities and strategies that use the unique characteristics of interactive and networked electronic environments need to be developed and made easy to use.

- New understandings of both learning and the differences in generations of learners need to be articulated and incorporated into instructional design, especially new research on brain functioning and learning, and on "embodied cognition" (Varela, 1991).

- The computer interface with learners needs to be broadened beyond the computer screen to new configurations such as wearable computers, digital paper and ink, and invisible embedding of computers in the environment.

In some ways, the failure of e-learning today is a failure of imagination, a failure to look ahead a few years to see where this is all heading. Let's look at how e-learning can be made better.

From E-Learning to E-Teaching

E-learning should really be called *e-teaching*. What we now call e-learning is either an attempt to facilitate or induce learning using electronic technology, or to track the results of learner behaviours and the results of assessments. This is teaching by electronic means. While people *do* learn some of the time using electronic technology, there is no guarantee that any significant learning is happening, or that the intended kind of learning is taking place, just because we label it "learning". As most teachers know, learning often doesn't take place in spite a teacher's best efforts. Or, learning *does* take place, but it is not the learning that the teacher intended, what Brown and Duguid (2000) call "stolen knowledge". While the word e-learning automatically raises expectations of learning, learning only takes place under the right conditions. We would be more honest if we acknowledged the tentative nature of our efforts and called them "e-teaching."

Similarly, what some "e-learning" vendors label "instructional design" or "online pedagogy" is not instructional design at all, but a description of the *process of course development*. For example, the commonly cited ADDIE model describes 5 steps in building an online course – Analysis, Design, Development, Implementation, and Evaluation. Beyond using the word "design", the details of the instructional design model are rarely stated. In other cases, instructional design is described as the process of assembling items on a screen. While user interface design is important, interface design is *not* the same as instructional design.

Once we recognize that learning is not automatic just because one uses electronic technologies, then it is easy to accept that both learners and instructors need to be prepared for, and comfortable with, this new educational environment. The online environment is *not* a classroom. Techniques effective for group instruction in a closed room do not necessarily work in a networked, computer-based, distance education setting. Here are some basic skills that are needed to teach online with present-day technology:

- A level of comfort and familiarity with computers and learning software

- The ability to multi-task, as the online environment often requires you to pay attention and work with several dimensions of teaching at the same time

- The ability to present materials and project enthusiasm without direct visual feedback from students

- Instructional design skills that emphasize the designing creation of interactive teaching activities

- Online moderating skills that recognize the stages of development in teaching online

Learners, too, need to acquire new skills to be successful with online learning, in addition to having the prerequisite equipment and network access. These skills include:

- The ability to use computers and learning software

- Being self-directed - the ability to learn even if the instructor is not available

- Learning online etiquette

- A willingness to cooperate and collaborate with other learners

Viewing e-learning as a form of teaching makes it obvious that instructional design and teaching strategies for online environments are important. For the most part, this orientation is not present in the e-learning industry.

Given the complexity of learning, a pragmatic approach to instructional design would be to realize that various learning tasks require different instructional strategies. Thus the first question should be - What am I trying to teach? The second question should be – Whom am I trying to teach? Knowing the answers to these two questions will go a long way towards selecting an effective and appropriate instructional strategy for any given learning task (Prensky, 2001).

A few (17) e-learning providers out of the 1004 surveyed describe their instructional design in terms of *the technology* used to deliver content, rather than a particular teaching approach or strategy. Detailed discussions of artificial intelligence, learning objects and reusability, adaptive or intelligent tutoring systems, automated instruction, or instructional templates, without presenting a methodological approach to online teaching, are signs that a vendor is fixated on the technologies of teaching rather than on methods of teaching.

When there is evidence of instructional design in e-learning, it is often underwhelming, as most e-learning providers don't take into account the unique characteristics of the digital environment. Instead, they have either tried to make online learning look and feel like classroom learning, or they have tried to mix online and classroom teaching together, the so-called "blended" approach.

Although there is nothing with using e-learning technology to supplement classroom teaching, blended learning can also be seen a fall-back position from facing the difficulties of entirely using e-learning to teach, and is less threatening to instructors who fear being pushed out by the new educational technologies. Raschke (2003) comments that "trying to impose a régime of computer instruction on the traditional, lecture centered, sage-on-the-stage style of classroom is like outfitting a pull cart with wings, aerons, and a jet engine. It can be done, but the product is strange, monstrous, and inappropriate to its real use" (p. 32).

