

Abstract

This dissertation reports on research examining the characteristics of a new classroom practice of reading mathematical texts. A mathematical text is a short enrichment article that presents a mathematical gem. It seems reasonable that the practice of high school students reading mathematical texts may expand and deepen their mathematical knowledge and proficiencies. In addition, one may claim that developing such expertise, and even the mere experience of reading enrichment texts, may foster an engaged and autonomous learner that participates in an exceptionally vivid mathematical activity. Therefore, this research aims at examining the viability of teaching the reading of mathematical texts to math-major high school students and characterizing the teaching and learning it entails.

Preliminary research examined the manner in which experts read mathematical texts, using the analysis of out-loud reading protocols to delineate the span of actions conducted by experts while reading. Identifying and articulating these practices - which were mainly metacognitive - enabled the setting of precise goals for teaching mathematical texts, and suggested relevant pedagogic instruction tools for achieving them.

Following the above preliminary research and an additional short experience of reading mathematical texts in a math-major senior class, suitable texts were selected; design principles of the new learning environment were formulated and two courses of 9-10 lessons with 3-4 students (who participated voluntarily) were conducted. The documentation of these courses is the main database of this research, which examines the characteristics of teaching and learning in these courses. In addition, following the centrality of experts' sensitivity to their sense of not-understanding, the students' expression and relation to this sense was thoroughly examined.

The results of this research direct attention to three main functions of the teacher's actions: guiding the students to act according to the customary procedures in reading mathematical texts, attending to gaps in the students' knowledge for achieving the most from reading a text, and encouraging the students to be active and initiating the dialogue they conduct with the text and following the text. In addition, it elaborates which of the teacher's actions is contributing to each of them. Furthermore, the results show that the students learnt to read mathematical texts using expert-like strategies, they enriched their mathematical knowledge, enhanced their communicational skills, experienced teamwork, defined their preferences and expressed contentment and appreciation regarding the mathematics they learnt through reading. In addition, the students learnt to identify and express their sense of not-understanding and resolved most of it using appropriate responses they learnt in the course.

The conclusions of this research, as well as the practical experience, accumulated through the design and enactment of the learning environment, may serve as an empirical and research-based foundation

to assist policy-makers in integrating the reading of mathematical texts within the advanced level high school mathematics curriculum.

The language used in this research is the commognitive language; the research questions, data analysis and inferring conclusions are all conducted under the commognitive paradigm as an over-arching theoretical framework.