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Computer graphics as an instructional aid in an introductory differential calculus course.

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Summary: Mathematicians in general claim that the Computer Algebra Systems (CAS) provide an excellent tool for illustrating calculus concepts. They caution, however, against heavy dependency on the CAS for all computational purposes without the mastery of the procedures involved. This study examined the effect of using the graphical and numerical capabilities of Mathematica as a supplemental instructional tool in enhancing the conceptual knowledge and problem solving abilities of students in a differential calculus course. Topics of differential calculus were introduced by the traditional lecture method to both the control and experimental groups comprised of students enrolled in two sections of the Business and Life Sciences I course. Mathematica was used only by the students of the experimental group to reinforce and illustrate the concepts developed by the traditional method. A content analysis was conducted using the qualitative data obtained from students' explanations of the derivative of a function. The quantitative data, the students' test scores, were analyzed using ANCOVA. The results showed that students in the experimental group scored higher than students in the control group on both the conceptual and the computational parts of the examination. The qualitative analysis results revealed that, compared to the control group, a higher percentage of students in the experimental group had a better understanding of the derivative.

Classification: I25 R25 D45

Keywords: computer algebra systems; computer graphics; numerical computation; supplemental instructional tool; black-box syndrome; first year students; non-mathematics majors; graph of a function; empirical investigations