

# **MATHEMATICS TEACHERS' DIDACTICAL DEVELOPMENT AND THE QUADRATIC FUNCTION**

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In this study, mathematics teachers' didactical development was explored on the basis of a series of conceptual maps that they produced while working on small groups. The teachers participated in a one-year long in-service training program in which they were asked to produce content, instruction and cognitive analysis of the quadratic function. The training program methodology was based on the presentation and discussion of the groups progressive productions for each analysis. The notion of representation system was the organizing idea for the teachers' conceptual maps. These maps were codified using a series of attributes for identifying what the teachers saw as the essential characteristics of the mathematical object and the type of representations they used to describe it. Using these attributes, a characterization of all possible maps based was produced and used to analyze the results of the codification process. The results show that this in-service training program, designed using the notions of didactical analysis and representation systems as conceptual structure, using conceptual maps as communicating tool for the teachers, and promoting small group work and whole class discussion, induced a didactical development of the participants that expressed itself in the increasing complexity with which the teachers represented the mathematical object at hand.

We describe briefly the methodology used to codify and analyze the nine conceptual maps produced by each of the five groups of teachers. The attributes considered were the following: whether the map is based on representation systems or not; number of structured representation systems present; number of connections between representation systems; number symbolic forms of the quadratic function present; whether there are connections among these symbolic forms; whether the map is centered on the quadratic equation; and whether the symbolic manipulation techniques were presented as objects or as relationships. On the basis of these attributes some conceptual maps are possible and others are not (i.e., one cannot talk of connections between representation systems if the map is not organized on them). These produced four different structures of the evolution of the possible maps and the paths the maps of a group of teachers can follow while improving them. In this way, we were able to characterize the development of the productions of each group of teachers.

All groups showed significant differences between the first and last conceptual maps produced. However, while some groups were able to make steady progress, other groups showed that there are obstacles to this development, related mainly to the use of structured representation systems and the connections among them. Furthermore, while some groups productions evolved using always the same basic structure, others groups changed that structure at least once along the program.