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Signifying the accumulation graph in a dynamic and multi-representation environment.

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Summary: The present study focuses on the accumulation process involved in the integration of a single-variable function. Observing the work of two high-school calculus students who had not yet learned any other integral-related ideas, we analyze the emergence of the semiotic relationship between personal and mathematical meanings, as expressed through the understanding of mathematical signs in integration tasks. Adopting Radford's educational perspective whereby learning is defined as a process of objectification, we identify a three-stage evolution of the double semiotic meaning of the lower boundary and of its role in the definition of the accumulation graph: (1) objectifying a zero accumulation in relation to the lower limit, (2) objectifying zero as marking the zero sum of accumulated areas, and (3) objectifying the accumulation graph as dependent on the lower-limit value. This evolution is marked by semiotic changes related to the pivotal role of the "zeros" in the accumulation graph.

Classification: I54 C34 R24 U24

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