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The attainment of English secondary school students: a 30-year comparison

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Background

In England over the past 30 years there have been various large-scale national initiatives directed at improving mathematics teaching and raising attainment, including the National Curriculum, the introduction of National Testing at age 7, 11 and 14, and the Primary and Secondary National Strategies. During this period examination results have shown steady and substantial rises; for example, the proportion of 16 years olds achieving grade C or above at GCSE has risen from 45% in 1992 to 57% in 2009. However, independent measures of attainment suggest that that these rises may be due more to "teaching to the test" than to increases in genuine mathematical understanding (e.g., Shayer & Ginsberg, 2009).

Research Questions

In this paper, we report and discuss findings of the Increasing Student Competence and Confidence in Algebra and Multiplicative Structures (ICCAMS) study regarding students' attainment, comparing these findings to 30 years ago. We update our earlier analysis based on a partial sample (Hodgen et al, 2009). Additionally, we extend this analysis to a consideration of the inter-relationship between students' understandings in algebra and multiplicative reasoning together with an analysis of students' errors.

Methods

Over two summers in 2008 and 2009, tests were administered to a sample of approximately 6000 students across Key Stage 3 (KS3) from 19 schools randomly selected using the MidYIS database (Tymms & Coe, 2003). The composition of this group is representative of the English population, as was the sample used in the 1970s, allowing a comparison with students' understandings over the 30-year period.

The CSMS tests were designed and trialed during the mid 1970s, starting with diagnostic interviews, and the final versions were administered in 1976 and/or 1977. The focus was on conceptual understanding and application, although for completeness a very small number of items were designed to assess mathematical procedures. In the original CSMS data analysis in the 1970s, items were selected from each test to form a series of hierarchical levels of difficulty. The analysis is conducted using the methods adopted in the original CSMS study. In addition, the survey analysis draws on theories of assessment e.g. the Rasch model as both a model of performance and a method of quantitative analysis (Williams and Ryan 2007).

Frame

The analysis draws on Phase 1 of the study, which consists of a large-scale survey of the attainment of 11-14 year olds in algebra and multiplicative reasoning. The survey uses tests of algebra, decimals and ratio developed during the 1970s in the Concepts in Secondary Mathematics and Science (CSMS) study (Hart, 1981). Although the tests were designed in the mid-1970s they are still very relevant to the current national curriculum and national assessment in England. Indeed, the CSMS results were influential in the construction of the National Curriculum (Brown, 1996).

Research findings

The major conclusion is that attainment has changed very little across the 30-year period. In many cases success rates of questions in 2008 remain very similar to what they were in 1976 and 1977, and there is very little change in the order of difficulty of different questions. There is little evidence for the sort of step-change in mathematical attainment that might be suggested by improvements in examination results or by England's recent success in TIMSS (Sturman et al, 2009). However, in all three topic areas and all year groups in 2008 there are a higher proportion of very low performances than there were in 1976/7. Performance amongst the highest attainers varies across the three areas.

We will compare these results to other similar studies in the UK (e.g., Coe, 2008; Shayer & Ginsberg, 2009; Tymms, 2004; Williams et al, 2007) and elsewhere (e.g., Askew et al, 2010; Kloosterman, 2010) and discuss possible explanations for our findings.

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