Much of what is termed e-learning is really a form of *simulated schooling*. That is, learning materials that are presented online are usually in the form of a course, with course authors, objectives, presentation of materials and assessments. Like the "horseless carriage" and "talking pictures", there is a cultural tendency to see new technologies in terms of traditional ways of operating, or as the absence of some characteristic of a technology that we understand (for example, "wireless" networking). It is hard to see past what we know and discover the unique advantages of a new technology.

In fairness, it should be noted that while some vendors may wish to produce innovative, exciting e-learning, there can be barriers to doing so, such as low budgets or restrictive client specifications. Clients, as well as vendors, often see educational design equated with their own experiences of schooling in their earlier years. To break through this barrier, it is necessary to understand the unique qualities of digital environments.

The Uniqueness of Digital Representation

Digitization is a unique form of representation, where some aspect of reality is broken into discrete units, which are then represented by at least two "digits". We tend to think of digitization as a new phenomenon, but as Berlinski (2000) points out, the idea is present in the thought of the 17th century philosopher and mathematician, Gottfried von Leibniz:

> Ultimately, Leibniz argued, there are only two absolutely simple concepts, God and Nothingness. From these, all other concepts may be constructed, the world, and everything with it, arising from some primordial argument between the deity and nothing whatsoever. And then, by some inscrutable incandescent insight, Leibniz came to see that what is crucial in what he had written is the alternation between God and Nothingness. And for this, the numbers 0 and 1 suffice. (p.14)

The code used in electrical telegraph systems (which were preceded by sophisticated *visual* telegraph systems) was a digital, binary code (Rowland, 1997). Combinations of "dots and dashes" were used to represent the letters of the alphabet, numbers and punctuation marks, a scheme similar to the ASCII code developed in the 1960s (Jennings, 2001).

So, the power of digitization is not in the binary coding or in the ability to transmit information. The electric telegraph could do both. Rather, the difference is in the ability of electronic computers to break analog phenomena into discrete pieces, represent those pieces as digits, store this data in memory and/or permanent media, manipulate the digits to *transform* them into something else according to instructions in stored programs, and then output the results in either digital form for later use or transmission to other computers, or in the form of analog (re)constructions that are then available to humans through their senses. The digital computer and related high speed networks are new representational, transformational, and distribution technologies that, together, "change everything."

The past ten years has seen the development of a myriad of software applications to manage and simulate just about every human activity. In the field of education, the focus on technology, and the dominance of the field by programmers and other software specialists, has resulted in a competition in the quantity of software features, and in the use of object-oriented software design principles such as object reusability. These features have been hyped with extravagant claims, while the e-learning industry has avoided real planning and building for effective online teaching. This is particularly the case with the e-learning industry's emphasis on "learning objects", which spawned the new software category of Learning Content Management Systems, but has not resulted in any breakthrough thinking in terms of online pedagogy.

Learning objects are often referred to as "chunks of learning". But people don't learn in de-contextualized discrete chunks, and the presentation of a particular chunk of learning, such as a graph, doesn't mean that any intended learning has taken place. Rather, learning objects are really software objects. Software objects are built for the purpose of reusability, so that programmers or graphic artists don't have to construct the object again. There is nothing inherently wrong in the concept of reusability; it is just that reassembling parts on a screen is not an adequate instructional design model.

At the simplest level, reassembly of learning objects results in the same old "Tell-Test" presentations. A more sophisticated version of this model is the vision of giant repositories of reusable objects that can be assembled into a "course" or "teaching moment" with the results of continuous online assessments. This idea is based on the behaviouristic concepts of "programmed

instruction" that have generally been discarded by newer cognitive and constructivist learning theories of education. While older adults may be impressed by a computer's ability to serve up a custom mix of things to look at on the screen, this model does not work for the younger generation of adults now in educational institutions or work settings.

