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TITLE:
EDUCATION DESIGN – WHAT IT TAKES TO REALLY UNDERSTAND WHAT WE ARE DESIGNING FOR IN A CLASSROOM SETTING. AN EVIDENCE-BASED APPROACH

PAPER:
As a result of this presentation, attendees will…

- Become aware of the theories of learning, cognitive ecology, and pedagogical modalities affecting learning environments;
- Understand the challenges of building for student/faculty interactions in a more decentralized setting; and
- Recognize how evidence-based design research supports better design solutions.

The learning environment, if designed well, addresses a complexity and a multifaceted situation. This complex "ecosystem" relates to three main components – pedagogy [using appropriate learning theories supporting all learning preferences], technology, and space. In an effort to help the designer understand this phenomenon, we'll look at each component in some detail to provide a more holistic understanding of why designing from the inside out is necessary to create truly effective learning settings. The time where "there is no budget left for furnishings" should be over; this type of situation means our priorities are not focused on where actual learning occurs – in the learning environment

Understanding the educator's perspective:
Generating an awareness regarding pedagogy allows the designer to appreciate why intentionally designing the learning space is imperative. Pedagogy, or teaching methods, builds curriculum and individual course content aligned with learning theories and preferences built from the sciences of cognitive ecology, cognitive science, and learning domains, thus ensuring that the level of learning is matched with student performance outcomes. Theories about learning come from scientists focused on understanding how the brain works and how people learn, and for the purposes of this paper, the theories that provides models for learning for educational research and practice. We'll discuss these next in brief summaries one by one.

Predominatelearning theory paradigmsinclude behaviorism, cognitivism, humanism, and constructivism:[1]
"1) Behaviorism

- Founders and proponents: John B. Watson in the early 20th century. B.F. Skinner, Ivan Pavlov, and others.

[1] Staff, Theories and models of learning for educational research and practice. Retrieved May 13, 2011, from: http://www.learning-theories.com/paradigms

- Basic idea: Stimulus-response. All behavior caused by external stimuli (operant conditioning). All behavior can be explained without the need to consider internal mental states or consciousness.
- Learner viewed as: Passive, responds to environmental stimuli.
- Behavior may result in reinforcement (increased likelihood that behavior will occur in the future); or punishment.

2) Cognitivism

- Founders and proponents: Replaced behaviorism in 1960s as dominant paradigm. Noam Chomsky.
- Basic idea: Mental function can be understood
- Learner viewed as: Information processor
- Cognitivism focuses on inner mental activities — opening the "black box" of the human mind. It is necessary to determine how processes such as thinking, memory, knowing, and problem-solving occur. People are not "programmed animals" that merely respond to environmental stimuli; people are rational beings whose action are a consequence of thinking.
- Metaphor of mind as computer: information comes in, is being processed, and leads to certain outcomes.

3) Humanism

- Founders and proponents: Abraham Maslow, Carl Rogers, others. [1960's]
- Basic idea: Learning is a personal act to fulfill one's potential.
- Learner viewed as: One with affective and cognitive needs.
- Emphasis on the freedom, dignity, and potential of humans.
- Learning is student-centered and personal, facilitated by teachers, with the goal of developing self-actualized people in a cooperative, supportive environment.

4) Constructivism

- Founders and proponents: John Dewey, Jean Piaget, Jerome Bruner, Lev Vygotsky, others. The dominate paradigm in use today.
- Basic idea: Learning is an active, constructive process.
- Learner viewed as: Information constructor.
- People actively construct or create their own subjective representations of objective reality
- New information is linked to prior knowledge, thus mental representations are subjective."

Look at the information about the learning, as highlighted in yellow, as described by each paradigm. Learner viewed as: Passive, responds to environmental stimuli; translation: row-by-column seating – passive learning;Learner viewed as: Information processor; row-by-column seating – passive learning; Learner viewed as: One with affective and cognitive needs; interactive layout – active learning environment; and Learner viewed as: Information constructor; interactive layout - active learning environment. Can you see the relationship between the design of the physical environment and the way the paradigm suggests we learn? Maybe there is a correlation. Now, think about the fact that educators also have to incorporate the knowledge regarding our learning styles/preferences in order to reach all learners and the way he/she learns.

"There are three basic types of learning styles. The three most common are visual, auditory, and kinesthetic. [VAK] To learn, we depend on our senses to process the information around us. Most people tend to use one of their senses more than the others."[2] The issue here is most of us have no idea how we learn best, and the educator won't either; AND research suggests we all need to use all of our senses in order to own information. Therefore, educators have to build into each part of the day exercises that consciously and intentionally reach all learning preferences.[3] Why is this important information for designers to understand? Most learning environments have been designed to support the most passive of the three VAKs, the visual and auditory senses. However, the

[2] Staff. Retrieved May 13, 2011, from: http://people.usd.edu/~bwjames/tut/learning-style/
[3] Staff. Retrieved May 13, 2011, from: http://people.usd.edu/~bwjames/tut/learning-style/

kinesthetic preference uses all of the rest of our senses and movement – small and large motor motions. How many times have you seen students trying to move in a row-by-column setting? Right! They cannot! So, the bottom line here is constructivist theory suggests that we must "build our knowledge" translating that literally into a learning setting means we must design for movement; passive learning is sitting and listening, **active learning is moving and doing**.

