Soutenance de thèse de Pedro Lealdino Filho (S2HEP)

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Titre : « Situations didactiques pour le développement de la pensée mathématique créative: le cas des fonctions et des algorithmes.
Title *: Didactic Situations for the Development of Creative Mathematical Thinking: A study on Functions and Algorithms.*

Abstract
Creativity is considered a crucial skill for the contemporary world. The research described in this thesis had the Project MC Squared as the main context. Carried out between October 2013 and September 2016. The objective of the project was to develop a digital platform for the development of C-books for teaching mathematics in a way that develops Creative Mathematical Thinking both in the students and the authors.

This thesis, entitled “Didactic Situations for the Development of Creative Mathematical Thinking} proposes an analysis of the design, development, implementation, and testing of digital and non-digital activities with the aim of improving and fostering Creative Mathematical Thinking having Functions and Algorithms as mathematical objects to analyze.

The following research questions raised from the problem:

- How to operationalize and revise existing definitions of Creative Mathematical Thinking?
- How can we assess the progress of a process involving Creative Mathematical Thinking?
- How the "Diamond of Creativity" model is a useful analytic tool to map the Creative Process path?

To answer such questions, the research followed a methodology based on an agile Design-Based Research. Four activities were cyclically developed. The first one, called: Function Hero," is a digital game that uses body movements of the player to evaluate recognizability of functions. Three other activities called "Binary Code," "FakeBinary Code" and "Op'Art", aimed at the development of Computational Thinking.

The main constructs of this thesis are: (a) the "Diamond of Creativity" model to map the process of solving problems found in each activity, evaluating the process and the products derived from the students' work. (b) The digital game: "Function Hero".

To validate the research hypotheses, we collected data from each activity and analyzed them quantitatively and qualitatively. The results show that developed activities have awakened and engaged students into problem-solving and that the "Diamond of Creativity" model can help in identifying and labeling specific points in the creative process.