The New Generation of Adult Learners

There *does* seem to be a distinct difference in how the under-40 year-old generation learns compared with older adults. The experience of younger learners with television, video games and computers, with a corresponding reduction in the amount of time spent reading, means that they actually think differently. The technology of e-learning, because it resembles the media familiar to younger learners, demands that they get *actively* involved in the learning experience. The resulting shift is a change from receptive learning to active learning (Raschke, 2003). The pressure of networked digital communications technology to move learning from passive or receptive modes of learning to active inquiring modes of learning is in opposition to the tendency of formal schooling to convert "dynamic knowledge into static information" (Beaugrande, 2002, p. 28). Schooling is often about learning "facts" and *not* about learning about "life" or integrating all of one's experiences into an illuminating and generative world view.

Our early experiences orient us to ways of thinking and to learning interests later in life. In North America, people now over 80 were raised in much simpler material conditions, generally went to work earlier, and were impacted by such experiences as the Depression and World War II. Their children, the baby boomers, experienced the growing gadgetry of the 1950s, the space race, libraries, television, movie theaters, mind-altering drugs, the civil rights movement, and a sexual revolution brought on by birth-control pills. The children of the baby boomers, born in the 1970s, were the first-generation to be raised with widespread access to personal computers, video games, gaming consoles, mobile phones, and personal digital assistants. The last 35 years has also brought AIDS, terrorism, ecological disasters, global warming, and the globalization of corporate capitalism. And, the speed of change increases with each passing year. This rapidly changing world necessitates the ability to both unlearn and relearn throughout one's life.

Given the differences in the experiences and the environments of the three generations described above, is not surprising to assert that each has its own interests and ways of learning. The under-40 generation has been described as "digital natives", while those of us who are over 40, and have ventured into the computer world, have been called "digital immigrants". Prensky (2001) describes the younger generation as operating at "twitch speed" because of its

training on videogames, and the requirements of a high-speed world produce at a faster and faster pace. Because of this, Prensky suggests that “digital game-based learning” is most appropriate for the under-40 group.

No wonder that both classroom teaching and Tell-Test models of online courses are seen by younger adults as BORING. Most have spent a lot more time watching television and playing computer games than reading. Just as the introduction of writing was a technology that restructured consciousness (Ong, 1988), electronic media technology has prepared a generation to think differently than their parents and their teachers.

For the older generation, the ability to read well is the heart of a good education. Once we master the art of reading, the words on the page disappear as we enter a world of reflection and imagination. Well-written description can take us into a dream world far away from where we are sitting (Birkerts, 1994). In contrast, electronic media tends to be on the surface. To keep our attention, designers of Sesame Street, commercials, and video games use quick animations and jump-cut editing to revoke instinctual "orienting responses" to movement and novelty. It works for a time, until we become habituated. Then even more movement, surprise, sex or violence is needed to keep our attention.

This is not the fault of the younger generation. After all, they didn't ask to be born into this particular world. But there is the danger of loss as well a something to be gained in this shift from reflective word-based learning to transient experienced-based learning. While many young people of today have a much wider view of the world than their parents, can juggle several cognitive tasks at the same time, are more relativistic and tolerant, and face new situations and change as a challenge, many young people also have a more fragmented sense of time, a reduced attention span, a lack of faith in institutions and explanatory narratives, a reduced sense of place, community and history, and a sharply reduced vision for a personal or collective future (Birkerts, 1994).

In approaching electronic educational media, the under-40 generation has high expectations due to their experience with video games. But, they are usually disappointed. For example, much of the hype generated by e-learning providers is about the amazing results of “interactivity”. But much of what passes for interactivity in e-learning is minimal compared to what it could be, especially when compared with the interactivity of video games.

Generally, interactivity in e-learning consists of turning pages through clicking on hyperlinks. True interactivity is based on feedback loops, whereby the action of one participant, the learner, results in an action by the other participant, the computer, in a back-and-forth exchange. With feedback, learners reflect on what is happened by seeing the results of their actions or

decisions. We also learn by being challenged or questioned on our decisions. There is little of this level of interactivity in today's e-learning content.

In another example, the commonly cited imperative “learn by doing” is used to justify and sell online simulations. While “learning by doing” method of teaching works better then the Tell-Test method for most skills, it is not the best method for teaching everything. As well, there are nuances that are not recognized in this simplistic formulation. For the naïve learner, simulations with reduced features may work best by minimizing “cognitive load”. But as the learner becomes more familiar with what is being taught, complexity and challenge may need to be added in order to make the simulation realistic and challenging.

