



INNOVATION ABSTRACTS

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REPOSE-ABILITY: EDUCATION IN A GLOBAL ECONOMY

In the early part of this century, the scientific community was in turmoil: Einstein's Theory of Relativity overturned the canon of absolute time, and Quantum Physics revealed a world unexplained by Newtonian Mechanics. The mechanistic viewpoint saw the world as objects, but the quantum world as relationships.

The emerging global economy is being shaped by the fluid transfer of capital, through the complex dynamic *structure* of information interchange on the Internet. Structures of this nature often fluctuate and self-organize; new systems may change suddenly with little warning. Effective transition management will depend upon our capacity to make ethical judgements regarding *economics, ecology, technology, and social consciousness*, with the understanding that changing one initiates a response in the others. Underlying this new reality is the symbiosis between information and communication that requires us to learn more, comprehend faster, and be creative: the question is *how*.

Our educational system is modeled on the legacy of the Tyler Rationale—i.e., reducing complex curricula to the teaching/learning of the smallest segments, on the premise that collectively they describe the *whole*. This format has severe limitations; the world is not divided into segments, and we need to understand the implications of complexity and interconnectedness.

Learning Thresholds

Understanding complex relationships, even in a rudimentary way, requires the development of transformational learning patterns associated with creativity and critical self-reflection. Principally, there are five learning thresholds:

- Rote learning
- Recursive learning
- Contextual transformative learning
- Paradigmatic transformative learning
- Transcendence-integrative development

Rote learning is learning in a repetitive manner. Recursive learning, also a repetitive process, involves a trial and correction procedure. Contextual transformative learning occurs when an event causes a re-evaluation of meaning constructs: we see things in new ways. Paradigmatic transformative learning is the result of questioning our world perspective. Transcendence-integrative development helps us see ourselves as one with the world.

Reflections

As a society we are conditioned to believe that we learn from the *bottom up*: simulating a manufacturing procedure where components are produced and assembled, as in the case of an automobile. Manufactured parts in themselves provide little information as to their function or origins. Reflecting on my learning patterns revealed them to be *top down*: i.e., formulating meaning from the context derived from a *big picture* concept. For example, the interconnectedness of our planet's ecosystem does not require an intimate knowledge of the details; we need to have an idea how interdependent systems influence each other.

Reflecting further on my educational experience and teaching practice as an educator in a technical program, I began seeking answers to these questions: a) Why is the comprehension of relatively simple concepts so difficult for many adults? b) What is it like being an adult learner and having me as an instructor? My thoughts were as follows:

- The social and physical space affects the dynamics of the learning environment: learning may be either enhanced or inhibited—e.g., a person (instructor or learner) who avoids active involvement within the class is unlikely to perform well.
 - Abstract course material is difficult to correlate with lived experience.
 - Attempting to understand complex processes by first studying the parts presents a contextual difficulty for most learners.
 - Exercises and labs with boundary conditions to provide specific outcomes promotes rote learning of



methodologies and instructor dependency, to the detriment of learning proficiency.

• Assessment of academic performance is generally based on the elementary patterns of rote and recursive learning. Uncertainty about grading arises from the ambiguity of what is actually measured: academic capability or procedural compliance?

Response-ability

Critically reflecting on how to encourage transformative learning in adults completely changed my teaching/learning perspective. The breakthrough happened when I acknowledged that the only reality is one of relationships; curriculum is the holistic and dynamic translation of knowledge, information, and experience to which we all contribute and in which we all share. Committing myself to a totally new way of teaching/learning was challenging and has created the following principles.

- The interrelationship between instructor and learner creates the learning environment. Classes in which there is enthusiasm for learning are invariably integrated; those where apathy prevails are fragmented, and learning becomes inhibited. An instructor's response is to encourage enthusiasm for learning by example.
- Holistic teaching/learning demand big-picture constructs. A big-picture construct is an energy conversion cycle that reduces complex molecules to simple molecules with environmental consequences—e.g., the automobile and pollution. Studying the relationships within the cycle encompasses the analytical details; the external relationships are the effects on the environment and the repercussions. As course curriculum becomes more complex, context facilitates understanding and experience determines relevance. These functions are essential for constructing meaning and providing impetus for increased learning proficiency.
- Big-picture constructs initially are kept relatively simple to assist learners in seeing the relationships between the parts and their contributions to the cycle; it is also an opportunity to develop an analytical methodology. As the complexity of the cycles increases, the greater the variation in solutions; and learners must adapt their analyses to suit each situation.
- Classes are not lectures but interactive opportunities for exploration, and in-class exercises frequently follow a design procedure to allow learners freedom for creativity. Labs are kept as simple as possible, enabling learners to develop concepts through their initiative and reflection. Learning becomes *personal-*

ized and not a repetition of information presented by the instructor.

- Technical programs should include courses in ethics, business, and environmental biology; and the interconnection between program courses should be clear.

Assessment

Final exams are a continuum of course curriculum and often take the form of a design-activity; the methodology employed must be adapted to suit the given situation. Exams are multilayered to provide conscientious learners the opportunity to obtain a passing grade; a high grade requires a complete resolution of a big-picture construct through a creative process. This is a more reliable method of assessment. Exam marks and course grades have increased to well above average despite the increased complexity of the course curriculum.

Learner and Teacher Perspectives

Most learners enjoy holistic teaching/learning; it gives them a sense of *real-world* applications. They like the interactive classes and the big-picture constructs even though they make for challenging exams.

Interesting outcomes of my new teaching style include: (a) big-picture constructs required a significant increase in course content, and (b) overall class grades increased to well above average.

Context and relevance are crucial for constructing meaning; the result is that students learn more and comprehend faster within a given time frame. Exploring the relationships of complex systems, even in a rudimentary way, provides learners with an understanding of interconnectedness. Seeing things in new ways, apart from being innovative, encourages development of transformative learning patterns that are essential for effective transition management in the emerging global economy.

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