

# **THE KNOWLEDGE DEVELOPMENT MODEL: RESPONDING TO THE CHANGING LANDSCAPE OF LEARNING IN VIRTUAL ENVIRONMENTS**

Nan B. Adams

*Southeastern Louisiana University, United States*

## **ABSTRACT**

Society's relationship to knowledge and what is considered to be factual is changing. Effective teaching models focused on leveraging strategic control of the knowledge from teachers to learners in virtual learning environments are critical to insuring a positive path is charted. The Knowledge Development Model serves as the guide for determining how to move learners through stages of knowledge acquisition to knowledge application and ultimately to knowledge generation in virtual settings. Instructional strategies for fostering student engagement in a virtual learning environment are identified as critical, and a number of relevant theories focusing on student learning, affect, needs and adult concerns are presented to provide a basis for transfer of knowledge from teacher to learner. The validated (2009, Adams, DeVaney & Sawyer) Knowledge Development Model combines the dimensions of knowledge approach, knowledge authority and teaching approach to demonstrate the recursive and scaffolded design for creation of virtual learning environments.

## **KEYWORDS**

Learning theory; social aspects of technological change

## **1. INTRODUCTION**

The landscape of learning and knowledge is changing – rapidly, and in fits and starts. Knowledge and facts are being challenged in incredible ways. Adult learning is increasingly taking place virtually. Responsive design of virtual learning environments to address these changes offer challenges and opportunities for innovative teaching and enhancement of learning. In a previous discussion, Adams, DeVaney and Longstreet (2010) provided evidence for a change in the way people identify themselves in relation to groups, coining the term 'Digital Ethnicity'. Ethnicity has morphed in the age of digital technologies. Aspects of ethnicity that include Social Value Patterns, Orientation Mode, Intellectual Mode and Communication Mode (verbal, nonverbal and digital) have been identified that indicate a unique and Digital Ethnicity has emerged (Adams, DeVaney and Longstreet, 2013, 2010). This ongoing line of reasoning that seeks to describe changes in intelligence and intellectual style and the resultant needs for educational practices was started by Adams (2004) with her discussion of Digital Intelligence. The Knowledge Development Model for virtual learning environments presented here was designed to address these new ethnic, intellectual and communication styles. Validity for this model was established in 2009 (Adams, DeVaney, Sawyer). The theoretical design and practical use for this model is presented to demonstrate additional evidence and need for responsive virtual learning environments that utilize a valid framework for educational design and practice in virtual environments.

## **2. BODY OF PAPER**

### **2.1 Learning Theory must drive Virtual Learning Environments**

Strategies to foster transfer of knowledge generation dispositions from teacher to learner should be central to the design of virtual learning environments. Implicit in this process is the facility for transitioning newly acquired knowledge to become internalized knowledge for learners so they may address specific problems they encounter, which is often the ultimate goal of organized educational programs. In this facilitated-learning paradigm, gradual release of responsibility for the learning shifts, over time, from the teacher or facilitator to the learner. During this process, the learner ultimately develops strategic control of the knowledge as should be evidenced through social interaction within the virtual environment.

In traditional classrooms and educational activities, the teacher is central to the learning process. The teacher serves variously as guide, facilitator, motivator, and often as the authority for knowledge structure and student behavior when engaged in the learning process. This role changes in the virtual environment – where students often engage without observation or direct guidance from the teacher. The creator of a virtual learning environment must make certain assumptions. These assumptions are not small, but deal with the very nature of knowledge and knowing. These assumptions must be acknowledged and employed to guide the construction of virtual learning environments.

The theoretical conflict in construction of virtual learning environments often lies in the basic belief about what is considered knowledge, the structure of that knowledge, and what knowledge should be valued or championed. This may be illustrated by a brief discussion of the modern and postmodern views about reality and knowledge. Modernists believe that reality exists objectively and generally believe that knowledge has a definable structure. They believe it is the charge of the teacher to either lead or facilitate inquiry for students to discover this pre-existing structure and incorporate it into their own knowledge base to solve problems in a way that demonstrates their systematic understanding of a body of knowledge. Postmodernists believe that reality is a human creation that is socially constructed. The postmodern view that reality changes – and is constructed differently by each individual necessitates less structured, more individually-oriented learning environments that provide student choice and serve to rely on the strategy of gradually allowing the learner to explore existing knowledge structures as they create their own knowledge structures. The focus is on the learner ultimately generating his or her personal knowledge from existing knowledge and information they encounter. Context often provides the social element for construction.

