Connecting

GEORGE SIEMENS
University of Manitoba (Canada)

Consider the hidden complexity of an experience that travelers frequently encounter: recently, while in Portugal, I walked past a car dealership and noticed a counter with the word *recepção.* Given the context, I concluded that it referred to reception desk (the similar pattern to the English word assisted in forming my opinion). However, when encountering the same word in spoken form, I was unable to recognize it—context and pattern similarity were lacking.

This situation offers a vague glimpse into the foundational disconnect in education and research today: through curriculum design and adherence to particular research models, we essentially foster an outcome based on hidden assumptions. Learning, in contrast, is rich, multi-faceted, with each modality and medium resulting in different levels of understanding. Context, learner knowledge, medium of learning, and skills of the educator all contribute to formation of a learner's understanding.

The common language of learning design and teaching reveal a bias held by many educators of learning as an act that can be controlled and managed toward an intended outcome. Recent criticism of minimally-guided instruction (Kirschner et al., 2006) and support of lecture formats (Burgan, 2006) set a tone of conflicting viewpoints to current ruling ideologies of "learner-centered" education. Unfortunately, these concepts are cast as opposed, when they ought to instead represent a gradient approach for use in quality teaching, learning, and research.

Complicity: An International Journal of Complexity and Education
Volume 4 (2007), Number 1 • pp. 107–109 • www.complexityandeducation.ca

Learning as connection forming

What does it mean to say that learning is complex or reflective of complexity science? Davis and Simmt (2003) detail two key components of complex phenomena: adaptive (the "system can change its own structure," p. 138) and emergent ("it is composed of and arises in the co-implicated activities of the individual agents," ibid.). In presenting connectivism as a "learning theory for a digital era", I detailed learning as the act of forming networks (Siemens, 2005a, 2005b), enabling adaptability of learning agents, and attendant emergence. These basic ideas represent key concepts of complexity views of learning.

On Research

Research in education varies in quality, format, and effectiveness (Levine, 2007). While quality of research is determined by numerous factors, research methods present no clearer way forward for today's educators than do teaching methodologies—action, design-based, quantitative, qualitative research each suggest an approach offering the preferred path. Complexity theory affords a valuable perspective to bring together disparate thoughts on research. Zimmerman, Lindberg, and Plsek (2002) go so far as to suggest complexity "has created a bridge or a merger of quantitative and qualitative explanations of life."

From dichotomies to systems

Monochromatic perspectives of learning—whether based in behaviourism or in the growing prominence of constructivism—tend to reside between conflicting camps (it's important, and obvious, to acknowledge that education is intensely political, bringing many to the conversation table with contrasting views and agendas). Context, needs of learners, institution, and teachers all contribute to the formation of valuable learning. No single avenue suffices. Initial conditions and adaptive interactions—not solutions crafted in advance—direct ongoing and subsequent activities of both educators and learners. Learning, when seen as a gradient of numerous factors interacting in a complex adaptive system where "correct" answers vary based on changed context, opens the academy to opportunities for continued relevance and leadership.

What then is a potential solution or option to curricular ills? Established curriculum—pressed through the instructional design process—leaves little room for multiple contexts, adaptive exploration, or even emergence of knowledge refined by interaction, not advance planning. Effective education (with effectiveness being a function of many factors—preparation

for employment, grooming for citizenship, and even the joy of learning) in complex environments of information abundance must be founded on adaptive, network models. Instead of curriculum being fully defined in advance of the learner taking a course, core concepts need to be established, and learners engaged to explore and extend the learning based on context, multiple perspectives, and dialogue.

Bruni, Gherardi, & Parolin address the fragmented nature of knowledge by declaring it is "fragmented and distributed among bodies, machines, images, evaluations, routines and laboratory techniques and it is enacted, on the one hand by relations and, on the other, by interactive and discursive practices" (2004). Phelps adds to this important conversation: "the world is irreducibly complex, not deterministic and predictable" (2003). The whole of learning walks parallels of multiple, distributed agents involved in complex, dynamic, ongoing interactions. Predetermined curriculum, false dichotomist positions, and inflexible instruction fade as viable options as complexity extends deeper into all areas of life. Learning must be aligned with the nature of flow of knowledge in our society today. Complexity theory affords basic principles on which to build new models of teaching, learning, and research.

References and Sources

Burgan, Mary (2006) *In defense of lecturing*. The Cargengie Foundation for the Advancement of Teaching. Retrieved June 30, 2007 from: http://www.carnegiefoundation.org/change/sub.asp?key=98&subkey=2105

Bruni, A., Gherardi, S., Parolin, L., (2004). *Knowing in a System of Fragmented Knowledge*. International Seminar on Learning and Technology at Work. Institute of Education, London. Retrieved on June 30, 2007 from http://www.londonknowledgelab.ac.uk/kscope/ltw/seminar2004/Gherardi-LTW-seminar-paper.pdf

Davis, B., Simmt, E. (2003). "Understanding learning systems: Mathematics Education and Complexity Science." *Journal for Research in Mathematics Education*, vol 34, no 2: 137–167.

Kirschner, P. A., Sweller, J., Clark, R. E., (2006) "Why minimal guidance during instruction does not work." *Educational Psychologist*, vol. 41, no. 2: 75–86.

Levine, A. (2007), *Educating Researchers, The Education Schools Project*. Retrieved June 30, 2007 from: http://www.edschools.org/EducatingResearchers/educating_researchers.pdf

Phelps, R (2003). *Developing Online from Simplicity toward complexity: Going with the flow of non-linear learning*. Retrieved June 30, 2007 from http://www.unb.ca/naweb/proceedings/2003/PaperPhelps.html

Siemens, G. (2005a). "Connectivism: A learning theory for a digital era." *International Journal of Instructional Technology and Distance Learning*. Retrieved on June 30, 2007 from: http://itdl.org/Journal/Jan_05/article01.htm

Siemens, G. (2005b) *Connectivism: Learning as network creation. Learning Circuits*,

November. Retrieved on June 30, 2007 from: http://www.learningcircuits.org/2005/nov2005/seimens.htm
Zimmerman, B, Lindberg, C., Plesk, P., (2002) A Complexity Science Primer. Retrieved June 30, 2007 from: http://www.pms.ac.uk/healthcomplexity/files/Primer%20on%20Complexity.doc

About the Author

George Siemens is an Associate Director with the Learning Technologies Centre at University of Manitoba and author of *Knowing Knowledge*, an exploration of how the context and characteristics of knowledge have changed, and what it means to organizations today. George is also Founder and President of Complexive Systems Inc., a learning lab focused on assisting organizations develop integrated learning structures to meet the needs of global strategy execution. [e-mail: george_siemens@umanitoba.ca]