
The Virtues of the Virtual World

Enhancing the Technology/ Knowledge Professional Interface For Life-Long Learning

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Nurses are quintessential learners. Nested between the fields of science and technology, the professional mandate for life-long learning has never been greater. The expanding demands for performance and quality coupled with the reality of diminishing time and resources increasingly frustrate and challenge providers in the field. By blending the best of current training and education with the emerging potential of virtual learning, new models for enhancing clinical reasoning and performance will simplify the challenges of complexity, moving it to higher order. In this transition lies the key to restoring the joy and commitment of professional practice while enhancing the capacity to care with competence. **Key words:** *e-learning, learning architecture, performance enhancement, professional development, safety in the workplace, scenario-based simulation training, technology, virtual reality*

The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn.

—Alvin Toffler

NURSES ARE quintessential learners. Many who choose a career within the discipline are drawn by the intrigue of rapidly evolving science and technology, the continuously changing status of the patient, the challenges of influencing clinical outcomes toward a desired state, and the sheer joy of being in a significant relationship with another member of the human family as they navigate their health journey in life. Being a *continuous life-long learner is the core competency essential to provision of care* in its deepest sense. It is this attribute that helps nurses fulfill their social contract with the public

who looks to them for guidance and support when health challenges disrupt their lives.

Nursing's Evolving Professional Journey

The presence of nursing has been continuous throughout the development of civilization. Training of nurses was initially based on cultural healing practices and oral tradition, with an apprenticeship under a skilled healer or midwife. The academic structures and standards for nursing education began with our founder, Florence Nightingale. Schools of nursing originated at the turn of the nineteenth century. For 100 years the evolution of learning moved from diploma-based training to academic education. As we progress in this century with instant access to information through global technology, the definition of learning is

Table 1. Nursing's evolving journey toward mastery

Era	Educational process	Faculty role	Functional focus	Knowledge acquired	Outcome
1930-1950	Nurses training	Instructor-controlled	Task/procedure	Clinical skills	Supportive care
1950-1970	Staff education	Instructor-led	Medical problem	Scientific process	Planned care
1970-1990	Staff development	Instructor-guided	Clinical diagnosis	Critical thinking	Information management
1990-2002+	Continuous learning	Self-directed	Patient-in-context	Clinical reasoning	Outcomes management

evolving in new and exciting ways. This requires us to reframe our entire notion of learning, knowing, and being into a larger framework as nurses claim their role as knowledge professionals for the 21st century (Table 1).

Throughout the 20th century the industrial era fostered a strong focus on science and technology development that built the connected infrastructure we enjoy today. As a society we are very adept at problem solving and building plans and solutions to manage any situation or crisis. Nursing, a mirror of the society it serves, also reflected this approach in professional practice. Nursing education focused on learning the scientific process so that we could predict and control the outcomes. Theories from our nursing leaders reflected notions from the behavioral sciences, providing care frameworks that looked at adaptation and balance. We were taught that, as the "expert," it was our role to design the plan of care and manage the patient. And if the patient did not "obey," he or she was labeled noncompliant. (It is interesting to note how that word has now been applied back to the entire health care industry).

Nursing as a Knowledge Profession

As the world became more complex and chaotic, society began to look for a deeper understanding of the universe.

The old mental models that informed and guided our lives and our work fell short of explaining the phenomena of everyday life at all levels. The emergence of quantum thinking, fostered by the tools and technology of the post-Industrial Era, revealed that, at a deeper, more inclusive level, the universe was dynamic and ever-changing rather than mechanical and predictable. From the important works of science and philosophy, new models to explain our world came forward. We started to recognize that there was no one right way, that the solution was within the problem rather than outside of it, and that a relevant question was more helpful than a standard answer. We discovered that if we approached things with an open and curious mind—rather than a prescribed solution—we could cocreate strategies and approaches that would be timely, relevant, and that would have an impact.

The evolution of nursing practice reflected this very phenomenon within the discipline. Postmodern nursing theories expanded to include definitions of health as "an expansion of consciousness"^{1(p.27)} and "the ability of people to live the values of their choosing."^{2(p.49)} Watson further observed that healing requires "a shift towards the symbiotic relationship between humankind-technology-nature and the larger, expanding universe."^{3(p.xiv)} These models acknowledge that people are expert regarding their own dynamic

and ever-changing life, and, with guidance and support from within and beyond nursing, they create and manage their own plan of health. So, nursing further opened its circle to collaborate more closely with other health care providers, facilitating integrative care across the continuum.

