

Investigating the Dynamics of Knowledge Acquisition in Learning Using Differential Equations

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Abstract : A mathematical model for knowledge acquisition in teaching and learning is proposed. In this study we adopt the mathematical model that is normally used for disease modelling into teaching and learning. We derive mathematical conditions which facilitate knowledge acquisition. This study compares the effects of dropping out of the course at early stages with later stages of learning. The study also investigates effect of individual interaction and learning from other sources to facilitate learning. The study fits actual data to a general mathematical model using Matlab ODE45 and lsqnonlin to obtain a unique mathematical model that can be used to predict knowledge acquisition. The data used in this study was obtained from the tutorial test results for mathematics 2 students from the Central University of Technology, Free State, South Africa in the department of Mathematical and Physical Sciences. The study confirms already known results that increasing dropout rates and forgetting taught concepts reduce the population of knowledgeable students. Increasing teaching contacts and access to other learning materials facilitate knowledge acquisition. The effect of increasing dropout rates is more enhanced in the later stages of learning than earlier stages. The study opens up a new direction in further investigations in teaching and learning using differential equations.

Keywords : differential equations, knowledge acquisition, least squares nonlinear, dynamical systems

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