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Conceptual structure of the accumulation function in an interactive and multiple-linked representational environment.

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Summary: In light of the recent growing interest in conceptual learning and teaching of calculus, and especially with the focus on using technological environments, our study was designed to explore the learning processes and the role played by multiple-linked representations and by interactive technological environment in objectifying the accumulation function. The study focuses on 13 pairs of 17-year-old students familiar with the concept of differentiation but not of integration. The study was inspired and guided by semiotic mediation theory, which considers artefacts to be fundamental to cognition and views learning as a process of becoming aware of the knowledge that exists within a cultural context. Students were asked to explain the possible connection between multiple-linked representations: the function graph, the accumulation function graph, and the table of values of the accumulation function. We include three types of analysis representing the mathematical elements involved in the students' learning path of the accumulation function, and the students' interactions with the artefact. The data analysis identified four phases in the processes of objectification. We describe a conceptual structure that typifies the learning of the accumulation function concept in an interactive, multiple-linked representation environment.

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