

HOW CAN STUDENTS' ABILITY TO DEAL EFFECTUALLY WITH CALCULUS SYMBOLISM BE ENHANCED?

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This paper is based on results of a research project on first-year university students' understanding of fundamental calculus concepts and on ongoing research on teaching strategies that may assist students in their efforts to develop a conceptual understanding of calculus content (concepts, symbols, algorithms etc.). In the ongoing research on classroom-based factors that may be key contributors to students' understanding of calculus content, the results of the initial research project are utilised.

The analysis of students' written and verbal responses to test items revealed significant information regarding the nature and characteristics of students' knowledge and understanding of calculus content (Bezuidenhout, 1998; Bezuidenhout, 2001). The ability to interpret a symbolic representation of a mathematical concept as representing both a process and an object, and to move between the two interpretations in a flexible way, reflects an understanding of the symbol that is involved. A student's tendency to focus on superficial aspects of symbols and to ignore the meanings behind the symbols, or to manipulate symbols blindly, may mainly be due to the absence of process and object conceptions that are required to deal with symbols in flexible and meaningful ways. Various examples from this study indicate that if the meaning behind a symbol is disregarded, mathematically unreasonable answers may be produced and that those students may be quite satisfied with such unreasonable answers.

This paper deals with students' interpretations of some symbolic representations and proposals concerning mathematical tasks and teaching strategies that prove to be effective in assisting students to develop reliable conceptions of symbolic notations in calculus. It is suggested that students' ability to interpret a mathematical symbol as representing both a process and an object is more likely to develop if it is the direct focus of teaching rather than if the development is left to chance. If mathematics educators comprehend students' understanding, they can develop specific mathematical tasks and teaching strategies to assist students in dealing with limitations in their understanding of mathematical symbols.

References

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