A New Understanding of Learning

Learning is multidimensional, a fact that does not seem to be recognized by most e-learning providers. There are many different types of learning, depending on what is being learned, the learning environment, and the characteristics of the learner. Part of the reason we tend to misunderstand the complexity of learning is because we see the results of learning as “knowledge” - which we tend to think of as a commodity that can vary in quantity from one person to the next. Because we tend to view knowledge as a *thing*, our ideas about learning center on metaphors of acquisition, processing, absorbing, building, or flowing. But knowledge is usually situational, and is often shared and collectively produced (Davis, et al., 2000).

With proper programming, computers have the ability to deliver individualized instruction. With the exception of those who deal with learning styles, most e-learning providers do not try take into account the many variables that can change from one learner to the next. Like learning, teaching is also an extremely complex undertaking, and a good teacher balances many different inputs in making a decision on how to facilitate a particular learning task. In addition to the differing requirements of various learning tasks, other variables that can influence learning success include the following:

- Learner’s experience with subject matter
- Learner’s general knowledge and “base metaphors” (Lakoff and Johnson, 1999)
- Learner’s learning preferences (“learning style/cognitive style/thinking style”)

- Learner's learning orientation, including his or her reaction to technology
- Learner's sensory pathways
- Learner's cognitive processing abilities
- Learner's emotional state
- Gender differences
- Age differences
- Cultural/corporate/institutional/societal requirements and values
- Presence or absence of collaboration with other learners
- Learning environment, including "learning distracters", availability of human and technological resources, and whether it is an individual or a group being taught
- The presence of other people in the learning environment

Instructional designers also need to confront the role of embodiment in the learning process. Watching a teacher conduct a class can be a rich sensory experience, in the sense that we as learners are attuned to the teacher's gestures, facial expressions, voice quality, and "gaze" in addition to any words that may be spoken or writing on a blackboard. Moreover, a teacher's body may be marked by "ethnicity, race, disability, size, gender, sexuality, illness, age, pregnancy, class, linguistic and geographic origins, or some combination of these" (Freedman and Holmes, 2003). In a classroom setting, there are the bodies of fellow student to contend with, which may also present opportunities for learning and for collective actions such as collaboration or resistance to the authority of the teacher.

In spite of a growing research literature on the phenomenon of "telepresence" in networked environments, most online learning environments are bereft of bodily features of teachers or fellow learners. It is not surprising that a two-year study of 169 Internet users found that they were more isolated and depressed at the end of study than when they started (cited by Dreyfus, 2001).

Instructional design models in e-learning rarely take into account the role of emotions or motivation in learning. The exceptions are those who cite the literature on "learning orientation" as a guide to their instructional designs.

Learning orientation takes into account both the emotional state of the learner and his or her motivation to learn. However, some of the learning orientation literature is conflated with the writing on learning styles, and each has a set of conceptual problems that need to be addressed.

When we learn something important, or when we reach a difficult level of achievement, we tend to feel a sense of elation and satisfaction. When we struggle with learning something and fail, we usually feel depressed and deflated. Learning is tied to emotions, and emotions are linked to our consciousness (Damasio, 1999). A teacher can play a crucial role in making learning emotionally important, through modelling and through supplying authentic feedback. The design of e-learning rarely takes this into account.

Finally, instructional design for online learning rarely acknowledges the potential conflict between the needs/desires/goals of the learner, and the institutional goals of the organization providing the instruction. The best circumstance for learning is where the individual's goals are aligned with the goals of the organization. The challenge to both schools and businesses will be to provide learning experiences that are seen to benefit both the learner and the organization.

Intuitive Learning

Online instructional design models rarely refer to research on the brain. With one or two exceptions, e-learning providers do not refer to the brain in any discussion of learning. One exception is the recent book by Clark and Mayer (2003) who use brain research to advise on how to construct online courses. They write:

> "Cognitive learning theory gives us several key ideas that explain learning:
> - human memory has two channels for processing information: visual and auditory
> - human memory has a limited capacity for processing information
> - learning occurs by active processing in the memory system
> - new knowledge and skills must be retrieved from long-term memory for transfer to the job" (p. 35).

