

# RESEARCH IN MATHEMATICS EDUCATION AND LANGUAGE

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*A synthesis of reasons for the production of this monograph is presented with a focus on contemporary research in the context of the Ninth Congress of the European Society for Research in Mathematics Education. Within the domain of mathematics and language, three lines of concern are addressed: (1) classroom discourse, (2) language diversity, and (3) conceptualization through language. Each line of concern is respectively illustrated by pioneering results from Ruthven and Hofmann, Barwell, and Edmonds-Wathen. An argument is made about the wide scope, depth and richness of this domain as well as the challenges involved in its development.*

**Keywords:** Challenges; Language; Lines of concern; Mathematics education; Research domain

## Investigación en Educación Matemática y lenguaje

*Se presenta una síntesis de razones para la elaboración de este monográfico con atención a la investigación contemporánea en el contexto del Noveno Congreso de la Sociedad Europea de Investigación en Educación Matemática. Dentro del dominio de matemáticas y lengua, se discuten tres líneas de interés: (1) discurso del aula, (2) diversidad lingüística y (3) conceptualización mediante la lengua. Cada línea de interés se ilustra, respectivamente, por medio de resultados pioneros de Ruthven y Hofmann, de Barwell y de Edmonds-Wathen. Se argumentan el amplio espectro, la profundidad y riqueza de este dominio, así como los retos involucrados en su desarrollo.*

**Términos clave:** Dominio de investigación; Educación Matemática; Lengua; Líneas de interés; Retos

In Pytlak, Swoboda and Rowland (2011), Ubuz, Haser and Mariotti (2013), Planas, Chronaki, Rønning and Schütte (2015), and Vondrova and Krainer (2015), we can read about the diversity and richness of contemporary research in mathematics and language. From all these compilations it follows that:

- ◆ the area of study on mathematics education and language is a long-held and traceable reality;
- ◆ the domains in this area are being developed in multiple directions and lines of interest;
- ◆ these domains are rooted in a number of disciplines and intellectual traditions.

The monograph “Research in Mathematics Education and Language” consists of three articles, located respectively in the domains of: i) classroom discourse, ii) language diversity, and iii) conceptualization through language. These related domains are linked to the study of language issues in contexts of mathematical practice, and have for some time been of importance in the international agenda.

The sessions of the Thematic Working Group (TWG) “Mathematics and Language” of the last Congresses of the European Society for Research in Mathematics Education (CERME), for example, have included studies which analyze the discourse in mathematics classrooms on various educational levels, those which examine the effect of languages on school mathematical activity and others which explore grammatical, functional and lexical aspects of the development of mathematical concepts. The articles which make up this monograph were actually presented, in substantially reduced versions, during the 9<sup>th</sup> CERME in February 2015.

In “A Case Study of Epistemic Order in Mathematics Classroom Dialogue”, Kenneth Ruthven and Riikka Hofmann, from the University of Cambridge, UK, develop the construct of *epistemic order*, with the aim of examining the semantic and syntactic structures underlying mathematical interaction in a class session. In their article, the authors pay attention to establishing methodical guidelines in order to explore class interaction in accordance with the adaptation, modification and revitalization of methods contributed by the literature on communication and discourse analysis. They have as close precedents some of the ideas of Mehan, of Coulthard and of Nassaji and Wells. Numerous levels of analysis are articulated in order to access the complexity of discourse in the interaction between students and teacher. The application of each level of analysis provides new meanings to the interaction and it is only on looking at all the levels together that a more complete sense is given to what occurs.

In “Investigating Stratification, Language Diversity and Mathematics Classroom Interaction”, Richard Barwell, from the University of Ottawa, Canada, explores the phenomena of stratification and language diversity in a mathematics classroom from the French-speaking region of Quebec with English as the language of instruction. The interest in understanding the social and political dimension of languages in use leads him to consider the notions of heteroglossia, orders of indexicality and scale-jumping applied to the case of the multilingual mathematics classroom. The analysis of an episode of a primary

class suggests the usefulness of these notions in detecting and understanding stratification processes emerging in the interaction. It is possible to observe how the presence of more than one language is experienced by the participants in different ways, with traceable implications in the course of the mathematical activity referring to valuations of the languages involved and their speakers.

In “A Route Description in Iwaidja: Grammar and Conceptualisation of Motion”, Cris Edmonds-Wathen, from Umeå University, Sweden, and Charles Darwin University, Australia, reports on a study concerning the modes of interpretation and conceptualization of mathematical notions in the Iwaidja language, the majority language in the Minjilang indigenous community in northern Australia. While Ruthven and Riikka and Barwell draw on linguistics and sociology, Edmonds-Wathen takes inspiration from cultural anthropology. The culture and the language of the participants in the study are considered in an inseparable manner in relation to mathematical practice and mathematical notions. To conceptualize the notion of movement, for example, it is explained the role of values associated with this notion in the particular culture and language contexts. Beyond the universal character attributable to mathematical notions, the latter acquires sense and meaning in culturally and linguistically mediated worlds.

The topics discussed in this monograph represent just a fraction of the thought produced by research in mathematics and language. This is an area of study with enormous possibilities. On compiling three articles, we can appraise this in specific rather than general terms. Thus, this monograph will need to be completed at a later date with other volumes which serve to progressively illustrate the area and the amount of reflection and elaboration still needed to adequately solve the problems raised in it.

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