

Coherence of discourses of asymptote in the university transition

Ana Katalenić¹, Aleksandra Čižmešija², and Željka Milin Šipuš³

¹J. J. Strossmayer University of Osijek, Croatia, akatalenic@foozos.hr; ²University of Zagreb, Faculty of Science, Croatia

INTRODUCTION

The notion of asymptote appears across different educational levels and mathematical domains. It developed from geometry, through calculus, into the notion of asymptotic behaviour in numerical and asymptotic analysis (Katalenić et al., 2021). Hence discourses of asymptotes in transition between educational levels should be coherent, that is, aligned and increasing in complexity.

Previous research showed that issues with discourses of asymptote emerge in particular educational settings (Berger & Bowie, 2012; Dahl, 2017; Katalenić et al., 2022; Mpofu & Pournara, 2018), some of them persisting with different participants – secondary and university students and practising teachers. This study investigated discourses of asymptote in a broader mathematical context and in the transition from upper secondary to university education.

FRAMEWORK AND METHODOLOGY

We used the Anthropological theory of the didactic (ATD) (Chevallard, 1999) and Commognition theory (Sfard, 2008) to examine discourses of asymptote in different settings covering; (1) upper secondary mathematics textbooks, (2) university students' answers to questionnaires, and (3) academic mathematicians' answers in interviews on discourses of asymptotes. Commognition theory enabled us to scrutinize the observed discourses and the ATD to compare them across institutional settings.

RESULTS AND DISCUSSION

Several discourses of asymptote emerged in our study of (1) and (2). They were content specific, separated from practice and incoherent across different settings. Mathematicians from (3) held different ideas about endorsing emerged discourses (Table 1). For example, the discourse of asymptote as a tangent line to the curve at the infinite point emerged in an analysed textbook and as an informal narrative in students' answers. However, it was endorsed only by an expert in geometry.

Emerged discourses of asymptote	Endorsement
Asymptote of a curve is its tangent line at the infinite point.	Rejected/Endorsed
Asymptote of a curve is a line that the curve approaches but does not intersect or touch.	Conditionally endorsed/Endorsed
A line is an asymptote of a curve if the distance from the curve to this line tends to zero as points on the curve move away from the origin of the coordinate plane.	Endorsed

Table 1: Discourses of asymptote emerged from secondary textbooks and questionnaires with university students and their endorsement from interviews with mathematicians

CONCLUSION

The study of asymptotes should be appropriate and representable in mathematical and educational context. Based on the results of our study, we propose the development of discourses of asymptote in the transition from the upper secondary and across the university education. The discourses that we suggest are coherent across settings, increasing in complexity and aligned with the notion of asymptotic behaviour in applied mathematics.

POSTER DESIGN

The poster will be focused on different aspects of discourse of asymptote in mathematics, results from literature review, methodology and results of our study, and suggestions for attaining coherence of discourses of asymptote. When appropriate, we will use diagrams, figures and tables to present the course of the study.

Keywords: teaching and learning asymptote, transition from secondary and across university mathematics, Anthropological theory of the didactics, Commognition theory.

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