Yet, this view is too limited in that it does not take into account *intuitive learning* (diSessa, 2000) that can happen without much conscious awareness that learning is taking place. Intuitive learning, as opposed to conscious learning, is similar to the distinction made by Polanyi (1958) between *tacit* and *explicit* knowledge. The processing of learning and storing tacit knowledge can now be tracked with brain scanning equipment (Baars, 1997).

Nørretranders (1999) argues that we can only process about 16 bits per second with our conscious brain, while 11 million bits of information per second are available to our unconscious brain through our sensory pathways. The learning that takes place in rich experiences may be mostly at the unconscious level.

But, as Davis, Sumara and Luce-Kapler (2000) point out,

> "… [electronic] media operate at a low information level - one that has been deliberately adjusted to suit what consciousness is able to accommodate. And so, while these technologies give access to immense stores of data, they operate at a very low level of stimulation. Human sense organs, however, function at a capacity that is about one million times greater than conscious perception. As such, abundant use of the so-called "information technologies" may actually result in a starvation of the senses, and information poverty. Traditional teaching strategies might also be criticized on the basis of such information poverty. These practices tend to be adjusted to the limitations of consciousness, but often failed to consider the breadth of human sensation" (Davis, Sumara, and Luce-Kapler, 2000, pp. 8-9).

Learning discrete bits of information is much slower and more difficult than being immersed in a rich learning experience. Intuitive learning is even more powerful when accompanied by reflection and integrative conceptualization.

As e-teachers, surely the goal is to facilitate "*committed learning*, where learners feel deeply connected to the activities in which they learn" (diSessa, 2000, p. 66). To do that, we must recognize the processes which support intuitive or unconscious learning, which happen with rich multi-sensory experiences. The present e-learning methods are mostly based on conscious learning, where information is presented and actively memorized.

Intuitive learning is based on strategic learning activities, stimulating and supportive learning environments, and a certain degree of exploration - even "fooling around". But this doesn't happen unless the activities are *of interest* to the learner. To develop a new pedagogy for committed e-learning, we need to examine the role of motivation and the concept of interests. "A committed relationship entails the feeling of ownership, personal connection, and competent such that extended engagement in those activities is perceived to be a natural extension of ourselves." (diSessa, 2000, p. 83)

The instructional design of e-learning has to start with the combination of the learner and the learning task, or as diSessa puts it, committed learning "is

nothing more than a particular relationship between a learner and a fabric of learning activities". This relationship is not linear, but a spiral based on feedback loops. As I learn, I get feedback that confirms what I have just learned. That unconscious knowledge is then strengthened, and applied to the next similar situation that I encounter. These pieces of knowledge become our "phenomenological primitives" within our "regime of competencies" that we then apply to the world throughout our life (diSessa, 2000).

Unfortunately, in this era of rapid change, facilitating committed learning, while a giant step forward, is not enough. The skills of *unlearning* and *lateral thinking*, where we discard or ignore what we have learned in favour of innovative thinking that deals with the problems at hand, will be paramount for vocational success in the next fifty years. Critical knowledge has shifted from how much a person has stored in his or her brain, to skills in solving new problems in innovative ways.

A New Relationship with Knowledge

As we have seen, a large part of the reason for the failure of the e-learning industry to deliver engaging and fruitful learning experiences is that it has treated learning in a simplistic, reductionistic fashion. As a consequence, learners are easily bored, and turn away from any attempt to teach them online. As well, learners know that any information that they learn can be obsolete in short period of time. This means that much learning needs to be *strategic* – the acquisition of critical judgement on what is important, where to find key information when needed, and how to apply this information to continuously changing demands.

We need, says Pierre Lévy (2001), a "new relationship with knowledge…for the first time in the history of humanity, the majority of the skills acquired by a person at the beginning of his or her professional career will be obsolete by the end" (p. 137). In a period of rapid and accelerating change, the ability to engage in continuous strategic learning will be the greatest competitive advantage of both individuals and organizations (Pietersen, 2002).

Future Possibilities of e-Learning

With such a marvellous invention, why are we trying to recreate the boredom of classrooms as an online experience? We need to imagine and use the many possibilities of this new educational tool set.

For example, the new fields of information visualization and auralization (Spence, 2000; Tufte, 1990, 1997, 2001) have not been explored in depth by e-learning providers. Yet, there is a growing literature in this area and further

developments in the digitization of touch, taste and smell are on the horizon. The near future (within 5 years) will see educational experiences created by computers that are embedded in clothing, on flexible sheets that can be carried around like paper, found in mobile phones, seen on large scale wall displays, and activated in "smart objects". E-learning companies who want to stay ahead of the development curve will start to investigate these technologies now.

