Does students' knowledge of mode correspond to what textbook tasks afford?

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This presentation discusses the concept mode and includes findings from two studies. One study involved 130 students between the ages of 12 and 13 (school year 6). The students completed an online questionnaire in which they explained the meaning of the term mode and whether or not they thought mode was useful. According to the findings, pupils have a poor conceptual understanding of mode with little linkages to usability. The textbook analysis study involved seven Swedish textbook series. The tasks about mode were analysed based on input and output objects, and transformations. These categories allow for an analysis of the opportunities afforded to students to learn about the mode. Findings suggest that the textbooks do not afford enough possibilities to develop a deep understanding of the mode.

## Introduction

Textbooks are the primary resource to guide decisions about what content to teach and what students should learn about mathematical content (e.g., Glasnovic Gracin, 2018; Rezat & Sträßer, 2015). Furthermore, research shows a connection between students' opportunities to learn (OTL) a specific content and their achievement in learning (e.g., Tarr et al., 2006). The concept mode is commonly perceived as an easy concept, yet research reveals that it can be difficult to grasp (e.g., Groth & Bergner, 2006). In this short presentation, I will contrast what OTL the textbook tasks allow for with what knowledge the students communicate. Examples will be given based on results.

## Theoretical framing

The student responses are analysed in accordance with statistical literacy (Gal, 2004). The following aspects of statistical literacy will be discussed in the short presentation: Mathematical Knowledge (MK), Contextual knowledge (CxK), and Use of Words (UoW) (Landtblom, forthcoming). The theoretical foundation in the textbook analysis proceeds from a framework in which a concept is based on central mathematical ideas that in turn are “built on a set of objects, transformations, and their properties” (Lithner, 2008, p. 261). This will be discussed out of input object (the variable of the dataset), transformation (what is done to the object), and output object (the result of the transformed input object).

## Short communication

Main conclusion comparing the two studies (Landtblom, 2023; Landtblom, forthcoming) is that student responses are related to what OTL the tasks afford. First, many students do not recognise the word *typvärde* (Swedish for mode). This could be explained by tasks frequently asking for what is most popular, etc., rather than asking for the mode. Some students (approximately 20%) who did not recognise the word have created a homonym built on the word *typ*. They explained mode as being an approximate value. Second, most students who know what mode is, give examples with one mode. This is consistent with most of the tasks. The mathematical property that there could be none or more than one mode is hardly treated in both tasks or in definitions (Landtblom, 2018). Third, pupils giving appropriate examples tend to favour quantitative values. Few students demonstrate nominal data awareness. One-fifth of the tasks in textbooks deal with nominal values. We can see from the fact that mode is the only measure of central tendency suitable to nominal values that this attribute requires extra attention in textbook tasks (Landtblom, 2023).

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