

Evaluating the Understanding of the University Students (Basic Sciences and Engineering) about the Numerical Representation of the Average Rate of Change

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Abstract : The present study aimed to evaluate the understanding of the students in Tehran universities (Iran) about the numerical representation of the average rate of change based on the Structure of Observed Learning Outcomes (SOLO). In the present descriptive-survey research, the statistical population included undergraduate students (basic sciences and engineering) in the universities of Tehran. The samples were 604 students selected by random multi-stage clustering. The measurement tool was a task whose face and content validity was confirmed by math and mathematics education professors. Using Cronbach's Alpha criterion, the reliability coefficient of the task was obtained 0.95, which verified its reliability. The collected data were analyzed by descriptive statistics and inferential statistics (chi-squared and independent t-tests) under SPSS-24 software. According to the SOLO model in the prestructural, unistructural, and multistructural levels, basic science students had a higher percentage of understanding than that of engineering students, although the outcome was inverse at the relational level. However, there was no significant difference in the average understanding of both groups. The results indicated that students failed to have a proper understanding of the numerical representation of the average rate of change, in addition to misconceptions when using physics formulas in solving the problem. In addition, multiple solutions were derived along with their dominant methods during the qualitative analysis. The current research proposed to focus on the context problems with approximate calculations and numerical representation, using software and connection common relations between math and physics in the teaching process of teachers and professors.

Keywords : average rate of change, context problems, derivative, numerical representation, SOLO taxonomy

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