

ZMATH 2016b.00957

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Communicational approach to study textbook discourse on the derivative.

Educ. Stud. Math. 91, No. 3, 395-421 (2016).

Summary: This paper investigates how three widely used calculus textbooks in the U.S. realize the derivative as a point-specific object and as a function using Sfard's communicational approach. For this purpose, the study analyzed word-use and visual mediators for the *limit process* through which the derivative at a point was objectified, and word-use and visual mediators for the *derivative process* through which the derivative as a function was objectified. The analysis highlighted inconsistency in realizations of the limit process and object, and derivative process and object found in some instances, and implicit discussion on relations among different visual mediators. Specifically, the results of this study led to four observations about issues suggested by one or more of the textbooks: a) visual mediators of the initial and final objects, and the visual mediators of these processes were often inconsistent; b) transformations of visual mediators from initial object, through process, to final object were often implicit both in one visual mediator and across multiple visual mediators; c) visual mediators for the limit processes were sometimes disconnected from the initial and final objects, or the connections were not explicit; and d) realizations of both the derivative at a point and the derivative of a function were mediated with nearly identical symbols suggesting a possible difficulty with understanding the difference between them.

Classification: U20 I40

Keywords: calculus; function; derivative; textbooks; communicational approach

doi:10.1007/s10649-015-9655-6