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Cultural Historical Activity Theory-related Research

My primary focus within Cultural Historical Activity Theory, (CHAT), lies in exploring the development and enhancement of teaching practices, particularly in the realm of mathematics education at the primary school level, through collaborative research with educators. Over the past two decades, my research has been deeply intertwined with the theoretical framework of developmental education and learning activity put forth by Daniil B. El'konin and Vasili V. Davydov.

El'konin and Davydov's theoretical principles on learning activity, as a specialised form of activity within the broader framework of activity theory, assume that real learning occurs when students experience a need and a motive to learn. Learning activity is not an institutional form of activity but temporal and occur when and if the students develop a need and a motive to learn. However, El'konin identified learning activity as the leading activity for children in the early school years. And even if learning activity is not a leading activity of teenagers and adults' lives, it is quite possible to organise teaching so that they become an agent in a learning activity, that is developing a need for new knowledge. Building upon Vygotsky's theories, learning activity serve as a model for organising teaching and content, particularly facilitating collective learning activities within the zone of proximal development (ZPD).

Davydov, drawing from Vygotsky's principles, advocated for an approach to teaching mathematics that begins with abstract, theoretical concepts and, once established, to explore them further in concrete situations —an approach often termed "ascending from the abstract to the concrete." This principle, integral to promoting a robust mathematical understanding, particularly emphasizes algebraic thinking. In recent years, there has been a growing consensus among researchers regarding the importance of cultivating algebraic thinking skills among young students.

In collaboration with esteemed colleagues such as mathematician Sergey Gorbov and educator Natalia Tabachnikova, Davydov developed a comprehensive mathematical curriculum. This curriculum was largely developed in a researcher-teacher collaboration at School No. 91, among others schools. Jean Schmittau played a pioneering role in introducing Davydov's curriculum to Western educational contexts.

However, the transferability of a curriculum developed within one cultural context to another presents significant challenges. As Schmittau and others have pointed out, cultural traditions must be carefully considered in any implementation attempt. Common challenges include discrepancies in teachers' perceptions regarding the timing of introducing a theoretical content as algebra. Additionally, there is reliance on traditional textbooks.

To address such implementation challenges, my research has focused on conducting small-scale developmental research projects in collaboration with teachers. These projects involve mostly iterative testing of individual tasks or series of tasks, with a particular emphasis on analysing the tools and communicative

strategies employed. For instance, in a three-year project targeting algebraic reasoning capabilities across different grade levels, we utilised the framework of learning activity to design and analyse tasks and iteratively refined and tested these tasks in various classroom settings. The youngest students were in first grade (appr. 7 years old) and the oldest students attended the first year of upper secondary education (appr. 16 years old).

Presently, I am leading a three-year research project aimed at developing a professional support framework for promoting understanding of the Positional Notation System (PNS) among K–3 students. Building upon Davydov’s learning activity, this project seeks to create a cohesive framework of tasks, tools, and theoretical principles. By adapting and trialling a selection of tasks originally developed by Davydov and his colleagues, we aim to provide teachers with the tools and principles to invite students into a learning activity around PNS. In the original material there are tasks that are more or less clearly aimed at PNS while other tasks are aimed at other aspects of mathematical knowledge. Also, in this project we work on what can help teachers to create teaching situations where students develop agency and motivation to explore specific content - that is, they engage in a learning activity.

To summarise, my research is mainly based on a collaboration with teachers where we iteratively develop teaching based on cultural-historical activity theory. By addressing implementation challenges through small-scale development projects, we aim to promote meaningful learning experiences of algebraic thinking for students in diverse cultural and educational contexts.

References

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