

DEVELOPING STUDENTS' MATHEMATICAL THINKING THROUGH TECHNOLOGY

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Research has shown that the appropriate use of technology can transform the traditional mathematics classroom into a dynamic learning environment where the student is actively engaged in constructing mathematical concepts and knowledge. There are a plethora of technological tools which can enable students to explore and discover mathematical concepts. These include Dynamic Geometry Software (DGS), graphics calculators, spreadsheets and Computer Algebra Systems (CAS). Because of these tools, the emphasis in the mathematics classroom has shifted from memorising procedures and techniques to conjecturing, meaningful problem solving and developing mathematical reasoning. These technologies provide numerous advantages. They enable the student to explore mathematical ideas graphically, symbolically and numerically. They can be used as pedagogical tools to extend student's mathematical thinking and provide possibilities in mathematical modelling activities. Their ability to effectively take over tedious calculations and algorithmic procedures reduces cognitive load on the student and enables her to focus on developing mathematical insight.

This presentation will focus on how an appropriate combination of CAS and graphics calculators along with paper-pencil tasks can be used to develop student's mathematical thinking. Some examples of technology enabled explorations by students at the higher secondary school level will be used to highlight how such tools can enhance visualization of concepts, give students access to higher level concepts and lead to a rich and motivating environment for exploring mathematical ideas. The presentation will also illustrate students' explorations of some interesting applications of school mathematics to topics such as cryptography, genetics, estimating π (Buffon's Needle problem) and fractal patterns in the complex plane. It will be shown that the appropriate use of technology can help students in their investigations giving them control over what they are learning and also help to create a balance between conceptual and procedural knowledge.

Keywords: Computer Algebra Systems, graphics calculators, technology enabled explorations, mathematical modelling, applications of school mathematics, conceptual knowledge, procedural knowledge, mathematical thinking