Because of the dominant "page" metaphor, much of what is on screens is in two dimensions. Think of the monitor as a stage where front to back display becomes as important as side to side. Or, more likely in the next few years, as the computer becomes invisible (Norman, 1999), think of the dramatic possibilities of programmable clothing, furniture, wall displays, and robots all mixed together in one room. Already there are 3D computer displays that don't require special glasses.

Cognitive mapping and the collective generation of ideas are all within reach, assisted by networked computer technology. Much of the collective knowledge of humans now resides somewhere on the Internet. The intertextuality of linked documents and multiple voices has created a new environment for humans to both create and store knowledge. This environment and tools for navigating through it are not usually part of current e-learning offerings, but they will be in the near future.

The world-wide networking of computers as resulted in radical new possibilities of communication in education. From online conferences with experts to international e-mail collaboration with peers, the possible educational uses of networked computers have hardly been explored. The dream of *integrated education*, where learners work on large-scale problems that involve many different disciplines can now be realized through networked communications, but a new curriculum and credentialing system will need to be developed to support this active form of learning.

Much excitement was generated in the 1980s by the development of the LOGO computer language as an educational environment (Papert, 1980). The theory of "microworlds" as places to learn by exploration and discovery generated a great deal of writing. With the move to online learning this emphasis on creativity in educational computer environments seems to have died. But one of the oldest forms of human learning has been through play and storytelling. We need to explore the narrative possibilities of the new media combined with true interactivity in developing e-learning (Meadows, 2003). Such story-telling does not have to come from a "teacher" but can be based on peer-to-peer sharing as well. Most videogames and computer simulations have a "storyline", and the player can immerse him or herself in creating the story. Not only has story telling become popular, but, with multi-player games, a learner can be *in* the

story, participating and influencing its outcome, as other players join in. Virtual environments can also be physically demanding, with large body exercise taking place while users "play the game". These will all become part of the educational mix in the near future.

Humans have astounding but limited abilities. Computers can extend our abilities in many different ways. While we tend to think of prosthetics as devices for people with disabilities, the computer, in fact, can extend all of us in terms of our senses and ability to manipulate and control the world around us, and, through virtual reality, can create new experiences that are not possible in the "real world." This is especially true in exploring new ideas of organisms (including humans) and societies as evolving "complex adaptive systems". The software, as well as the user, will learn. As the software gets to "know you", it will become more useful in delivering the right e-learning experiences for your development.

The computer revolution is moving teaching out of schools and corporate training classrooms into the workplace. Just-in-time training, and performance-based training are hot areas of development for e-learning. And, with new flexible learning management systems[2], individualized learning is now a real possibility.

Perhaps the most radical change in education caused by networked computer technology will be the increasing opportunities for collaborative work. Shneiderman (2002) calls for "an active learning approach to education that integrates the new computing to create collaborative team experiences based on ambitious, authentic, service-oriented projects" (p. 112), facilitated by new software tools. His approach to building learning experiences with computer support is based on four steps: a) collect, b) relate, c) create, and d) donate. Such an approach challenges the usual organization of the classroom in that the teacher's role is truly that of a facilitator and not "the expert".

Finally, learning is moving from a mostly imposed curriculum in most educational settings to a kind of mixed market of courses, competency based skills training, and self-directed learning based on one's personal journey through both the "offline" and online environments. New systems of tracking achievements are now available that gather all manner of credits into one personal portfolio (Lévy (2001).

To be successful, a new pedagogy for e-learning must take all the above possibilities into account. It must use new insights from neurological research, factor in the multiple dimensions of learners, pay attention to the complexity of

[2] See www.learnflex.com for an example of this new kind of learning management software.

the learning spiral, and emphasize the unique characteristics of electronic networked media in order to produce e-learning experiences that are engaging, generative of new insights, and useful to all those young people who will need all their individual and collective ingenuity to deal with what appears to be a world of accelerating crises and change. The current failure of e-learning content to interest and motivate learners, especially those under-40, is a failure of imagination and an unwillingness to apply effective methods of teaching to the online environment.

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