Investigating Backward Transfer Effects in High School AP Calculus Students’ Knowledge of Derivatives

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Abstract

The derivative is a fundamental concept in calculus. Unfortunately, many studies have shown that students have trouble understanding derivatives. Few studies have investigated how learning about other calculus topics affects students’ understandings of the derivative. In this study, qualitative methods were used to investigate the influence that learning about integration has on three high school AP calculus students’ prior understandings of derivatives. Semi-structured task-based interviews were conducted with participants before and after learning about integration and classroom observations were conducted in between the interviews. The interviews and classroom observations were analyzed for backward transfer (BT) effects, which are defined to be influences that learning new knowledge has on one’s ways of reasoning about previously encountered topics (Hohensee, 2014). A productive BT effect is defined to be an influence that results in a learner’s reasoning of a prior concept becoming increasingly connected to the structural core of that concept. Alternatively, an unproductive BT effect is defined to be an influence that results in a learner’s reasoning of a prior concept becoming less connected to the structural core of that topic. Both productive and unproductive BT effects were uncovered in this study. Therefore, learning about integration is a potential reason for why students have trouble understanding derivatives, but can also help students develop fuller understandings of derivatives.

Keywords: transfer, backward transfer, calculus, derivatives, learning