ABSTRACT

The habilitation thesis, *From the morphology of thinking and problem solving to a rigorous psychology of mathematical thinking, with effects on the development of cognition and mathematical creation, (an interdisciplinary approach),* encompasses and synthesizes a large part of the initial, confirmed, demonstrated and imposed academic environment, by contributions published in books, both in postdoctoral I and postdoctoral II period (list A2), in indexed ISI Web of Science journals, in magazines indexed in recognized International Databases, or in magazines rated B or C by CNSS.

The topic on which research was focused is within the broad perimeter of mathematical psychology, of the relationship between thinking and language, the role of mathematical thinking in the learning process and the cognitive development, the psychology and the epistemology of mathematical creation. The thesis contains three research axes:

Axis I. The psychological and ontological problem of thinking, language and problem solving

The first axis, generated by research following the first PhD, comprises three thematic areas:

I.1. The thematic area *Ontology, morphology and power of thinking* reveals, from the perspective of modern psychological research, the author's contributions related to the complexity and nature of the psychic phenomenon; how thinking resolves problems and the psychological structure of thinking; language psychology, communication and sign theory; the structure and organization of language, the research of the neurophysiological support of language and the psychological relationship between thinking and language; the heuristic-algorithmic report in thinking, the cyber-mathematical perspective of thinking, the mathematical theory of game and abstract thinking;

I.2. The thematic area *The thinking-language-cognition relationship in learning mathematics* has forced the implementation of a conceptual system of analysis and assessment of how some aspects of language can influence learning mathematics: it has been demonstrated the need to pursue the meaning of a concept in linguistic practice, helping to clarify the relationship between concept and action in mathematical thinking, the concept and the object it designates, the relationship between the theory of meaning and the theory of the reference, between the theory of meaning and the nature of the object; it has been analyzed how the meaning of mathematical expression can not be located as an entity "outside" the language; it has been argued that psychology has multiple possibilities to explain the rational faculties on which mathematical knowledge is based;

I.3. The thematic area *The role of mathematical thinking and dynamic heuristics in the learning process* reveals the author's contribution to the elements related to the morphological-structural analysis of the cognitive map, the dynamic heuristics in the learning process and the cognitive development; to deepen the relationship between the mind and the brain in order to understand the characteristics of the mental ideas of those who oppose any type of learning or assimilation; analyzing the process of learning in terms of interrogation and perspective, and their effect on the cognitive process; the psychology of explanatory notions and their role in the learning process;

AXIS II. Psychology of mathematical education and development of learning and cognition

The second research area was generated by the second doctorate, the one in psychology, has occasioned the publication of several articles addressing a series of issues that have imposed three research directions:

II.1. The thematic area *Scientific Perspectives of the Mathematical Thinking Psychology; Concept and action in mathematical thinking* proposed the establishment of mathematical psychology analysis criteria and the argumentation of its scientific perspective, by revealing the static evolution of mathematical thinking and educational opportunities, through the psychological analysis of the relationship between thinking and concept, between concept and action in mathematical thinking and by revealing the multiple ways in which mathematical game contributes to the formation and restructuring of cognitive processes, language and behavior; identifying some principles and rules that argue the importance of 'value' in the process of learning mathematics, presenting the psychological evidence of the relevance of advanced mathematical thinking; identifying the circumstances and techniques by which the learning process can be tested and evaluated for neuropsychological and cognitive purposes in order to determine daytime influences on cognitive performance, measuring fluency, processing speed, semantic memory, and episodic memory; the research, analyzing and the criticism of the debates on the differences between 'total learning' and 'incremental learning', as well as research into the contribution of memory awareness to interference.

II.2. The thematic area *The role of mathematical thinking, information and communication technology in learning and cognitive development* draws attention to new methodologies and conceptualizations on: the emergence of information and communication technology as learning technologies; the social aspects of learning situations improved by technology; the relationship between faculty practices, student engagement and learning; the role of nerve mechanisms in the learning process; integrating cognitive neuroscience into educational practice; the complexity of the learning process, the transformative effect of technology on pedagogy, the necessity of applying neuroscience in education, the relevance of educational influence in neurocognitive development, and the neuroscientific understanding of the learning and teaching process.

