

## Chapter 2.9

# Epistemological Framework and Mathematical Learning

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*Determine a reality that is within the child's grasp, describe the relations that the mind builds, the structure and the underlying models, and reconstruct linguistic codes for mathematics that form a communicative link between reality, thought, emotions, behaviour and the joy of discovery.*

### ABSTRACT

The aim of this chapter is to provide some indications on the background of our research regarding the use of simulation games for learning geometry and arithmetic. We reinterpret certain educational goals from the perspective of the anthropology of the virtual. Within this context, a number of

important international commissions on math teaching are analyzed with particular reference to the difficulties involved in finding the right balance between the need for a formal mathematical language and teaching solutions to guide learning.

### INTRODUCTION

Learning math is a difficult business and its acquisition entails many intrinsic problems that stem from the difficulties children find in mastering processes of abstraction and the formal codes that characterize the language, that often undermine their motivation to learn. Moreover, it is complex process relating the mechanical aspects- internalizing and automatically accessing procedural knowledge- with the far more challenging task of

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learning the underlying structures, that leads to an awareness of the value mathematical concepts can have when applied to reality, to art, science and in intellectual and personal growth.

Today any serious consideration of math teaching must be based on the premise that the technological progress of recent years has led to a redefinition of forms of social communication causing friction between conservative and evolutionary forces in the educational field. In other words, the new forms of reality require a revision of how math teaching is approached in schools because the pupils are now part of a complex community that is used to interacting in real and virtual worlds and this can be of profound importance for the field of educational psychology.

## **LEARNING NEEDS REVIEWED FROM THE PERSPECTIVE OF VIRTUAL ANTHROPOLOGY**

Up until the advent of the virtual world in everyday reality every child arrived in class with learning needs clearly defined by organizational and social contexts. At school the children found a learning environment organized to respond, in a fairly predictable predetermined way, to their learning requirements; the roles (teachers, heads, admin staff, the organization itself) were clearly defined as were the tools and methods employed to teach certain facts and encourage certain behavior in the right way, often, vis-à-vis the knowledge to be communicated and the attitudes to be encouraged.

Up until the advent of the virtual world in everyday reality every teacher brought to the classroom a metaphorical toolbox of materials and techniques, even if one may sometimes doubt the methodological value and motivational effectiveness of some of the contents.

It is a complex business finding causal connections or other forms of correlation between the natural inclination and motivation to learn mathematics- variables known to influence the

learning process- and strategies that organise and shape the process of learning of mathematics in the reality in which both parties-children and teachers- find themselves, i.e., the classroom.

We can say that teaching provision that should facilitate math learning is only partly able to respond adequately to the changing needs of virtual anthropology<sup>1</sup> (Levy P., 1994). The environments children grow up in are already vibrant and sometimes conflicting mixtures of the real and the virtual. As ever the case when innovations upset the established paradigms, it becomes necessary to reanalyze the underlying structures and harness the potential of change (Fregola, 2003). Or society is based on paradigms that are linear, certain, deterministic, where everything is reduced to the smallest detail, and these can only partly help us understand the changes in progress. It is, therefore, essential to search for more suitable models of analysis and interpretation of daily life and this implies recourse to paradigms involving simultaneity and uncertainty, situational paradigms, and the ability to reconstruct an overall vision, starting from the need to manage processes of communication, production and development that characterize complex systems to be determined or defined (Gandolfi A., 1999).

In order to deal with the consequences of this profound paradigm shift, primary school math, besides counting and measuring, should also develop competences that contribute to personal growth and supply pupils with the tools to deal with complexity<sup>2</sup>.

What is clear is that the theme of prospective methodologies has been left open and there is little trace of references to learning and teaching models that take into account the consequences of recent changes that have involved children, adults, the interrelationships and their respective roles<sup>3</sup> in different contexts of life.

For this reason, it becomes essential to reflect on certain aspects of math teaching: "Math has a specific role in the development of the general capacity to operate and communicate meanings

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