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Investigating the Dynamics of Knowledge Acquisition in Undergraduate Mathematics Students Using Differential Equations

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Abstract : The problem of the teaching of mathematics is studied using differential equations. A mathematical model for knowledge acquisition in mathematics is developed. In this study we adopt the mathematical model that is normally used for disease modelling in the teaching of mathematics. It is assumed that teaching is 'infecting' students with knowledge thereby spreading this knowledge to the students. It is also assumed that students who gain this knowledge spread it to other students making disease model appropriate to adopt for this problem. The results of this study show that increasing recruitment rates, learning contact with teachers and learning materials improves the number of knowledgeable students. High dropout rates and forgetting taught concepts also negatively affect the number of knowledgeable students. The developed model is then solved using Matlab ODE45 and \verb"lsqnonlin" to estimate parameters for the actual data.

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