

# **CONSTRUCTIVIST LEARNING THEORY TO WEB-BASED COURSE DESIGN: AN INSTRUCTIONAL DESIGN APPROACH**

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## **ABSTRACT**

*With the advent of web-based courses and distance education technology, it is necessary to carefully consider how the use of this technology fosters the learning intended in adult education programs. In this paper, we have outlined constructivist learning theory as an approach to fostering web-based course development. A constructivist approach allows both learners and facilitators to take advantage of the World Wide Web, because the theory focuses on making connections and making meaning in the learning process. Web-based courses that are designed with a constructivist approach encourage the learners to navigate, create, and construct their unique knowledge base.*

## Constructivist Learning Theory to Web-Based Course Design:An Instructional Design Approach

Is constructivist learning theory simply a theory of learning or a strategy for teaching as well? Can constructivist learning theory guide the development of web-based instructional design? What web-based design considerations and teaching strategies are relevant to create a good on-line learning environment that supports and nourishes active construction of knowledge? The purpose of this paper is to analyze the process and results of a project designed to incorporate technological learning strategies to facilitate knowledge construction. In this project, faculty in adult education collaborated with an expert in web course design to develop an on-line learning environment that aided constructivist learning. The instructional design process and teaching strategies will be synthesized to develop an understanding of constructivist learning theory. In this paper, the term constructivist means a type of learning framed by constructivist learning theory. Three aspects of the project will be addressed in this paper: (1) application of constructivist learning theory in the on-line environment, (2) on-line instructional design process, and (3) constructivist teaching strategies.

## Application of Constructivist Learning Theory in the On-line Environment

Constructivist learning theory holds that "learners actively construct and reconstruct knowledge out of their experiences in the world" (Kafai and Resnik, 1996, p. 3). Knowledge construction takes place when learners actively construct knowledge through intellectual engagement and investment in personally meaningful tasks. Constructivists believe that individuals learn through their experience and that meaning is rooted in that experience. The key to learning, in a constructivist framework, is for the learner to find multiple ways to link new information to previous experience.

Lambert et al. (1995) refer to constructivism as the epistemological processes of knowing and coming to know (p. 17). They then identify principles of constructivist learning theory that are discussed here.

## PRINCIPLES OF CONSTRUCTIVIST LEARNING THEORY

Knowledge and beliefs are formed within the learner (Lambert, et al., 1995, p. 17). Within constructivist learning theory learners create their own knowledge by how they put their worlds together. In other words, constructivists focus on the connections that the learner is making between ideas. Novak (1998) believes that learning occurs through a process of assimilating concepts into the cognitive structures by either subsuming concepts under each other, by progressively differentiating concepts from each other or by reconciling the similarities between concepts. The crucial element is that the learner actively creates a knowledge base through the linkages and the experiences.

Learners personally imbue experiences with meaning (Lambert, et al., 1995, p. 17). Creating meaning in a constructivist view consists of analyzing and synthesizing experiences so that new understandings are developed. This is more than simply understanding our experiences as learners, it is about probing deeply the meaning of these experiences in our lives and how these experiences shape our understanding.

Learning activities should cause learners to gain access to their experiences, knowledge and beliefs (Lambert, et al., 1995, p. 17-18). Constructivists believe that learning activities should foster an integration of thinking, feeling and acting (Novak, 1998). Learning activities that foster this constructive integration of experience, knowledge, belief, thoughts, feelings and actions can assist the learner in the process of developing meaning.

Learning is a social activity that is enhanced by shared inquiry (Lambert, et al., 1995, p. 18). One of the goals of constructivist learning is to foster the development of shared meaning (Novak, 1998) between facilitator and learner or between learners in a group. Arriving at shared meaning is a complex activity that is primarily social and relies on the process of shared inquiry. Learner and facilitator together probe the connections between new information and previous experience with the idea of developing a mutual understanding.

Reflection and metacognition are essential aspects of constructing knowledge and meaning (Lambert, et al., 1995, p. 18). For learners to construct meaning, they need to understand and analyze their own learning processes. Thus, constructivists promote the process of learning how to learn (Novak & Gowin, 1984) by incorporating reflective and metacognitive strategies into the learning design.

