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BETWEEN SYMBOLS AND WORDS

Structural connections
in mathematics texts and
their effect on reading

Ulrika Wikström Hultdin

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Fakultetsopponent: Professor Anselm Strohmaier
Institute of Mathematics, University of Education Ludwigsburg, Tyskland.

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Ulrika Wikström Hultdin

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Between symbols and words: Structural connections in mathematics texts and their effect on reading

Abstract

Mathematics texts, being multisemiotic, require readers to integrate content presented through different sign systems. Thus, the organizational structure of these texts becomes important when designing texts for learning. The purpose of this thesis is to build knowledge about the organization of mathematical symbols and written language, and to achieve better understanding of how this organization influences the reading of mathematics texts. The thesis presents a framework of structural connections, ranging from connections where mathematical symbols are integrated into sentences to those based solely on the proximity between two text sequences. An investigation of the prevalence of these connections across mathematics textbooks from different school levels indicated a progression in how texts are organized, with a shift from reliance on proximity connections in early school years towards a preference for symbols interwoven in sentences. This suggests that all students eventually need to navigate texts with symbols interwoven in written language. Some changes were also seen in how symbols were being connected to more detailed meanings conveyed through the written language. Moreover, students' perception of two distinct text designs was investigated: one featuring only sentences with interwoven symbols, the other involving a graphic to highlight key connections between symbols and language. By analyzing gaze measurements and interview material, students' reading processes and experiences with the two text designs were characterized. The results showed that the designs had different advantages. While the graphic drew attention to the connections between symbols and words, facilitating quicker content matching, the symbols interwoven in sentences might provide better access to details. Additionally, on the individual level, there were great variations in both design preferences and how easily texts were read. The main conclusion is that although readers generally prefer text designs that improve readability, the optimal design is dependent on both the reader and the specific context.

Keywords

multimodality, reading mathematics, semiotic resources, text organization, text design, textbooks, disciplinary literacy, inter-semiotic connections, sign systems

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