Nursing education also is moving into the postmodern era. An expanded focus on critical thinking and clinical reasoning models⁴ foster reflective rather than prescriptive patterns of practice. Freedom to cocreate responses with and for the patient in addition to care management from approved protocols has invited the patient and family into a dynamic caring partnership that enhances the experience and outcomes for all.

This rich professional legacy has positioned nursing at the center, the very core of care delivery in the health system today. The shortage situation has only heightened the truth of its key integrative and facilitative function. Nursing is the distribution point for many of the health services required by the society we are privileged to serve. Alarming, with all these positive developments in the profession and the health field, patient safety has emerged as the number one concern of the general public and policy makers. The 1999 Institute of Medicine's report shocked many Americans who now enter the hospital wondering if the visit might harm rather than help them.⁵ Closer examination of the issue reveals that many of the errors occur at the human and technology interface. The power at this boundary has equal power to heal or harm—the outcome is ours to determine.

Merging People and Technology

Destoruzos observed that, "Technology is an inseparable child of humanity. For

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true progress to occur, the two must walk hand in hand, with neither one acting as servant to the other."^{6(p.6)}

Rapid changes in science and technology quickly render current skills and knowledge obsolete. As devices and care protocols become more complex they also place new and different demands on the caregiver. The interface between humans and technology requires a competent and reflective professional practitioner who can manage a patient care event with the assistance of quality products, services, and devices without error. The impact of this dynamic complexity must be captured within the corporate education agenda. Three virtual vehicles are emerging to assist with the task of continuous learning for the knowledge professional: e-learning, virtual reality, and scenario-based simulation.

E-learning

E-learning was a first wave of online education predicted to "make e-mail look like a rounding error."^{7(p.13)} Course design is typically built using pedagogical principles complete with objectives, an introduction and a navigational path that is hard coded by instructional design experts and focused on comprehension of content. Often hyperlinks and drop-and-drag features are added to increase user interactivity. Evaluation upon completion of the course tests learner recall. This methodology, akin to putting a textbook online, is used to teach children and has been employed by educational

Table 2. Adult learning

Qualities of learner	Qualities of learning event
<ul style="list-style-type: none"> ● Already have a set pattern of learning ● Are not beginners, rather, are in continuous growth state ● Bring a package of unique experiences and values ● Come to education with specific intentions ● Bring expectations about the learning process ● Have competing interests in their lives 	<ul style="list-style-type: none"> ● Need a climate conducive to learning ● Seek educators that facilitate rather than didactic instructors ● Do best when self-directed and engaged in design of learning ● Respond to learning activities relevant to their circumstance ● Learn when individual learning needs and styles are considered ● Use experiences in the learning process

institutions since 1892. The outcomes have shown a disappointing 30% completion rate, with no standard method of identifying if the training is actually having a positive effect on those who take it or if it is affecting the bottom line.⁸

Second-generation e-learning models are beginning to incorporate androgogical principles designed to address the specific ways adults learn, a process significantly different from children (Table 2). Stephen Brookfield, noted adult learning specialist, identified qualities that facilitate adult engagement in the learning process:

Engaging the adult learner occurs when the learning experience is tied to their dreams, goals and aspirations while they simultaneously weave the learning experience into their lives at work, at home and at play. It puts the power of the learning experience back into their hands.^{9(p.42)}

Currently, e-learning is best used when combined with more traditional methods of training and mentoring. It is an ideal model for teaching repetitive content such as safety training and other regulatory or mandatory courses. It frees the instructor, and the learner, from rote lecture so more classroom time can be spent in group work, case studies, and applied science activities. Standardiza-

tion of content is assured so all learners receive the same quality of instruction, and standards-based logic helps prepare clinicians for certification in their field of specialization.

Virtual reality

Virtual reality (VR) is advancing rapidly as a futuristic learning method. It is best defined as a computer-generated three-dimensional (3-D) experience in which users can navigate in a world and interact with it while being immersed in another environment in real time. Although multisensory experiences are a futuristic potential, today most of virtual reality is only visual and auditory in nature. Computers have moved from two-dimensional to 3-D computer-aided design. VR will be the next natural progression of this work, but price and technology are barriers to its rapid emergence. In 2001, \$1.3 billion was spent within the VR market, but \$5.3 billion went to 3-D images.¹⁰ VR was used in 8,512 organizations worldwide, mostly in museums and exhibitions showing virtual prototyping.

Within 10 to 20 years VR is predicted to greatly extend the capabilities of the Internet and other communication, education, entertainment and work-focused media such as virtual medicine. Today, however, the cost of production, the

immaturity of the requisite technology, and the small scale that can be trained in its use at one time (five to six users maximum), makes this a promising futuristic model rather than a broad-scale application to meet today's education needs.

