A DIGITAL ADAPTIVE LEARNING SYSTEM FOR DIAGNOSTICS AND SUPPORT OF BASIC ARITHMETIC COMPETENCIES

Jingyi Lai[1], Parviz Asghari[1], Lukas Baumanns[1], Alexander Pihl[1], Achim J. Lilienthal[2], Anna L. Simon[1], & Maike Schindler[1]

[1]University of Cologne, [2]Örebro University

Basic arithmetic competencies are a core content of primary mathematics education. However, some students leave primary school without acquiring sufficient basic arithmetic competencies, which then often cascades to greater difficulties in the first years of secondary school (Ehlert et al., 2013). This problem also emerges since, in practice, teachers may lack resources to individually diagnose student difficulties and to provide individual support. The KI-ALF project aims at developing a digital adaptive learning system for diagnosis and support of basic arithmetic competencies, to facilitate individualized diagnostics and support of students with difficulties.

Eye tracking, the recording of students' eye movements, has been proven to provide valuable insights into students' approaches on arithmetic tasks—especially for students with mathematical difficulties (Schindler & Lilienthal, 2018). Therefore, the digital adaptive learning system developed in the KI-ALF project uses eye-tracking data to diagnose and support students in basic arithmetic competencies.

The poster shows the results of a first study with 24 fifth-graders in a German comprehensive school, in which we piloted the digital adaptive learning system. For this purpose, students worked on different kinds of arithmetic tasks on a computer screen, while their gazes were tracked. The tasks involved, for example, quantity recognition in structured representations, number line estimation, as well as addition, subtraction, and multiplication in different representations. In the poster presentation, we will present the digital adaptive learning system as well as the findings on the diagnosis of students' approaches on and difficulties with the basic arithmetic tasks.

Acknowledgment

This project has received funding by the Federal Ministry of Education and Research as a part of the program KI-ALF (01NV2123). The responsibility for the content of this publication remains with the authors.

References

Ehlert, A., Fritz, A., Arndt, D., & Leutner, D. (2013). Basic arithmetic competencies of secondary school students from grades 5 to 7. *Journal für Mathematik-Didaktik*, *34*, 237–263.

Schindler, M., & Lilienthal, A. J. (2018). Eye-tracking for studying mathematical difficulties — also in inclusive settings. In E. Bergqvist, M. Österholm, C. Granberg, & L. Sumpter (Eds.), *Proceedings of the 42nd Conference of the IG PME* (Vol. 4, pp. 115–122). PME.

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. 368). PME.