

Chapter 11

Coping with Infinity: Using TI-Nspire™ CAS to Bring Alive Multiple Representations in Mathematics

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ABSTRACT

This chapter outlines the structure of the initial module of a pilot project investigating the benefits of using dynamical mathematical software when teaching students about cross-curricular models of thinking. Focus is on the use of conceptual metaphors when teaching the concept of infinity in mathematics as well as in literature. The use of dynamical mathematics software facilitated constructions of multiple representations in problem solving in a series of carefully selected problems involving infinity. The pilot project is currently being evaluated, but preliminary findings indicate an increased student awareness of the usefulness of the software when learning how to use mathematical inscriptions for problem solving. The pilot project will be expanded in the Fall 2011 to include 6 classes across Denmark to test the applicability of the software, the teaching model and the teaching materials in a variety of classes to see if the initial successes of the project can be replicated.

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INTRODUCTION

In a recent project concerning “Mathematics and Cognition” we introduced a pre-calculus class to the dynamical mathematical software TI-Nspire™ CAS—from Texas Instruments (2007)—and confronted them with the challenges of understanding infinity in a mathematical context. The purpose of the project was three-fold:

1. To introduce the class to the use of multiple representations using various mathematical inscriptions (graphs, tables, equations, text ...) in problem solving.
2. To introduce the class to the theory of modern cognition, especially the concepts of metaphor and blending with the purpose of making them aware of some of the basic cognitive mechanisms underlying abstract thought. This would also be useful for the students in humanistic subjects (literature).
3. To introduce the class to the fundamental ambiguous concept of infinity the taming of which is a central part of the history of mathematics.

In this chapter, I will focus exclusively upon the mathematical didactical aspects of the project. The project was structured in several parts, where I will only go into details concerning the first part. The first part was subdivided into a general introduction, several workshops, and a concluding session, which incorporated a summary of what they have learned so far.

The introductory part consisted of a general introduction to mathematics and cognition with the emphasis upon conceptual metaphors and blendings and their role in facilitating communication in mathematics.

The workshop part consisted of the students working on various problems using multiple presentations, including a number of problems concerned with infinity.

The concluding session was devoted to a cross curricular investigation of the novel “The Book of Sand” written by Borges (1975).

General Considerations Preceding the Project

To make it possible to work with multiple representations we needed a versatile and user friendly dynamical mathematical software tool. In our school, we have adopted the computer program TI-Nspire™ CAS from Texas Instruments, which is an integrated computer package specifically designed to facilitate the use of multiple representations in mathematics. The program consists of a number of dynamically interactive applications among other subjects offering support for investigations in geometry, statistics, tables, graphing as well as symbolic calculations (hence the

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