Scenario-based simulation

Scenario-based simulation is evolving on the health care landscape as a dynamic tool for professional skills training and assessment. The use of *simulation* technology, including multimedia computer programs, is already well-established in other disciplines such as the military and aviation. Simulations place the learner in lifelike situations that provide immediate feedback about questions, decisions, and actions. The student gets an accurate assessment of his or her performance in real-time and access to information that can quickly correct or expand the current "mental model," enhancing skill and performance immediately.

Changes in professional education, limited instructor time and patient availability, expanding options for diagnosis and patient management, and advances in technology are calling for greater use of simulation technology in health care education.¹¹ This offers learners the opportunity to enhance their psychomotor skills without risk to patients. Patient-centered and case-based programs have controlled responses that vary according to numerous possible scenarios. Combining medical devices with scenarios provides skills training and proficiency. A clinical wrapper learning module contains tacit knowledge gleaned from experienced professionals and scientific knowledge from the academic world. With this blended learning taxonomy the learner can experiment, review, and refine clinical reasoning models in the safety of a virtual learning environment.

Simulation and Patient Safety

Patient safety is an agenda that crosses all federal and private health care agencies. A recent Joint Commission on Accreditation of Healthcare Organizations (JCAHO) *Sentinel Alert* reported the root cause to be inadequate orientation or training in 87% of cases studied. Simulation affords multiple opportunities for clinical decision making that fosters the opportunity to learn from errors and avoid jeopardizing patient safety, making it a viable tool to address the emerging safety crisis in health care.

Most health systems are focusing on medication administration as a starting point for their safety agenda. The Patient Safety Agenda 2002 demands improvements in patient safety, freedom from accidental injury/adverse events, and freedom from over/under/misuse. Research shows that errors in the use of medical devices result in hundreds, if not thousands, of patient injuries and deaths each year. Data reveal that 50% of errors occur during actual drug administration, with 25% arising during the dispensing stage and another 25% happening during the prescription stage.¹² Further exploration reveals that 27% include abbreviation errors, 33% involve look-alike or sound-alike drugs, and 62% of all medication errors include intravenous pump issues. A targeted area of focus identified by JCAHO/Leapfrog/Agency for Healthcare Research and Quality/Institute for Healthcare Improvement/Institute for Safe Medication Practices is the medication administration process with an emphasis on human factor issues associated with infusion pumps.

Rapid change is occurring in major devices moving into the marketplace, in their use, and in the users who apply them to patient care situations. To remain competitive, vendors continue to

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make changes that require upgrading the users skill, resulting in high travel and inservicing costs. Initial orientation efforts are commendable. However, with the current health care worker shortage and frequent use of temporary staff, continued competence is a challenge. Clinicians are frequently confronted with a piece of equipment that they are not familiar with. "Folklore orientation"—the passing on of essential information from the nurse leaving to the one coming onto the shift—often assures safety, but uses only a minimal number of key functions of the device.

A comprehensive solution to this issue resides in device simulation: the modeling of a device, its process and user behavior. Where e-learning involves instructional designers coding a learning path, simulation begins with engineers who program high-fidelity logic that is the exact replication of the logic embedded within the device. This affords the learner an opportunity to work through realistic problems and see the consequence immediately. Simulation offers three interrelated functions to the field.

Enhanced retention

Many studies show that clinical or technical competency rates drop over time, making repeated exposure to infrequently used devices or clinical scenarios imperative. A simulation-based Adult Cardiac Life Support class showed 85% retention after 10 months, compared to 30% with the traditional classroom or textbook instructional method.¹³ By having virtual simulations online, the clinician

can review and remediate his or her skills in real-time when faced with a challenging clinical situation.

Assessment/training

New equipment installation training can now occur virtually. A practitioner can be assessed on his or her current skill and measured against organizational standards. This is especially helpful when temporary staff or new or returning nurses enter the system. Individual performance can guide inservice and competency training at the level of learner need—one size does not fit all. The sophisticated assessment and learning platform "teaches to the gap" by customizing the training material to the individual learners needs.

Error reduction

The human factor gap can be closed as simulation offers the capacity to model a device before it goes to production. Because it operates exactly as a real device would, the prototype can be put on the Web, inviting users to methodically evaluate the simulation of various models of a device. An objective score can be obtained to guide purchasing decisions. Also, outcomes of this prepurchase trial partners the vendors and purchasers into a cocreative process that can drastically reduce errors in the field, time to market, and cost of production. These savings can be passed back to the purchaser or provider.