II.3. The thematic area *A reconstruction and a rational investigation of the convergent-divergent ratio in learning mathematics, in the light of the concepts of convergence thinking and divergent thinking*

In this thematic area, some experimental researches of mathematical psychology were resumed in which:

a) it has been found that revealing and deciphering personality traits plays an important role in the educational process, the teacher having to take into account the student's temperament;

b) it has come to the conclusion that intelligence, cognitive style and productive thinking are the psychological factors that have been identified in the process of mastering mathematical disciplines;

c) it has been observed that in the study of mathematics and problem-solving, variations are also determined by the cognitive style of the learner: his own way of thinking; the ability to distinguish the content of knowledge; different ways of perceiving, organizing and processing information, etc .;

AXIS III. Psychology and epistemology of mathematical creation axis structurally supports three research directions:

III.1. The thematic area *The educational and scientific impact of mathematical psychology research, cognitive and heuristic psychology* which brings original contributions of novelty and relevance based on: the relationship of the psychology of mathematical education and the hypothetical nature of mathematical experiments; the relationship between mathematical models and the structure of phenomena and the way psychology analyzes this relationship; the relationship between cognitive psychology, neural dynamics and mathematics education, how mathematical education technologies relate; the way heuristic reasoning is analyzed in the mathematical education psychology and the relationship between mathematical reasoning,

cognitive psychology and creativity; revealing the effects of the social environment on individual creativity and the role of social factors in the creative process;

III.2.The thematic area ***Motivation-behavior-action in Psychological, Mathematical and Educational Competence,*** which reveals: the implementation research techniques on gender differentiation and thinking in social values and regulatory objectives, as well as divergent adaptations in the emotional response; on the prevalence and cost of deviant behavior in different circumstances; on the role of memory awareness and cognitive performance in the learning process; how the psychology of education is used to explain personality traits and economic behavior; on the educational value of interferences between personality psychology and the education economy, in order to elucidate the psychological fundamentals of the behavioral economy; the effect of cognitive information on televisioned news, emotional, attitudinal and behavioral results; psychopathological processes involved in social comparison, depression and envy on Facebook;

III.3. The thematic area ***Research perspectives on the psychology and epistemology of mathematical creation*** aims to: substantiate research perspectives on the psychology and epistemology of mathematical creation, analyzing the psychology of mathematical thinking and the nature of mathematical objects ; to investigate the psychology of projection and mathematical creation, to reveal the foundations of the creative process as a psychological act; to analyze the psychology of the heuristic structures and the consistency of the epistemological value of mathematical creation; the structuring of a possible research on mathematical concepts as elements of the intelligent environment and, of the psychological research of the categorical foundations of mathematics, in order to demonstrate the necessity of substantiating mathematical psychology as a rigorous science.

The didactic activity we focused on the elaboration and presentation of courses and the support of seminars for students and master students, such as: Fundamentals of Psychology, Psychology of Education, Personality Psychology, Psychology of Age and Development, Inclusive Education of Students with Special Educational Requirements.

The evolution and development plan of the university career is preponderantly related to the thematic and ideological issues set up so far. In particular, we will take into account the principles of cooperation, the prerequisites of the career development and career development plan; the vision and general objectives of professional development; strategic directions and ways of implementing the results of scientific research; how we will conduct the process of training and guidance and counseling of students, master students and PhD students; the educational projects we are going to start, as well as the institutional management and evaluation as well as the institutional services.

Regarding the scientific research activity, we will consider new themes, we will elaborate a scientific paper of quantum physics psychology, together with other researchers, we will coordinate volumes of scientific papers that will include scientific contributions and results of the research activities of the master students, doctoral students and teachers; we will obviously be concerned about the further development of mathematical psychology as a rigorous science.