MATHEMATICS LEARNING & TECHNOLOGY – A STRUCTURAL TOPIC MODELLING

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The role of ICT for mathematics learning has been discussed for years in mathematics education (e.g., Mariotti, 2012), and the pandemic situation has put even more emphasis on the topic. Recent research reviews often focus on a specific technology, a specific goal or process of mathematical learning. We aim to provide a broader picture of the different perspectives on hypothesized and reported effects of technology on mathematics learning by analysing theoretical and empirical research articles.

We searched Web of Science, ERIC, PsycINFO and MathEduc (last search 12/2021) for articles containing the terms "mathematics" and "learning", one technology-related term ("digital technolog*", "educational technolog*", "ict" or "multimedia"), and one term related to effects or processes of learning ("achievement", "effect*", "gain", "mathematic* learning", "outcome", "performance" or "process") in title, abstract or keywords. The search resulted in 652 admissible, peer-reviewed articles that focus on mathematics learning and technology.

Research field, mathematical content, technology, research methods, and grade level were coded for all articles (mean inter-rater reliability: $\kappa = .75$). The articles are analysed using topic modelling techniques (Roberts et al., 2019). Topic modelling is a probabilistic method to assign documents to clusters (topics) based on the co-occurrence of words. A first analysis based on 444 texts yielded 9 different topics. Some topics refer to specific types of technology (blended learning, dynamic visualizations, apps & games, feedback systems), some relate to specific theories (cognitive learning, activity theory) or specific variables (teacher competencies, gender, emotions). International comparison studies emerged as an own topic in the field. The topics in that initial search reflect established research traditions on ICT in mathematics learning. The poster will provide profiles of the topics, e.g., in terms of research methods and contents covered to stimulate a discussion on relations between the topics and on possible "blind spots" in the field.

References

Mariotti, M. A. (2012). ICT as opportunities for teaching-learning in a mathematics classroom: The semiotic potential of artefacts. In T. Y. Tso (Ed.), *Proceedings of PME36* (Vol. 1, pp. 25-40). PME.

Roberts, M. E., Stewart, B. M., & Tingley, D. (2019). stm: An R package for structural topic models. *Journal of Statistical Software*, 91, 1-40.

2022. In C. Fernández, S. Llinares, A. Gutiérrez, & N. Planas (Eds.), *Proceedings of the 45th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 4, p. 366). PME.