

# Learning-by-Doing Strategy Using ITC

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## INTRODUCTION

The use of the information and communication technologies (ICT) in the learning process can help the constructivist theory because it is possible to build a “learning by doing” environment that combines the constructivist approach and also cooperative learning (CL). Students work together to reach an educational goal and the computers can play a central role in the learning environment (Kozma, 1991). The traditional learning theories are based on a dualism between the learner and the known; knowledge exists independently of the learner, and understanding is coming to know that which already exists. Knowledge is seen as contextualised so that it can be learned, tested, and applied more or less independently of particular contexts. Teaching is a matter of transmitting this knowledge, learning and receiving it accurately, storing it, and using it appropriately. The use of information and communication technologies to support engaged learning goes hand in hand with the learning-by-doing strategy. This is an approach in learning where it is possible to gain the ability to navigate a challenge or problem or even one’s life by implementing the learner’s own powerful natural process of exploration and discovery. John Dewey (1859-1952), American philosopher and psychologist that influenced education in the United States, focused his philosophy of education, instrumentalism (also called pragmatism), on learning by doing rather than rote learning and dogmatic instruction, the current practice of his day. Learning by doing also involves the philosophy of constructivism (Crotty, 1995; Sherry, 1998). Brooks and Brooks in their studies (1993) present five principles of constructivism:

1. the problems must be relevant to students;
2. the curriculum should be structured around primary concepts;
3. teachers should seek to understand and value of students’ points of view;

4. teachers have to adapt the curriculum to address students’ suppositions; and
5. authentic assessment should be used as a tool to help the student rather than strictly as an accountability device (Scardamalia & Bereiter, 1993).

An instructional strategy that supports the constructivist approach is the cognitive flexibility theory (Spiro, Feltovich, Jacobson, & Coulson, 1992; Spiro & Jehng, 1990). The cognitive flexibility theory is called cognitive flexibility because it refers to the “flexible” way learners assemble and retrieve knowledge from their brains. This theory is best used in designing learning environments that support the use of interactive technology. It is based upon the cognitive learning theory, but it is also very similar to the constructivist learning theory. Spiro and Jehng (p. 165) state:

*By cognitive flexibility, we mean the ability to spontaneously restructure one’s knowledge, in many ways, in adaptive response to radically changing situational demands...This is a function of both the way knowledge is represented (e.g., along multiple rather than single conceptual dimensions) and the processes that operate on those mental representations (e.g., processes of schema assembly rather than intact schema retrieval).*

Ideally adapted to the hypertext learning environment of the World Wide Web (WWW) and relying on multiple representations of content and diverse case studies, the theory emphasizes the importance of giving learners the opportunity to construct their own representations of information so that they can transfer their knowledge and skills beyond their initial learning situation (Scardamalia & Bereiter, 1993). The cognitive flexibility theory is especially formulated to support the use of interactive technology (e.g., hypertext and hypermedia). Its primary

applications have been literary comprehension, history, biology, and medicine. For example, Jonassen, Ambruso, and Olesen (1992) described an application of the cognitive flexibility theory to the design of a hypertext program on transfusion medicine. The program provides a number of different clinical cases that students must diagnose and treat using various sources of information available (including advice from experts). The learning environment presents multiple perspectives on the content and also emphasizes the construction of knowledge by the learner.

## BACKGROUND

Learning by doing and the term experiential learning are commonly used to refer to several different aspects of learning. In the early 1980s, Freire, Mezirow, and others described learning as a cycle that begins with experience, continues with reflection, and later leads to action, which itself becomes a concrete experience for reflection. The most established model of experiential learning is the one developed by David Kolb. He refined the concept of reflection by dividing it into two separate learning activities: perceiving and processing. He added another stage called abstract conceptualization. Whereas in the critical reflection stage we ask questions about the experience in terms of previous experiences, in the abstract conceptualization stage, we can try to find the answers. We can make generalizations, suppose conclusions, and form hypotheses about the experience (Kolb, 1984; Kolb, Rubin, & McIntyre, 1974). The action phase, proposed in his interpretation, then becomes a phase of active experimentation where we can try the hypotheses out. Learning from experience involves different links between the doing and the thinking. Kolb elaborated the four-stage model of learning by doing shown in Figure 1. The model starts with the cycle of adult learning conceived by Kurt Lewin (1890-1947). The terms used as labels in Figure 1 for the four stages come from Kolb's experiential learning theory, and placed in this sequence they form the experiential learning cycle. The learner can enter in

Figure 1. Experiential learning cycle

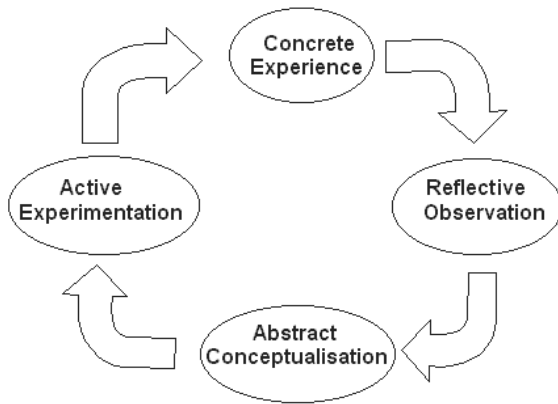
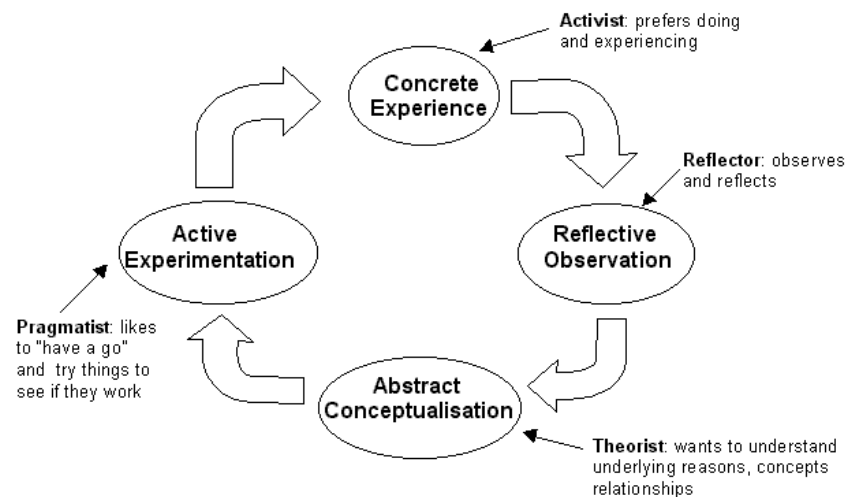


Figure 2. Honey and Mumford (1982) learning styles



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