Virtual environments exemplify postmodern belief. This highly changeable and infinitely responsive environment is wholly constructed by the mind of the author and then reconstructed by the mind of the visitor/learner. The notion that rigid structure should be applied in this environment is unrealistic. It is of great concern to the author that these virtual learning environments seek to develop whole, rather than partial constructions of reality, knowledge and knowing.

Modernist approaches to teaching and learning often utilize behavioral learning and instructional practices. Post-modern approaches to teaching and learning utilize constructivist teaching practices. These two major and somewhat opposing cognitive approaches to teaching currently guide educational practice, both in classrooms and in virtual learning environments. The proliferation of standardized testing has added to this problem – promoting the more behavioral approach to teaching and learning by requiring assessment in a totally objective ‘only one answer’ format. Arguably, we live in a post-modern world.

Programmed Instruction, the behavioral approach to teaching assumes teachable knowledge has a given structure and it is the task of the teacher to develop within the learner an understanding of this structure and an ability to utilize this knowledge to solve problems. The constructivist teaching approach assumes that knowledge is constructed and therefore the student must develop their own knowledge structure based on personal experience and through discovery and experimentation with the information that exists that surrounds this area of knowledge. Said plainly, behaviorism assumes a linear learning process that may be described as the learn/test cycle demonstrated by the prevalence of standardized tests with only one ‘correct’ answer and assumes ‘mastery’ when this one correct answer is given by the student.

Constructivism assumes a recursive learning process that allows the learner to develop and understanding of knowledge structures with the goal of gaining and strategic control of the knowledge to address contextual problems by applying acquired knowledge. Constructivism views knowledge as a product of reality. Constructivists consider learning to be an active process where knowledge is contextualized rather than

acquired. Personal experiences guide the construction of knowledge. Learners continuously test their knowledge construction through social negotiation. The learner is not a blank slate (*tabula rasa*) but brings past experiences and cultural factors to a situation. The Knowledge Development Model for virtual learning environments melds the two approaches and suggests that the learning process requires BOTH to be comprise effective teaching design.

## 2.2 Foundational Theories for the Knowledge Development Model for Virtual Environments

Vygotsky (1978) proposed that social interaction profoundly influences cognitive development. His theory centers on the belief that biological and cultural development do not occur in isolation. He believed that the development process that begins at birth and continues until death is too complex to be defined by stages. His work describes a phenomena he termed the Zone of Proximal Development which is defined as the distance between the actual knowledge level as determined by independent problem solving and the level of potential development as determined through problem solving in collaboration with more capable peers. A central concept in Vygotsky's theory is the Zone of Proximal Development (ZPD), which may be explained as zone of potential for cognitive development that limited to a certain time span. He defines the ZPD as having four learning stages. These stages range between the lower limit of what the student knows and the upper limits of what the student has the potential of accomplishing. The 4 stages may be further divided as (p.35) Stage 1 – assistance provided by more capable others (experts or teachers); Stage 2 – assistance by self; Stage 3 – internalization; Stage 4 – recursiveness through prior stages. Vygotsky's theory promotes contexts in which students play an active role in learning. Roles of the teacher and student are therefore shifted, as a teacher should collaborate with students in order to help facilitate meaning construction. Learning becomes a reciprocal experience for the student and teacher. The transfer of knowledge from facilitator to learner in knowledge development occurs through the gradual release of responsibility from the inter-psychological plane of teacher and student to ultimately the intra-psychological plane of self. Students ultimately become 'owners' of their knowledge because they are highly participant in its construction.

Bruner (1996) proposed Discovery Learning Theory as a constructivist learning theory based in personal inquiry. Bruner describes learning as an active process in which learners construct new ideas or concepts based upon their current/past knowledge. Knowledge structures are used to provide meaning and organization to experiences and are intended to allow the learner to go beyond the information given. Bruner suggests the instructor should encourage students to construct hypotheses, makes decisions, and discover principles by themselves, in effect they should present information in such a way that students may build new knowledge on existing knowledge to facilitate a recursive learning process. It is assumed that students may be more likely to remember concepts and knowledge discovered on their own. This approach assumes that if learning activities foster student ownership of the knowledge, this knowledge will be meaningful to the learner. Bruner's constructivist theory may be applied to instructional practice, as Kearsley (1994) surmises, by applying the following principles: 1 - Instruction must be concerned with the experiences and contexts that make the student willing and able to learn (*readiness*), 2- Instruction must be structured such that it may be easily grasped by the student (*spiral organization*). 3 - Construction should be designed to facilitate extrapolation and or fill in the gaps (*going beyond the information given*).

