

**DEVELOPING CONTEXTUAL-AND-GRAPHING-ACTIVITY-
BASED LEARNING CYCLE UNIT TO ENHANCE STUDENTS'
UNDERSTANDING OF THE FUNDAMENTALS OF CALCULUS
AND THE RELATIONSHIP BETWEEN DIFFERENTIATION AND
INTEGRATION**



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ABSTRACT

Calculus is one of the greatest achievements of human intellect and demonstrates the power to illuminate the most fundamental problems in mathematics, physical sciences, biological sciences, and engineering. Calculus can reduce complicated problems to simple rules and procedures by using symbols and notations. However, use of symbols and notations might lead to losing the original pictures of the problems. Despite its importance, the teaching of introductory calculus always emphasizes manipulation of algebraic notations and rote learning. Students memorize algebraic procedural steps rather develop conceptual understanding. Most students learn the how instead of the why of calculus due to extensive use of algebraic symbols and notations. The real meanings of symbols and notations learned in the classroom are not interpreted explicitly in the context of real world situations.

To address this issue, contextual and graphing activities based on the learning cycle approach were developed to enhance students' conceptual understanding of the fundamentals of calculus and the relationship between differentiation and integration. Experimentally real activities for students were developed to convey the concepts of the fundamentals of calculus realistically and then represented in the form of graphs. The study was conducted with eleventh grade students in the south west of Bhutan.

The experimental group results showed that the developed learning units significantly improved the students' conceptual understanding of the fundamentals of calculus and the relationship between differentiation and integration and they also showed positive attitude towards the developed learning units.

KEY WORDS: CALCULUS/ DIFFERENTIATION/ INTEGRATION/ LEARNING
CYCLE/ CONTEXTUAL AND GRAPHING ACTIVITIES

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