Chapter 5.10
The Application of 'Activity Theory' in the Design of Educational Simulation Games

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ABSTRACT

As you read this text you perform an activity. Activity is literally everything we do and yet we are unaware of most of our operations. In this chapter, I will describe activity through a psychological lens and explain how this relates to the process of learning. The conceptual instrument used for analysis is 'activity theory'; a cultural-historical concept that was formulated in Russia during the 1920s. I will offer suggestions as to how activity theory may be used in the design of computer simulation games directed at education and highlight its conceptual underpinnings. In the latter part of the chapter, I offer possible directions for further research in this field.

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INTRODUCTION

Activity is something that the West takes much for granted and yet it epitomizes human life itself. Russian psychologists over the last century have taken the notion of activity more seriously and are accredited for much of the research work in this field. The Russian viewpoint of activity is that it must be driven by a concrete objective and according to Petrovsky (1986), comprises internal (cognitive) and external (behavioural) components. Working with a computer is also an activity. In fact, it is likely to involve a multitude of activities simultaneously multitasked. It can be argued that the strategic design of human-computer interface (HCI) programs should consider the psychological aspect of the user and application programs de-

signed for education purposes should underpinned with sound pedagogical concepts, which is often not the case: '… educational software has been based on instructionist theories, with the computer performing roles that are traditionally performed by the teacher …' (Sawyer, 2006, p. 29). Bellotti (1988) studied a group of software designers in a number of leading software houses and found that many of these designers were unaware of any research in HCI although did concede that many good quality software programs have been developed without the potential benefit afforded by research findings.

Human beings are highly complex animals and the mind remains an enigma. This undermines any attempt to formulate an ideal software package based on theoretical underpinnings. Indeed, there are many sound theoretical underpinnings but only one truth, and adrift in the complexities of the human mind, it is likely to remain elusive.

It is important to acknowledge early on in this chapter that simulation is intended to augment the learning process and is not a substitute for real practice (Bellamy, 1996). One framework that might be considered as an underpinning theoretical base upon which to build a computer simulation program is 'activity theory' (AT). The aim of this chapter is therefore to introduce the concept of AT to designers/ developers of computer games for educational purposes as a viable option in software design in order to provide a sound theoretical pedagogical foundation on which to construct the program. I do not wish to enter epistemological or ontological philosophical debate but simply to introduce a pragmatic option that offers a tangible benefit in the design and development of simulation gaming software for educational purposes.

BACKGROUND ON 'ACTIVITY THEORY'

Activity theory (AT) is a historic-cultural conceptual model that was introduced primarily by the Russian psychologist Vygotsky (1896-1934) and was further developed mainly by Leont'ev (1903-1979) and more recently Engeström, but is influenced by the philosophies of Marx, Engel, Hegel, Kant and Luria. AT is essentially not a theory but a descriptive representation of an activity. AT initially emerged from a totalitarian environment that was highly structured and externally controlled and this powerful cultural antecedent has indelibly permeated the underlying concept. This influence led to Lektorsky's (1999) description of AT as 'one-sided' but the polarization is conceivable given Vygotsky's belief that the development of the mind is profoundly affected by the cultural and societal environment within which it exists.

Activity and Learning

In the West, 'action' is synonymous with 'activity' and the terms are often used interchangeably. Russian psychology suggests a distinct difference in that an activity is a hierarchical construct with action being a subordinate constituent. Operations are found at the next lower level. AT maintains that an activity is broken down into a series of actions which are undertaken consciously by individuals. These actions are facilitated by subconscious, routine motor operations. Repetition of a conscious action will eventually transform into a sub-conscious operation as it becomes *internalized*.

Experiential learning is a keystone in the development of skill-based competences. After some considerable repetition and practice via an interactive computer simulation program, a surgeon's competence transcends from novice level to expert level as the activity of performing a very delicate and intricate operation becomes *second nature*. Although the surgeon may claim that the act of conquering this skill was 'demanding', he accounts only for the explicit learning element. This is metaphorically speaking, the tip of the iceberg because the bulk of the learning was almost