Bloom's taxonomy is widely accepted and universally employed when developing instructional materials. Because this inquiry seeks to describe strategies for internalizing knowledge through ownership, Bloom's Affective Domain is considered for use within this model rather than the more commonly used Cognitive Domain Taxonomy. The Affective Domain Taxonomy is concerned with perception of value issues and ranges from mere awareness (receiving), through to being able to distinguish implicit values through analysis (1973). The model includes the following levels of affect, from least engaged to most engaged and include 1 - **Receiving Phenomena**: Learners are aware, willing to hear and receiving information; 2 - **Responding to Phenomena**: Learners are active participants with engaged responses that reflect personal motivation; 3 - **Valuing**: Learners begin to attach value or worth to a particular object, phenomenon, or behavior. This worth ranges from simple acceptance to the more complex state of commitment; 4 - **Organization**: The learner contrasts different values, resolving conflicts between them, and creating a unique and organized value system; 5 -**Internalizing values**: The learner possesses a value system that controls their behavior. The behavior is pervasive, consistent, predictable and characteristic of the learner.

Maslow (1954) sought to address the complexity of human behavior and presented the idea that human actions are directed toward goal attainment. He proposed that any given behavior could satisfy several functions at the same time; for instance, going to a bar could satisfy one's needs for self-esteem and for social interaction. Maslow's Hierarchy of Needs has often been represented in a hierarchical pyramid with five levels. The four levels (lower-order needs) are considered *physiological needs*, while the top level is considered *growth needs*. The lower level needs need to be satisfied before higher-order needs can influence behavior. The levels include **Self-actualization** - morality, creativity, problem solving, etc; **Esteem** - includes confidence, self-esteem, achievement, respect, etc.; **Belongingness** - includes love, friendship, intimacy, family, etc.; **Safety** - includes security of environment, employment, resources, health, property, etc.; **Physiological** - includes air, food, water, sex, sleep, other factors towards homeostasis, etc. A virtual environment focused on learning takes on the same characteristics as the physical environments we currently inhabit, one might consider that the complexities of human behavior continue to exist in virtual classrooms and should be addressed.

Kolb (1984) provides a descriptive model of the adult learning process. His model considers learning to be a recursive process that includes 4 progressive stages: *Concrete Experience* is followed by *Reflection* on that experience on a personal basis. This may then be followed by the derivation of general rules describing the experience, or the application of known theories to it (*Abstract Conceptualization*), and hence to the construction of ways of modifying the next occurrence of the experience (*Active Experimentation*), leading in turn to the next *Concrete Experience*. All this may happen instantaneously or over varied periods of time, depending on the topic. There may also be smaller recursion cycles of this process simultaneously.

Adopting change may be considered a learning process. Suggesting that a group should adopt or 'buy in' to a new way of thinking is surely an educational process. The Concerns Based Adoption Model (Hall, George & Rutherford, 1979) is included in this discussion because it focuses directly on the concerns of the individual who is in the process of adopting a new way of thinking or doing things. These concerns may pose barriers to accepting new information and therefore should be addressed when developing virtual learning environments for adults. This model includes identification of 4 general types of concerns that stretch across 7 stages of development that represent a cycle of student concerns about adopting new ideas or knowledge to include **Unrelated Concerns** are characterized by a lack of Awareness and need for Information. **Self Concerns** are characterized by need for personal context. **Task Concerns** are focused on learning to manage the new knowledge and **Impact Concerns** include consideration of the consequences of using this new knowledge, collaboration with others using this new knowledge and a refocusing to allow new uses for the newly incorporated knowledge.

The figure below (Figure 1.) has been developed to visually represent the contributing theories of learning. As the recursive nature of each theory demonstrates - learning theories, affective and need theories and adult learning theories are effectively attempting to accomplish the same task of fostering ownership for knowledge among learners. The graphical demonstration of shared purpose has been included to support those dimensions proposed in the Knowledge Development Model for virtual environments which include the learner's developing knowledge approach, the teacher-student relationship with regards to knowledge authority, and suggested teaching approaches for virtual learning environments.

