TECHNOLOGY BASED ASSESSMENT OF EARLY NUMERACY AND LATER MATHEMATICS ACHIEVEMENT

Attila Rausch[1] & Attila Pásztor[2]

[1] Institute of Education, Eötvös Loránd University

[2] MTA-SZTE Research Group on the Development of Competencies

Since later mathematics achievement is predicted by early numerical skills (Jordan et al., 2009), it is essential to measure and develop these skills at school entry. Due to the rapid technological development technology-based assessments can be realized with younger students as well (Csapó, Molnár, & Nagy, 2014). However, while reliability and construct validity of these new online tests can be checked instantly, we know little about their predictive validity. We aim to compare the results of a technology-based early numeracy assessment at school entry with later mathematics achievement.

4277 first grade students participated in our study, their mean age was 7.09 at the first assessment. The online early numeracy test comprised of 40 items. Its reliability (Cronbach's alpha=.89) and structural validity (χ^2= 5089.56; p<.001; CFI=.928) were verified (Mean=82.6%p; SD=15.5%p). The online mathematics achievement test with 3 subtests (mathematical thinking, application, and discipline) comprised of 50 items (Cronbach's alpha=.94; Mean=50.0%; SD=22.8%). Early numeracy test was administered in computer laboratories of primary schools. in during first months of school, and it was followed by the mathematics achievement test six month later.

We found positive correlation between the online early numeracy test and the mathematics achievement test (r=.53; p<.001). The results of structural equation modelling showed that early numerical skills have significant effect on later mathematics achievement (standardized regression coefficients=.63). Model fit was good (χ^2= 363.41; p<.001; CFI=.972). Results of our study showed that our online early numeracy test is a reliable and a valid instrument in terms of construct and predictive validity. Due to the advantages of technology-based assessment such as automatic scoring or group testing our online instrument could be used in everyday school practice for identifying learning difficulties in early mathematics.

References

Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early Math Matters: Kindergarten Number Competence and Later Mathematics Outcomes. *Developmental psychology*, *45*(3), 850-867.

Csapó, B., Molnár, Gy., & Nagy, J. (2014). Computer-based assessment of school readiness and early reasoning. *Journal of Educational Psychology*, *106*(3), 639−650.

In E. Bergqvist, M. Österholm, C. Granberg, & L. Sumpter (Eds.). Proceedings of the 42nd Conference of the International Group for the Psychology of Mathematics Education. p. 145. Umeå, Sweden: PME.