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Optimization in first semester calculus: a look at a classic problem.

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Summary: Optimization problems in first semester calculus have historically been a challenge for students. Focusing on the classic optimization problem of finding the minimum amount of fencing required to enclose a fixed area, we examine students' activity through the lens of Tall and Vinner's concept image and Carlson and Bloom's multidimensional problem-solving framework. We are particularly interested in students' evoked concept images for the mathematical concepts that play a role in the construction of the function whose minimum is needed. Data analysis revealed several gaps in students' understanding of the optimization process. We highlight the mathematical concepts that play a role in these gaps, focusing on variables, function notation, function composition, properties of rectangles and the relationships between them, the role of the optimizing function, and the graphical representation of the function.

Classification: N65 I45 C35

Keywords: calculus; optimization; concept image

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