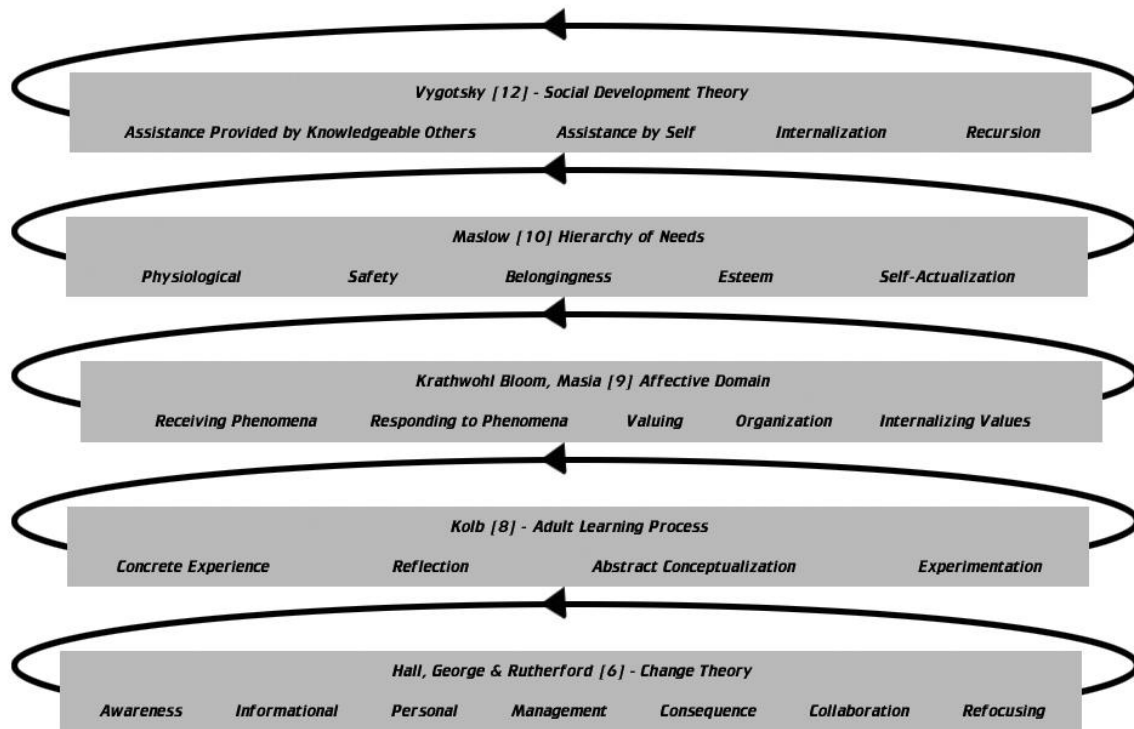


Figure 1. Contributing Recursive Developmental Learning Models

### 2.3 The Knowledge Development Model – a Recursive Model for Both Virtual and Physical Learning Environments

Most electronic learning environments seek to replicate existing traditional classroom teaching and learning practice. In this environment you will find word intensive pages that are intended for students to read and be expected to ‘know’ for a later demonstration. While these learning sites may be easy to construct, they are hardly virtual environments that create a variety of learning opportunities to foster knowledge development. Their focus is Knowledge Acquisition and they imply that knowledge authority is possessed by the teacher or site creator and are not particularly open to student manipulation.

As a virtual learning environment is developed the teacher or developer of the environment must consider the overall goals for student learning and within each of these goals determine the knowledge acquisition concerns, the knowledge application activities and determine how to foster knowledge generation through the discovery process. Using the Knowledge Development Model for Virtual Learning Environments, the following strategies are suggested for each of the proposed knowledge approaches.

After review of selected learning theories and their resultant models, the Knowledge Development Model was developed. The KDM is a derivative meta-model that seeks to address the domains of affect and need while employing discovery learning and scaffolding for recursive learning while recognizing the concerns of adult learners. This model deals with a description of three interrelated dimensions: the learner’s developing knowledge approach, the teacher-student relationship with regards to knowledge authority, and suggested teaching approaches. It is assumed that each of these dimensions are cyclical and recursive and that this process may have several different instances occurring simultaneously.

