Preface

The use of simulation games is a well-established practice in many countries in schools and training although the research into its educational benefits is uneven and fragmentary and little work has been done on the didactic justifications of its use in the educational field; indeed, what there is tends to be more geared towards commercial rather than educational ends with little attention devoted to the underlying structures and concepts or the knowledge or processes one would like to stimulate.

There is a considerable body of work on the design, realization and evaluation of simulation games in education but the variety of different criteria used indicates that there is no common theoretical framework regarding the learning epistemology in simulation games. Moreover, the work on methodological issues in the educational context is not explicitly orientated towards best didactic practices.

Research of validity and effectiveness of approaches, applicable to educational contexts, opens important pedagogical prospects in the education to complexity, to the extent that they can relate to widespread systems of competences able to integrate the instruments and means application in learning-teaching processes, guided by theoretical models able to orientate decisions and behaviors of the teaching professionalism.

The aim of this book is to draw attention on the epistemological and methodological aspects of learning through simulation games starting from a repertoire of meanings that can guide research in the educational field.

Simulation games in schools can, indeed, represent an important practical and methodological innovation in the teaching of various subjects and the use of new forms of educational technologies that offer a scaffolding for the construction of knowledge and the development of channels of didactic communication.

The subject area we have focused on in our work is mathematics, where there is a clear need to link different aspects involved in the learning process- cognitive, emotive social, motor and so on. The interaction in the games can activate connections that bring the aforementioned aspects together and contribute to the sharing of new meanings.
This work describes an educational research project based on the main characteristics and functions of simulation games, and aims to encourage the design and realisation of learning environments for the process of learning mathematics and discovering its relationship with reality with reference, in particular, to the acquisition and mastery of a mathematical language by children in primary schools.

Drawing on a vast theoretical background this work relates the ontology of simulation games and recent advances in educational psychology to the construction of a system for the teaching of mathematics within the context of an educational discourse from an ecological perspective.

Indeed, the spread of technologies, and consequently virtual worlds, have led to the development of environments which form reproductions reality; moreover, these advances in technology allow us to organise and design educational environments where it is possible to carry out simulations, thereby enabling us to highlight different facets and configurations of situations that otherwise it would be difficult realise in one place and time.

In this work simulation games are viewed from the perspective of the design of environments in which classroom interaction and the learning and teaching processes are informed by the most recent advances in research into theories of learning and inspired by systematic observation of certain typical types of behavior of children who have immerged themselves in video games rather than in the portals of cyberspace.

In this sense simulation games in schools can be reconsidered as meeting places between ways of learning about reality and ways of learning about virtual reality.

To sum up, the research focuses on the design, realisation and experimentation of simulation games applied to the learning-teaching process of mathematics with three priorities:

- Experiment with certain aspects of the evolution of educational science, that have made new learning models and teaching schemes available; these could act as a guide to launch a motivational process than achieves and sustains over time the learning of mathematical contents;
- Investigate certain structural characteristics and the dynamics of simulation games when applied to the learning process and the construction of a mathematical language based on abstraction and formalisation;
- Promote a meta-cognitive control within the game environment to develop self-efficacy in the learning of mathematics.

With regard to the research objectives, the goals are:

- Contributing to the formation of an accessible culture for the construction of learning environments for the teaching of mathematics, through the review
and re-definition of traditionally familiar learning environments, influenced by the outcomes of innovation and research;

- Encouraging those involved in mathematics teaching to identify criteria for producing simulation games, by supplying concrete examples for the design of simulation games for mathematics that emerged from our research effort, and provide practical hints on their conduct and academic effectiveness.

The work is structured in four sections. The first section presents the introduction on the two central themes of the work: math learning and simulation games. As regards the first, the theoretical, epistemological and methodological guidelines for math learning are considered in the light of the changing realities and learning needs with a view to adapting math teaching to the new situation. Regarding the second, on the other hand, a study is made of different types of simulation games employed in social, recreational and educational fields. Our particular interest is the need to develop an ontology that can overcome semantic divisions and provide a basis for scientific progress.

The second section focuses attention on the theoretical and methodological aspects of simulation games for mathematics learning. In the light of the changes in society and the advances in educational psychology, the educational purposes of our work are outlined. Reference is made to transcoding and the processes of math learning in which not only cognitive elements play a part, but social and cultural ones as well.

The third section presents the theoretical framework and the methodological decisions taken for the design and conduct of the games, supplemented by various guidelines on how to operate the activity. This section also contains a description of the games designed for the research project along with teaching material and final progress tests.

The fourth section describes the Simulandia research project, complete with a review of the literature on simulation games and a description of the previous experiences of different members of the research group that have had a relevant influence on the research direction. In this section the research framework is presented on which the assumptions and procedures of the work were based, as well as an analysis of the initial results.

Along with the text there is a bibliography with n° 12 descriptions of the work of various authors concerning both the theme of simulation games and the question of the learning of mathematics.

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