A framework for analysis of students' mathematical meaning making in images

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Students use different semiotic representations when doing mathematics. This paper presents a work in progress that involves the development of a framework for analysing students' multimodal meaning making and communication in mathematics.

Introduction

This presentation is part of a PhD project aiming to investigate what counts as signs of knowledge in primary school mathematics. By synthesising different frameworks for analysis of multimodal and mathematical communication, this study works toward the development of a framework for identifying students' meaning making in mathematical communication, with a special focus on the mode of image.

Background

Solving mathematical problems or doing calculations requires working with semiotic representations (Duval, 2006). In mathematical problem solving students move between different semiotic systems as well as from one semiotic representation to another within a system (Duval, 2006; Lesh, 1981). When students make and communicate meaning, they are using a range of semiotic resources that have become available to them through their schooling as well as through their experiences outside of school. One of the basic assumptions of social semiotics and multimodal analysis is that "meanings are made, distributed, received, interpreted and remade in interpretation through many representations and communicative modes" (Jewitt, 2011, p. 14).

Method

A sample of 300 accounts of mathematical problem solving was collected for analysis. The analysis adopts a multimodal approach in which attention is given to the different modes that students use and to the way these modes are interrelated. A particular focus of this analysis was the mode of image and its relation to the mode of text (for the purpose of this paper *text* is used to refer to written symbols and words). As a way to attend to the different elements of the accounts and concurrently to the account as a whole, units of image and/or text

are identified as nodes (Mavers, 2011). The relative status of the modes is studied using the concepts of independency and complementarity (Martinec & Salway, 2005) and the nature of images is studied using the concepts of iconic and symbolic signs (Machin, 2011).

Preliminary findings

Images and text are co-present in a majority of the accounts. All images are drawings and are of basically three types: 1) iconic drawings for calculation; 2) symbolic drawings for calculation; 3) illustrations that seem to illustrate the problem, parts of the problem or something else. An iconic drawing is something that resembles that which is represented while a symbolic drawing does not. Drawings and text are often complementary. They serve different purposes but are dependent on each other. Independent drawings occur but are often subordinate to text. Individual nodes are separated by distance (white space) or lines enclosing a node. There are several ways to link the nodes.

Discussion

Questions the authors are interested in discussing include: What can be assessed with the help of a framework that attends to the different modes that students use to communicate? What are possible complementary concepts to the suggested framework?

References

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