### **2.3.1 Knowledge Authority – Leveraging the Teacher-Student Relationship**

Vygotsky (1978) discusses the gradual release of knowledge from teacher or knowledgeable other to student or learner. Uniquely in the online environment, students are initially invested with the authority to move freely throughout the virtual environment. This may be controlled by timed offering of certain material and certain activities much as it is controlled by class meetings in the physical environment. It is suggested that much as students are provided the entire textbook in a face to face environment, virtual environments should be presented in their entirety (as a whole learning experience rather than disjointed parts) with the gradual release of knowledge authority from teacher to student demonstrated by the course organization. This provides a whole rather than partial view of the virtual reality construction of the knowledge to be explored. This also allows students to continually view the entire construction of the knowledge as they set about exploring the dimensions that make up this full construction.

### **2.3.2 Teaching Approach – Strategies for Learning**

Teaching approaches range from the most behavioral strategy of drill and practice, through programmed instruction to constructivist strategies that include discovery learning and scaffolded learning activities. This model suggests that all of these techniques are useful in the virtual learning environment. A natural use of these strategies might begin with more behavioral strategies to convey basic terminology and other supporting skills and progress to constructivist teaching approaches to foster the Knowledge Application and Knowledge Generation goals of this model. Scaffolding of learning activities to continually expand the student Zone of Proximal Development (Vygotsky, 1978) should be a central focus for continued knowledge transfer and generation. For when new knowledge is being generated, student ownership of knowledge is central to this new construction of knowledge to solve new problems.

### **2.3.3 Knowledge Approach – Outcomes for Learning**

**Knowledge Acquisition.** If the goal for a certain learning activity is to foster knowledge acquisition, drill and practice and programmed instruction segments that provide supporting terminology and initial concepts to be used as building blocks for more sophisticated learning activities should be considered. Discovery learning may also be employed as the context and various PI modules may be supplied to inform this discovery process. Tutorials, informational web pages and databases to support student knowledge acquisition are useful tools for this phase of student learning.

**Knowledge Application.** Discovery learning may also serve as the context for knowledge application. Traditionally, knowledge application tasks include laboratory work, writing, preparing presentations and other activities that require the student to construct acquired knowledge to solve existing problems that have somewhat predictable outcomes. Collaboration among students often reinforces this process. The design of presentations or web pages that demonstrate a construction and application of the knowledge under investigation are appropriate virtual learning tools. These student products may be included for review as part of the virtual environment and serve to develop student ownership of course content, which is critical to fostering knowledge generation among students. The posted presentations demonstrate their knowledge and investment in the learning activities and ultimately their ownership of the knowledge. These constructions also allow the teacher to uncover common misconceptions about the knowledge base and facilitate discussion about these misconceptions to increase knowledge. Collaborative environments such as chat, threaded discussion boards, instant messaging and other collaborative tools are useful.

**Knowledge Generation.** A different level of discovery learning may be employed for fostering knowledge generation. Student ownership of this process is critical. Student brainstorming of problems to be solved creates the context for this ownership. Collaboration is critical among students and between students and faculty. Private discussion forums that foster risk taking may aid this process. As with knowledge application, collaborative environments such as chat, threaded discussion boards, instant messaging and other collaborative tools are useful. The design of presentations or web pages that demonstrate new construction and application of the knowledge under investigation are appropriate virtual learning tools. These student products should be provided space for private development either by singular students in collaboration with faculty or within student groups with faculty collaboration. The final projects should be included as part of the virtual environment and may be the capstone discussion activity of the learning cycle. These projects may easily reveal new areas of knowledge for exploration and may serve as the catalyst for another recursive learning cycle.