Add to that complexity by introducing information about the science of cognitive ecology. Healy and Braithwaite [4] define cognitive ecology as, "a work that attempts to integrate functional explanations of behavior, such as those provided by behavioral ecology, with an understanding of the underlying psychological and neural mechanisms." Hutchins[5] argues that, "Cognitive ecology is the study of cognitive phenomena in context. In particular, it points to the web of mutual dependence among the elements of a cognitive ecosystem…As cognitive theory continues to shift from units of analysis defined by inherent properties of the elements to units defined in terms of dynamic patterns of correlation across elements, the study of cognitive ecosystems will become an increasingly important part of cognitive science." Cognitive science tries to understand how the brain processes information and many disciplines work on deciphering this complex system simultaneously as well as in multi-disciplinary teams. The term, cognitive science, "spans many levels of analysis, from low-level learning and decision mechanisms to high-level logic and planning; from neural circuitry to modular brain organization."[6]Science teaches us how the brain works, how we cognitively process information, and then educators must figure out how to match how we learn, with the different levels of cognitive processing – levels of learning. "Benjamin Bloom in 1956 identified three domains of educational activities: (1) **cognitive**: mental skills (*knowledge*), (2) **affective**: growth in feelings or emotional areas (*attitude*), and (3) **psychomotor:** manual or physical skills (*skills*)."[7]

It takes work on the part of the educator to develop meaningful course material, follow the prescribed curriculum's expectations and student outcome measures, while imbedding all of the scientific evidence we have to date relative to how we learn and what level of educational activities must be present. It takes work being a student. Participation is the key. Total immersion in the learning process is necessary. One of this paper's goals is to help designers understand this complexity in an effort to make them supporters of the changes that must happen in our classrooms in order for real learning and knowledge retention to take place; how not to make the environment the barrier.

Using intentional design methods eliminatesthe physical environment's barriers

Design enables or disables. And certainly our education system is fraught with sets of wicked problems as noted by picking up any newspaper on any given day. One place design can help, in fact must help, is inside "the box"; the learning space. The physical space of the learning environment should stop being the barrier to learning. Today more than ever before it is not OK to design a wonderful building that is so wonderful it goes over budget and leaves teachers and students with folding chairs/camp stools/picnic tables, etc. to get the work done called teaching. Or from the get go the design costs have not built in furnishings which include items such as technology, seating, tables, white/black boards, etc.

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[44]Healy, S. & Barithwaite, V. (January 2000). Cognitive ecology: a field of substance? Retrieved May 13, 2011, from: http://docs.google.com/viewer?a=v&q=cache:ob1o1SG3MkJ:cognition.icapb.ed.ac.uk/resources/pdf/Healy00.pdf+cognitive+ecology&hl=en&gl=us&pid=bl&srcid=ADGEESgmoMsyTBQCi0TGHUghBdEYLBNX0SkTDXbriCtquU9Qb1KglMYgT_ZKL9f7MmBBZChSFW_rYc4V1BmmCvLWzwoCCPuy7eVc2MoQJ0Kd02y-942wYxXITWUWQkyKt08ir24Wgppk&sig=AHIEtbTW2lamPKjf6Ro7eRXFf93P6qzK9Q; TREE vol. 15, no. 1.

[5] Hutchins, E. Retrieved April 15, 2011, from: http://onlinelibrary.wiley.com/doi/10.1111/j.1756-8765.2010.01089.x/abstract

[6] Staff Retrieved May 14, 2011, from : http://en.wikipedia.org/wiki/Cognitive_science

[7] Staff, (1999). Retrieved May 14, 2011, from: http://www.nwlink.com/~donclark/hrd/bloom.html

In North America, we are all steeped in the knowledge of what is expected of us in a row-by-column, passive learning setting. We open the door and our enculturated behaviors kick in. For a teacher it means to stand and deliver, for a student it means to sit and listen. Centuries of conditioning (behaviorism) have led us here. In fact, we stopped using the classroom years ago when interactive, or team work was required. Over the years we have compensated the lack of utility in the classroom's real estate and merged into the in-between spaces, informal spaces, and corridor niches to accomplish the new need for active learning.

To step out of the design of the passive learning mold means to dismantle the physicality of the space. Currently, approximately ¼ to 1/3 of a passive environment is given to the teacher, one person. The rest of the space crams in all of the students, many numbers of people. It costs more to move to an active learning environment. What are some of the factors? These factors may include, but are not limited to the need for:

- Including more intense and interactive technology – for co-creation, co-presentation, illustrating what others are doing, and seeing what the faculty member is sharing;
- Redistributing the faculty member's "stage's" real estate to create multiple stages for people to get up, move around, share resources, and present to others;
- Generating "no bad seat in the house" – a continuous view plane between others and for viewing technology. What I call eye-to-eye and yet-to-others[8];
- Allowing for more square feet per person – it takes more to enable movement;
- Designing from the inside out – down to the budgeted specifications for the learning space, keeping that budget "safe" and then building the architecture around it, and in support of the fundamental need for an educational building – to teach and to learn.
- Working with academic administrators and education systems to help them recognize that the requirement for density, a perpetuation of the industrial age, itself can become a barrier for the support of active learning.

Interaction creates challenges. It means connecting with others and in a classroom that often means the need to physically move. As mentioned earlier it costs more to be active than passive. People will need to move. The costs implications may include more square feet per person, more integrated technologies, more seating that swivels [to help facilitate eye-to-eye and eye-to-others, and individual motor movements] as well as more apparatuses for viewing and connecting, more professional development for faculty members to "work" in these new situations.

Conclusion

This presentation has shared some evidence-based information in an effort to provide a baseline awareness of the complexities of teaching and learning, the impact of a passive learning culture, and the impact the design of the box has on active learning strategies. It is hoped that designers have learned that in order to design a successful learning environment means designers should understand what it takes to teach and become aware of the scientific evidence educators employ in order to deliver and share knowledge.

[8] Scott-Webber, L. (2004). *Insync: Environment behavior theories and the design of learning spaces.* MI: The Society for College and University Planning.