Learners play a critical role in assessing their own learning (Lambert, et al., 1995, p. 18). Evaluation and assessment in a constructivist framework focus on the learner understanding the processes and the meanings that they have created from their own learning. Learners are actively involved in the assessment process and articulate what they have learned and how they have made the connections to their previous experiences.

The outcomes of the learning process are varied and often unpredictable (Lambert, et al., 1995, p. 18). Finally, constructivists acknowledge that learning occurring in this framework is often idiosyncratic and unexpected. Learners make meaning from new information in light of their personal experiences and thus, unexpected outcomes are common and unique.

In order to form new relationships with knowledge and new representations of knowledge, three elements are taken into consideration when trying to provide a good learning environment for learners: choice, diversity, and congeniality. The learner is the best person to decide what is to be personally meaningful. If learners are empowered to choose what to construct or create, they are more likely to be personally engaged and invested in the activity. Constructivists recognize that learners have different skill levels and learning styles. A rich learning environment encourages multiple learning styles and multiple representations of knowledge (Kafai & Resnik, 1996). Having a congenial learning environment free from constraints of time and space is central for creating and sharing knowledge. Creativity and interactivity among learners are best assimilated in a friendly and welcoming environment.

Constructivist learning theory can be applied in the on-line environment by providing opportunities for learners to engage in creative and collaborative activities that encourage knowledge construction. Thus, it can also be a strategy for teaching. In order to create the on-line environment focused on adult learners' construction of knowledge, instructional design and teaching strategies are considered.

### On-line Instructional Design Process

The use of an instructional design process links constructivist learning theory to the practice of adult education. Merrill (as cited in Duffy & Jonassen, 1992) suggests that instructional design and delivery systems are composed of two primary subsystems: a knowledge base and a family of instructional transaction shells. "The knowledge base is a representation of all of the knowledge and skills to be taught. Transaction shells enable the learners to interact with this knowledge in ways that best enable them to build appropriate mental models" (p. 109). The World Wide Web has turned into one of the most accessible learning devices for creating an environment for constructing knowledge. It provides patterns of learner interactions that enable the learner to create new relationships with knowledge and new representations of knowledge. These instructional transaction shells provide learners with the means necessary to understand different content topics and solve problems.

Designing web-based environments for learning and communicating is more than just placing information on the web, it requires new skills to produce web sites and to communicate with learners. These skills include audience consideration, web design process, self-directed learning techniques, two-way feedback mechanisms, navigational science for directional and psychological movement, expertise in content and content architecture, links and relationships management, mind map development, and learning theory and human development (Morris and Hinrichs, 1996). It is important to consider the learner's needs, differences between novice and expert users, diverse platforms and browsers, graphics capability, and Internet providers.

Creating a web page for instruction involves the process of analysis, design, development, testing, implementation, and updating. It is during the analysis process that the identification of users and tasks the web site will perform are determined. During the design process, major high-level topics and

sets of information are divided into subgroups and a theme is selected. An important feature of the design process is the brainstorming of the relationship between the sets of information and subgroups and how they support the theme. Identification of the document structure constitutes a component of the development stage. Throughout the testing phase, all linkages should be tested by novices and experts. The last phase of the design process is the implementation and updating of the web site, which includes the insertion of feedback tools on the site, the transfer of files into the World Wide Web, and the frequent verification for broken links (Morris & Hinrichs, 1996).

Certain aspects related to course content should be considered. For example, syllabi, handouts, and class assignments provide guidelines for students to follow and give learners a sense of place and structure on the web. The text structure must follow the use of command verbs to cue learners what to do next; short lines and short paragraphs create exciting visual stimulation for learners. Recommendations related to text formatting included the need to use brief text, active voice, bullets to format a list, whitespace, left-justify, etc. The language style should be conversational as if the web site would be speaking to the learner. Bullets, headlines and pull quotes should be combined with paragraphs or explanatory text after the bullet heading. When inserting links, the identification of patterns in the links and a brief description of the link should help learners navigate through the course more efficiently. The use of templates is an option that can help organize the information structure. Having a common navigational control bar for all pages can assist the user to easily reach locations on the web site (Morris & Hinrichs, 1996). In order to integrate human mind maps with web mind maps to create an environment for helping learners' construct knowledge, the web site must have a set of common features, it must identify with the learner, and provide interactive tools. These features follow the visual representation of conceptual meanings.