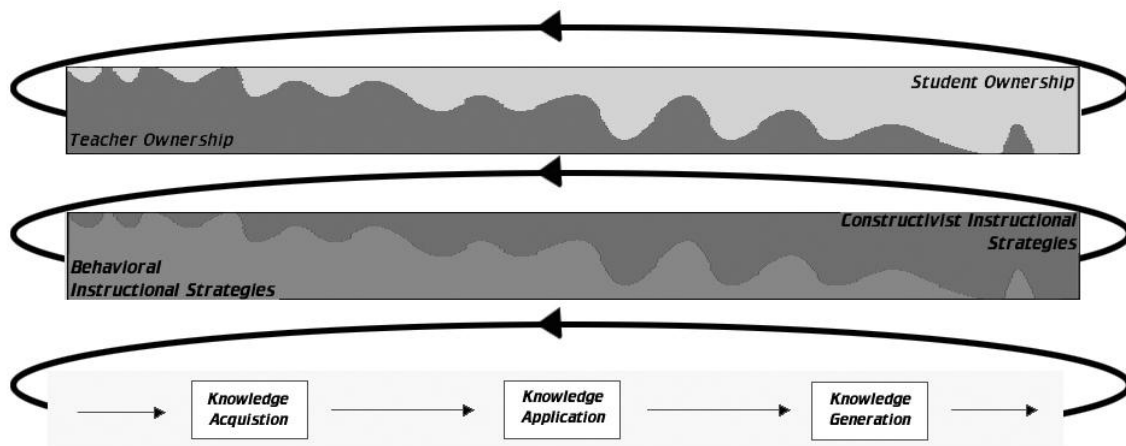


Figure 2. Knowledge Development Model in Virtual Environments

The model above (Figure 2.) combines the dimensions of Knowledge Approach, the teacher-student relationship with regards to Knowledge Authority and Teaching Approach to demonstrate the recursive and scaffolded design for creation of virtual learning environments. At this time, the author would like to offer a practical observation. In the context of course progression found in most learning institutions, these progressive knowledge approaches may occur repeatedly during one course or learning unit, or may stretch across two or more learning units or courses. The *focus* is to insure that all levels of knowledge engagement should be considered when creating *complete* knowledge transfer and foster ownership.

### 3. CONCLUSION

The social aspects of technological change greatly influence intellectual style and learning. Regardless of the modern or postmodern view held by the teacher and the learner and the assumptions about knowledge structure each reflects, student engagement is central to the learning process. The instructional strategies for fostering internalization and utilization of knowledge in a virtual environment are critical to the learner's strategic use of the knowledge. The instructional design to facilitate the transfer of knowledge so that it is strategically and gradually released to become internalized knowledge often occurs in the interactions between the facilitator of learning and the learner. The notion of scaffolded instructional strategies to support the transfer of knowledge is paramount to the goal of knowledge development and ultimately knowledge generation. Educational theory that has been accepted for traditional learning environments provides direct guidance as we seek to construct rich virtual learning environments that create whole learning experiences. Thus, instructional strategies and fertile learning environments that address the entire range of student learning likes, needs and concerns must be designed. The Knowledge Development Model for design of virtual learning environments was developed utilizing recursive learning theories that suggest targeted teaching strategies to yield learners with strategic control of knowledge.

### REFERENCES

- Adams, N. B. (2004) Digital intelligence fostered by technology. *The Journal of Technology Studies*, 30(2).
- Adams, N.B., DeVaney, T.A., (2013) Aspects of an Emerging Digital Ethnicity. *Book Chapter*. Research Highlights in Technology and Teacher Education 2013. Society for Information Technology and Teacher Education.
- Adams, N.B., DeVaney, T.A., (2011) Digital Ethnicity: Discussion of a Concept and Implications for Education. *Book Chapter*. e-Learning and e-Education.
- Adams, N.B., DeVaney, T.A., Longstreet, W.S. (2010) Investigating aspects of an emerging digital ethnicity: Development of the Digital Ethnicity Scale, *Computers and Human Behavior*, 26 (2010) 1822–1830.

- Adams, N.B., DeVaney, T.A. & Sawyer, S.G., (2009) Measuring Conditions Conducive to Knowledge Development in Virtual Learning Environments: Initial Development of a Model-Based Survey. *Journal of Technology, Learning and Assessment*, 8(1).
- Bloom, B. S. (1956). *Taxonomy of educational objectives, Handbook 1: The Cognitive Domain*. New York: David McKay Co., Inc.
- Bruner, J. (1966). *Toward a theory of instruction*. Cambridge, MA: Harvard University Press.
- Hall, G. E., George, A., & Rutherford, W. L. (1979) *Measuring stages of concern about the innovation: A manual for use of the SoC Questionnaire (Report No. 3032)*. Austin: University of Texas at Austin, Research and Development Center for Teacher Education. (ERIC Document Reproduction Service No. ED 147 342)
- Kearsley, G. (1994). *Constructivist theory (J. Bruner)*. [Online]. Available: <http://www.gwu.edu/~tip/bruner.html> [May 30, 2007].
- Kolb, D. A. (1984) *Experiential Learning: Experience as the source of learning and development* New Jersey: Prentice-Hall.
- Krathwohl, D. R., Bloom, B. S., Masia, B. B. (1973). *Taxonomy of educational objectives, The classification of educational goals. Handbook II: The affective domain*. New York: David McKay Co.
- Maslow, A. (1954). *Motivation and personality*. New York: Harper.
- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.