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Enhancing Students' Interest in Algebra

Mark Prendergast, John O'Donoghue
University of Limerick, Limerick, Ireland

Background

The poor uptake of Higher Level Junior and Senior Cycle (lower and upper secondary education) mathematics is one of the main concerns regarding mathematics education in Ireland at present. In 2009, figures show that only 43 % of the Junior Cycle cohort took the Junior Certificate Higher Level mathematics' examination (SEC, 2009). More worryingly only 16 % opted for the Higher Level Leaving Certificate examination (SEC, 2009). These low numbers have serious implications for the follow on study of mathematics at degree level. Third level institutions have expressed concern as this does not just affect mathematics courses, but also imposes on other courses where mathematics provides an important basis for development. Indeed, such a decline in mathematical ability has far reaching consequences for Ireland's future. An adequate supply of people with mathematical, science and ICT skills is crucial to the country's social and economic development (EGFSN, 2008).

Undoubtedly, the problem can be linked back to the comparatively smaller number base of Junior Certificate students in Higher Level mathematics. In order to meet the future needs of the economy a greater number must sit Higher Level for the Junior Certificate. 'Project Maths' (a new curriculum and assessment initiative currently underway in post-primary mathematics education in Ireland) has targeted this number to be in the region of 60 % of the cohort (www.projectmaths.ie).

There are many possible reasons for such low numbers taking Higher Level. However, the completion of an extensive literature review by the authors has identified a poor quality of teaching and a subsequent lack of student interest in mathematics as the dominant factors. This poor quality of teaching is the consequence of an over reliance on traditional methods. Teachers have become dependent on an informal behaviourist style of education with a focus on rote learning and instrumental understanding. Accordingly, current research shows that 52 % of Irish students are not interested in things they learn in mathematics and are unable to link what they have learned to everyday life (PISA, 2003).

Towards this end, this paper is concerned with designing, implementing and evaluating an effective teaching intervention which stimulates and maintains students' interest in mathematics using the topic of algebra as an exemplar. This topic has been specified as Chief Examiner reports of the past ten years have shown that Irish student performance on algebra has shown little of no improvement.

Research Questions

The key research questions concerning the intervention are:

- What are the factors that contribute to mathematics teaching that maintains student interest, value and enjoyment at Junior Cycle level?
- How can these factors be integrated into the design of an exemplar teaching intervention in Junior Cycle algebra?
- How can one evaluate such a teaching intervention?
- How can this successful teaching intervention be translated into effective CPD for mathematics teachers?

Methods

A qualitative approach was adopted in the design of the intervention. Such an approach consisted of an extensive literature review of both national and international documents and research articles concerned with the area of effective classroom practice in mathematics (NCCA, 2005a; NCCA, 2005b; TIMSS, 1995, 1999, 2000; OECD, 2003). Literature was also examined regarding approaches to improving student's interest in mathematics (Hidi, 2000, 2006; Hidi and Renninger, 2006; Del Favero et al., 2007). In addition, the topic of algebra was investigated in detail (Stacey, Chick, and Kendal, 2004; Kieran, 1996, 2001, 2004; Bednarz, Kieran and Lee, 1997). Such an extensive literature review informed the direction of the intervention and also influenced the key research questions. Subsequently the authors examined best practices for developing a teaching intervention. Theoretical and conceptual frameworks have been identified.

Frame

Two frameworks, theoretical and conceptual influenced the design of the intervention programme to be implemented with second level mathematics teachers. These frameworks will be discussed individually in the paper and will be utilised for developing the intervention programme specific to Algebra and improving interest in mathematics at Junior Cycle education.

Research findings

Provided the evaluation reaches a successful conclusion, an attempt will be made to model the intervention into an effective CPD programme. Access to the intervention will be provided to more schools and teachers. Support networks for teachers using the intervention will also be put in place. In addition the intervention frameworks may be used to apply similar interventions to different topics in mathematics and indeed other subjects