The role of the instructional designer is to move from structuring teaching strategies to designing environments in which constructivist learning can take place. Duffy & Bednar (as cited in Duffy & Jonassen, 1992) suggest that these environments present 's rich contexts, authentic tasks, collaboration for the development and evaluation of multiple perspectives, an abundance of tools to enhance communication and access to real-world examples and problems, reflective thinking, modeling or problem solving by experts in the content domain, and apprenticeship mentoring relationships to guide learning" (p. 132).

### Constructivist Teaching Strategies

This paper is based on a project developed to integrate new learning strategies and innovative educational technologies into an adult and continuing education weekend program with the purpose of decreasing travel time for learners and increasing communication between students and faculty. As a result of this experience, the use of on-line learning strategies has fostered student and faculty communication, individualized the learning to the student's needs, and supported and nourished learners' construction of knowledge.

When using constructivist strategies for learning, instruction. . . "should not focus on transmitting plans to the learner, but rather in developing skills of the learner to construct (and reconstruct) plans in response to situational

demands and opportunities" (Duffy and Jonanssen, 1992, p. 4). To facilitate the constructivist learning approach in an on-line environment two examples will be highlighted: concept maps and on-line discussions with group reflection (also known as mailing list or listserv).

Concept Maps. "A concept map is a schematic device for representing a set of concept meanings embedded in a framework of propositions" (Novak and Gowin, 1984, p. 15). Concept maps (Novak, 1998) are a visual representation of conceptual meanings used to develop shared meaning between learner and facilitator or between learners in a group. Concept maps are a metacognitive tool that demonstrates explicit, overt representation of concepts and propositions a person holds, they allow teachers and learners to exchange views on why a particular propositional linkage is good or valid, or to recognize missing linkages between concepts that suggest a need for new learning" (Novak and Gowin, 1984, p. 19).

In the on-line learning project described in this paper, concept maps were used in two different ways. First, students were asked to read two different books discussing the topic of the course. A concept map was developed that represented the similarities and differences between the two books. Students then used the maps as a format for on-line discussion of their understanding of the readings.

Second, students were asked to view popular films that dealt with the course topic. After viewing the film, the student created a concept map that depicted what was seen in the film and how that related to the theories under study. The maps were then used as a basis for the on-line case discussions of the films and their connections to the course topics. Concept maps were created electronically with a software program called Inspiration. Once the maps were created the students could share, discuss, alter or revise their maps as their learning and understanding of the concepts under study grew and changed.

On-line Discussion with Group Reflection. In this project, on-line discussion groups were established and were included as part of the course requirements. Learners were expected to participate and the instructor initially established discussion questions related to the concepts under study. The discussion questions served the purpose of initiating the on-line activities, but it soon became apparent that the learners would take the discussion in the direction that enhanced their learning the most. On-line discussions were used to discuss course concepts, case studies, and course readings. It was interesting that the on-line discussion seemed to promote a more in-depth level of analysis and synthesis. The learners discussion points and comments were a thoughtful analysis and critique, of not only their course work, but their life experiences as well. Learners reported that they used a constructivist process in preparing for and participating in the on-line discussion. The learner would read the discussion questions, review some of the material in the text, read and think about the contributions of other students and then frame their response. Responses were thoughtfully created and showed many connections to other course work and learning materials.

## Summary

With the advent of web-based courses and distance education technology, it is necessary to carefully consider how the use of this technology fosters the learning intended in adult education programs. In this paper, we have outlined constructivist learning theory as an approach to fostering web-based course development. A constructivist approach allows both learners and facilitators to take advantage of the World Wide Web, because the theory focuses on making connections and making meaning in the learning process. Web-based courses that are designed with a constructivist approach encourage the learners to navigate, create, and construct their unique knowledge base.

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