Simulation training can provide a highly efficient and inexpensive method to address competency and safety issues across the entire industry.

The Virtues of the Virtual World

Traditional clinical education has relied on the student-preceptor relationship to

assist the practitioner with real-time learning in situations unfamiliar to the caregiver. The shortage of professional staff and economic realities have decreased access to mentored support which often leaves novice practitioners alone in challenging and unfamiliar situations. The virtues of virtual learning and information processing tools hold great promise in enhancing existing educational structures and systems.

Timely

Virtual education can be accessed anywhere at any time, making it timely for the user. New learning platform architecture allows for modification of information to occur in the moment, making the information current. A new research finding can be broadcast to the field at the moment of its discovery rather than the typical 7-year time lag, making the information relevant. And, when faced with a high-risk-low-volume event, the professional can go online and refresh skills just-in-time to assure competency in performance.

Relevant

Virtual assessment can occur in the moment with a level of objectivity not possible before. Sophisticated logic and tracking technology allows learners to see the effect of their decision on the outcome desired immediately. Dashboards give them (and the instructor) an immediate map of their reasoning process, allowing for verification of competence and amplification of mental models that are inaccurate or inadequate for the situation. The learner is linked only to the material he or she needs to know, bypassing competency they possess. Honoring current life skills and accomplishments maintains their interest and attention in the learning process.

Safe

Health care is becoming increasingly complex. Issues around competency, patient safety, and litigation are part of a licensed health care professional's world. Online information and continuing education allows learners to take accountability for their continued professional development. E-learning pathways can lead to an advanced degree or certification in their chosen area of specialization. Simulation can allow the learner to practice new or forgotten skills in the safety of a "free-play" environment until competency is obtained. Then, at the learner's discretion, the evaluation mode is engaged, and performance is measured and recorded in the individual personnel record.

Measurable

Tracking and recording individual, unit, and organizational competency is a daunting task. Multiple paper-and-pencil forms of documentation are blended with computer-based information systems. As online assessment, training, and evaluation processes are increasingly used in the industry, all efforts made toward continued competency can be captured, documented, and "trended" in one place, meeting regulatory and mandatory requirements of the field. These efforts will help offset the challenges of a litigious environment and reduce malpractice insurance for clinicians and health care institutions that demonstrate continued excellence in performance.

"Delight-full"

True learning is fun! We are born with a birthright that delights in the joy and wonder of discovery. Watching children at play, we remember the many ways we engaged in the world to uncover its

mystery and enrich our understanding. By combining the best of stand-up lecture, classroom discussion, and clinical mentoring at the bedside with virtual learning tools and processes, a blended curriculum is born. A dynamic partnership between people and technology can create a forum that will once again ignite the passion for life-long learning in a way that puts the learner at the center of their path toward mastery.

The virtual world offers an exciting vehicle to expand the horizons of society. Each day, new information can be placed on the Web: data; analysis; strategy; progress reports; e-mail; simulation; decision-support tools, discussions, and chats; best practice scenarios; and other information that fosters a community of interest. People working together from a shared framework of information create synergy of effort and quality outcomes at both the individual and collective level.

Summary

Organizational leaders who integrate e-learning technology and practice into their culture and performance will maintain the competitive advantage in the 21st century, becoming the employer of choice. Today's challenged health care systems need appropriate competent and productive employees, information dissemination and tracking capabilities, effective clinical and educational technology, and quality outcomes in performance. Employees need a work environment that offers challenging and

meaningful employment, appropriate recognition and reward, access and support to information, tools and technology to help them perform to their optimal capacity, and a relevant learning plan that keeps them current as the information age continues to increase the challenges of maintaining state-of-the-art professional practice.

The value of a corporate learning agenda that blends the best of virtual learning and traditional learning is pronounced. It keeps key people in the field rather than having to stop work to obtain needed information or skills. It puts learning back into the hands of the learners, allowing them to maintain competence or acquire new skills without total support of the teacher or institution. Blending work and learning into an integral whole allows Web-based knowledge and databases to be consistently current and up-to-date. Tracking capacities allow faculty and human resource departments to maintain learner- or employee-specific records on participation and performance on educational activities. Shared information and data sets provide a broader range of consistent information that transcends folklore information management. The quality of information, communication, and performance is enhanced. And the ability for each employee to fulfill his or her potential and interest allows is ever-present. An inspired, connected, and learning work force is the secret to quality in the current challenged health care world. And it is the key to a professional life infused with meaning, purpose, and soul.

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