

Within the Vygotskian perspective, the role of the adult (teacher) is to guide the intellectual development of learners by providing learning targets and means to achieve them. The research we analyzed and summarized here suggests the great potential of young children for the development of important elements of algebraic thinking. We believe that relational and algebraic thinking can be one of the interesting targets in early education.

References

- Kieran, C. (2004). Algebraic thinking in the early grades: What is it. *The mathematics educator*, 8(1), 139–151.
- Pasnak, R., Kidd, J. K., Gadzichowski, M. K., Gallington, D. A., Sar-cina, R. P., & Addison, K. T. (2009). Promoting early abstraction to promote early literacy and numeracy. *Journal of Applied Developmental Psychology*, 30(3), 239–249.
- Polotskaia, E., Anwandter-Cuellar, N., & Savard, A. (2019). *La réussite en mathématiques au secondaire commence à la maternelle: Synthèse des connaissances sur les pratiques d'enseignement des mathématiques efficaces à la maternelle et au primaire pour réussir l'algèbre du secondaire*. Rapport au MEQ.
- Radford, L. (2012). Early algebraic thinking: Epistemological, semiotic, and developmental issues. *12th International Congress on Mathematical Education* (pp. 675–694). Seoul: Seoul National University.
- Squalli, H., & Bronner, A. (2017). Le développement de la pensée algébrique avant l'introduction du langage algébrique conventionnel. *Nouveaux cahiers de la recherche en éducation*, 20(3), 1–8.


FALEDIA - DESIGN OF A DIGITAL CASE-BASED LEARNING PLATFORM FOR PRIMARY PRE-SERVICE TEACHERS

Lara Huethorst, Meike Böttcher, Daniel Walter,  Annabell Gutscher, Christoph Selter, Andreas Bergman, Tabea Dobbrunz and Andreas Harrer

Abstract

The poster will illustrate the current status of the design of a digital, case-based learning platform (FALEDIA), which is being iteratively designed and researched later on with the goal to increase the diagnostic skills of pre-service teachers. In an interdisciplinary team consisting of researchers from mathematics education and computer science, digital learning modules on central topics of arithmetic in primary school are designed and implemented in university courses.

Keywords: digital learning platform, case-based, diagnostic skills, place value understanding, understanding of operations

 University of Münster, Germany; e-mail: d.walter@uni-muenster.de

Theoretical background

‘Diagnostic skills’ are considered a key skill that all teachers should have in order to be able to provide individual support in (mathematics) lessons (cf. Schulz, 2014). They are here understood as validly recording the learning status, difficulties and possible backgrounds on the basis of learners' statements (*diagnostic depth of focus*, e. g. Prediger et al., 2013).

In order to prepare pre-service teachers to diagnose the learning levels of children and, based on this, to take appropriate support measures, case-based learning is of decisive importance (cf. Syring et al., 2016). One of the reasons for this is that the complexity of pedagogical actions can already be indicated by working on cases during teacher training at university (cf. Frommelt, Hugener & Krammer, 2019).

When analysing the cases, the pre-service teachers – unlike in classroom practice – are not exposed to any immediate pressure to act. Accordingly, it is possible to repeatedly work through a case and, thus, adopt different perspectives and gain knowledge for diagnostic skills.

Design of the FALEDIA learning platform

The FALEDIA learning platform includes two separate pages for the same content. One version presents the content with only informative elements (*worked-examples*) while the other one includes elements to stimulate exploration (*problem-based learning*). Each will be briefly presented in the following.

Worked examples only	Including interactive modules
Well-structured examples are presented, largely without learners' self-activity (Renkl, 2017)	The learners' own activity is encouraged and accompanied, for example, by tutorial systems (Koedinger & Anderson, 1997)
Explanatory video concerning the connection of different representations	Sorting into groups whether the representation matches a certain task
Tabular presentation of the multiplicative basic mental model giving exemplary contexts	Sorting different contexts to the multiplicative basic mental model which were unknown before
Explanatory audio file including an audio file of a pupil explaining her train of thoughts while using mathematical laws	Linkage of single-choice tasks concerning an audio file of a pupil explaining her train of thoughts while using mathematical laws

Table 1: Work-examples only and included learning models in comparison

The poster will show the different implementations for an exemplary content and present first research results.

References


- Frommelt, M., Hugener, I., & Krammer, K. (2019). Fostering teaching-related analytical skills through case-based learning with classroom videos in initial teacher education. *Journal for educational research online*, 11(2), 37–60.
- Koedinger, K. R., & Anderson, J.R. (1997). Intelligent Tutor goes to school in the big city. *International Journal of Artificial Intelligence in Education*, 8, 30–43.
- Prediger, S., Wessel, L., Tschierschky, K., Seipp, B., & Özdil, E. (2013). Diagnose und Förderung schulpraktisch erproben - am Beispiel Mathematiklernen bei Deutsch als Zweitsprache. In S. Hußmann & C. Selzer (Eds.), *Diagnose und individuelle Förderung in der MINT-Lehrerbildung. Das Projekt dortMINT* (pp. 171–192). Münster: Waxmann.
- Renkl, A. (2017). Learning from worked-examples in mathematics: students related proceduresto principles. *ZDM Mathematics Education*, 49, 517–584.
- Schulz, A. (2014). *Fachdidaktisches Wissen von Grundschullehrkräften*. Wiesbaden: Springer.
- Syring, M., Bohl, T., Kleinknecht, M., Kuntze, S., Rehm, M., & Schneider, J. (2016). Fallarbeit als Angebot—Fallbasiertes Lernen als Nutzung. Empirische Ergebnisse zur kognitiven Belastung, Motivation und Emotionen bei der Arbeit mit Unterrichtsfällen. *Zeitschrift für Pädagogik*, 62, 86–108.

REFINEMENT OF THE PROCESSUAL GENERIC MODEL

Anna Kuřík Sukniak and Darina Jirotková 

Abstract

The poster presents the results of researches that have recently enriched the Theory of generic model (Hejný, 2012) by one stage. The theory models the process of gaining knowledge in mathematics and comes out of the ideas of Piaget's genetic epistemology and his description of cognitive development through developmental stages (Piaget & Garcia, 1989). The Theory of generic models (TGM) has been gradually developed by M. Hejný in cooperation with several research teams since mid-20th century. In our research, TGM is used as the basis for analysis and interpretation of pupils' thinking processes. During in-depth analyses of several pupils' cognitive processes and their comparisons the first author discovered that sometimes there is one more step in the first stage of the cognitive process that has not yet been described. Pupils were solving a problem leading to the discovery of the relationship between two series of numbers and to generalization. The poster will present four pupils' solutions. The pupils' thinking thought processes will be interpreted with TGM at the background.

 Charles University, Czech Republic; e-mail: darina.jirotkova@pedf.cuni.cz