

Chapter 14

The Extended Body in the Teaching–Learning Process

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ABSTRACT

This chapter focuses on the relationship between technology and education, starting from the consideration that the software design explicitly dedicated to the teaching-learning process is, for the most part, still anchored to a discreet information processing model. This model underestimates the role of the body and corporeality in the teaching and learning process and fails to capitalize on the potential offered by enactive interaction devices already present and widely used in schools and learning-dedicated centers. The opportunities offered by the NUIs in school contexts represent the natural consequence of an embodied and enactive approach to knowledge, valued in school contexts in which the skills of perception and the action are enhanced to foster learning.

INTRODUCTION

This work is the enhancement of an article published in 2012. The focus of the previous work was on the overall design of the body - perception - cognition - technology perimeter, in the light of evidences coming from the hard sciences and certain developments in the technology. The work was presented as *positio questionis*. The aim was, therefore, not to provide definitive answers, but rather to ask precise questions, knowing that articulating an answer to these questions without giving reason of an explicit and documented theoretical framework would be unrealistic. The present paper, starting from the theoretical framework outlined

in the previous article, is therefore an attempt to further the research. The focus of the work is on the relationship between technology and education, starting from the consideration that the software design explicitly dedicated to the teaching–learning process is, for the most part, still anchored to a discreet information processing model. This model tends to underestimate, from a conceptual point of view, the suggestions coming from the areas of research that have re-considered the role of the body and corporeality in the teaching and learning process (Aiello et al., 2012; Maturana, Varela, & Ceruti, 1992; Sibilio, 2012a), and, consequently, tends, from an operational point of view, not to promote those technologies that

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allow the involvement of the entire body in the digital semiosphere (Di Tore, Aiello, Di Tore,, & Sibilio, 2012).

The thesis presented here, in brief, is that the design of digital products intended for education suffers from cultural settings that perpetuate a sequential, discreet interaction model and fails to capitalize on the potential offered by enactive interaction devices (IWB, smartphones and tablets equipped with gyroscopes and accelerometers, gaming devices like Wii, Xbox + Kinect or PSMove) that are already present and widely used in schools and learning dedicated centers.

FROM EXTENDED MIND TO EXTENDED BODY

In the above mentioned work, it was argued by the same authors (Di Tore, Aiello, Di Tore, & Sibilio, 2012), that the central role played by corporeity and the body in the current cultural context is the result of two different lines, which have, throughout their history, large overlapping and contamination areas.

The first line started from the Mind – Body problem posed by the phenomenological perspective (Husserl, Merlau-Ponty...) and deepened by the theorization of *embodiment* in the field of cognitive sciences (Varela, Maturana, Lakoff...), gradually finding confirmation in experimental evidence that have identified the neural correlates of cognitive processes (Rizzolatti & Sinigaglia, 2006) and “progressively reducing the nomansland area determined by the distinction between *res cogitans* and *res extensa*” (Di Tore et al., 2012).

The second line follows McLuhan’s thought (2001) in a pure technological sense, focusing on modifications in bodily function, including body extensions which are “intelligent” prosthesis systems that are interfaced directly with the synaptic circuits (on use of mind-controlled robots and on how people with tetraplegia use their thoughts to control robotic aids, see Hochberg et al. (2012)).

In other words, the reflection started recognizing the need for a functional definition of “body,” to distinguish what, in the usual sense, is “body” from what is not, identifying two possible meanings. In its ordinary organic meaning, the body implies a continuity of biological tissues, cells, nerve endings. this meaning, for several ways simplistic, was evaluated as not functional for the purposes of research

Another instrumental meaning sees the body as that on which one exerts motor control. A prosthesis definitely falls into this vision.

A meaning of this type of course involves a question: “where does the body stop and the rest of the world begin?” (Clark & Chalmers, 1998).

A question remarkably similar to the *incipit* of a well-known article in which Andy Clark and David Chalmers (1998) theorized the existence of the “extended mind” “*Where does the mind stop and the rest of the world begin?*” asked Clark and Chalmers.

In the cited article, the authors, in order to introduce the concept of extended cognition, present three cases of problem solving:

1. “A person sits in front of a computer screen which displays images of various two-dimensional geometric shapes and is asked to answer questions concerning the potential fit of such shapes into depicted ‘sockets’. To assess fit, the person must mentally rotate the shapes to align them with the sockets.
2. “A person sits in front of a similar computer screen, but this time can choose either to physically rotate the image on the screen, by pressing a rotate button, or to mentally rotate the image as before. We can also suppose, not unrealistically, that some speed advantage accrues to the physical rotation operation.
3. “Sometime in the cyberpunk future, a person sits in front of a similar computer screen. This agent, however, has the benefit of a neural implant which can perform the rotation operation as fast as the computer in

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