

TEN EASY STEPS TO MATHEMATICS INTERVENTION IN YOUR CLASSROOM: IS INTERPRETING THE RESEARCH ON STUDENTS WHO STRUGGLE IN PRIMARY MATHEMATICS THIS EASY?

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Catering adequately for students who struggle in mathematics is a huge issue for primary school teachers. In any primary (elementary) school classroom it can be expected that there is a range of ability levels spanning 7 years of development (Cockroft, 1982). There is an expectation that the teacher will effectively cater for all of the students in the class at their varying levels. This expectation is a cause for concern as many students in normal classrooms are identified as requiring extra assistance in mathematics.

In a study of 377 Australian primary schools (these represented the useable responses from a sample of 1000 schools) more than half the schools reported between 10 percent and 30 percent of their students had difficulties in learning mathematics (Rohl, Milton & Brady, 2000, p. 47). Statistics like these should be a cause for major concern. Why do so many students struggle with mathematics? What are the causes? What are the cures? What is known about effective approaches for working with students who struggle? In this paper an attempt is made to review the literature on students and difficulties in learning mathematics.

This isn't intended to be a complete review; rather it is intended to provide an introductory view of current approaches to identifying and working with students who struggle in mathematics with a view to the practical objective of informing the work of teachers who themselves struggle each day to make a difference for these students. The focus of discussion is on how the literature can inform classroom practice in catering for students who have difficulties in learning mathematics.

ISSUES IN IMPLEMENTING SUPPORT PROGRAM FOR STUDENTS WHO STRUGGLE IN MATHEMATICS

A considerable amount of effort is expended in Australian primary schools in identifying students who are "at-risk" in mathematics, but little has been achieved in the development of strategies to address the needs of these students (Lokan, Doig & Underwood, 2000), even though the implementation of interventions for students who struggle is a stated Australian governmental priority area. The neglect of students who struggle in mathematics is not just an Australian phenomenon. It occurs to varying extents throughout the western world. Ginsberg (1997) in reference to the United States, suggested this was due to a culture in which it was acceptable to 'not be good at' mathematics. This leads to a general reluctance to address issues in mathematics teaching and learning which is also reflected in the tendency for elementary teachers to avoid mathematics and for education systems to continue to accept this situation.

Milton (2000, p. 118) identified a number of factors contributing to the neglect of learning difficulties in mathematics in Australia. These included teachers' acceptance that some children

were not able to do maths. A further barrier to improving support for children having difficulties was found to be that early years teachers often viewed numeracy as a form of literacy and consequently failed to address the specific aspects of mathematical thinking that are involved. Louden (2000, p. 12) stated that teachers in the early years of schooling often had mathematical backgrounds that were not strong, leading to a lack of confidence in their teaching of mathematics, which supports Ginsberg's finding in the United States. This statement is supported by research conducted by Carroll (2005) who found that 52 percent of a sample of 100 primary teachers in suburban Melbourne did not feel confident about teaching mathematics and 43 percent felt they did not know the appropriate mathematical content to support their teaching of mathematics.

Gersten, Jordan and Flojo (2005) found there to be a paucity of research on interventions to prevent mathematics difficulties in struggling students. In contrast to the research and funding allocated to reading difficulties, little systematic attention has been given to the development of strategies to address the widespread difficulties mathematics learning. Rohl, Milton and Brady (2000, p. 32) found that while many Australian schools had well developed support programs in place for students at-risk in literacy only 14 percent of the 377 surveyed schools had numeracy programs in place that specifically supported these students and these involved either in-class support or small-group and individual withdrawal. This figure is a cause for concern given that more than half of the same schools reported between 10 percent and 30 percent of their students struggled in mathematics.

While there is an increasing number of intervention programs available, many of these are still undergoing research into their effectiveness. Of the schools in the Australian study of 377 schools (Rohl, Milton & Brady, 2000, p. 32) reporting that they had implemented support programs for numeracy, the most frequently mentioned were Support-a-Maths Learner (eight schools) which involves weekly or more frequent tutoring from trained teacher aides, parents and/or volunteers, Numeracy for All (five schools) and Count Me in Too (three schools) (Rohl, Milton & Brady, 2000, p. 32). These are not really statistics to be bragged about!

A more recent study by van Kraayenoord and Elkins (2004) reported the use of Count Me In Too in NSW schools, a professional development program that promotes the development of solution strategies, reasoning, reflection, problem solving and conceptual understanding at a classroom level. Count Me In Too is based on the Mathematics Recovery Program (Wright, Martland, & Stafford, 2000; Wright, Martland, Stafford, & Stanger, 2002).

There is general agreement in the literature that when considering intervention strategies "one size does not fit all" and that mathematics interventions should be tailored to the needs of the context. Structured intervention programs around the world, rely upon a mixture of explicit instructional procedures along with a range of opportunities solve problems relating to real world contexts. Interventions in Australian schools, where they exist, are an ad hoc mixture of approaches often applied by teachers who have had very little training. Interventions have focussed on developing recall of basic arithmetic facts and the development of skills to solve problems. Interventions often mirror the processes of the classroom, but frequently involve one-to-one or one-to-small group interventions in which the pace is slowed and repetition of the ideas is included, often taking on slightly different forms. In basic fact interventions the focus has shifted from the rote memorisation of facts, to include the specific teaching of thinking strategies that link concepts together. Problem

solving skills are taught explicitly, usually detailing a list of steps to be followed. (Chan & Dally, 2000, p. 172).

There is no agreement in the literature on whether in-class or withdrawal interventions are most appropriate. Part-time withdrawal programs have been criticised on a number of fronts including the disruptions to classroom instruction, the absolution of the classroom teacher's responsibility, the stigma attached to children receiving special instruction, failure of learning to be transferred back into regular programs, the cost of the intervention and its ineffectiveness (Chan & Dally, 2000, p. 289). The alternative is to integrate the intervention into the classroom, often with the use of a teacher's aide or parent helper. Critics of this approach cite large numbers of students, less opportunities for individualised instruction and a more distracting environment as factors limiting the effectiveness of this approach (Chan & Dally, 2000, p. 290).

A wide-ranging review of literature on learning disabilities, by Steele (2004) enabled her to develop a list of ten strategies which assisted students who were at-risk of low achievement in mathematics. These were the: use of advance organisers to introduce purpose of lesson; provision of an additional review of all prerequisites as needed; prioritising, teaching, and reviewing major concepts frequently; teaching generalisations and applications to real-life situations; modelling sequential procedures at a slow pace and with extra clues; presenting new skills using concrete materials, then pictures, and finally abstract explanations; providing additional practice in small steps with sufficient guidance; ensuring directions are clear before starting independent practice; teaching students to keep track of their progress with charts and graphs; and checking for error patterns and related corrections when providing guidance. She felt that these strategies would benefit all students in a classroom as well as those at-risk.

This paper examines research reported by Steele (2004) and others in an attempt to determine whether supporting students with difficulties in learning mathematics is as easy as implementing ten simple strategies. Many different terms are used to describe children who have difficulties in mathematics, so definitions and terminology related to the discussion of students who struggle in mathematics will be examined in the paper. The paper will also look at how students who are at risk in mathematics are identified and the causes and characteristics of learning difficulties in mathematics. Approaches and strategies for dealing with difficulties will be investigated and a discussion of the issues in implementing support programs for struggling students will be included. This paper does not attempt to cover these issues exhaustively, but aims to provide an introductory overview of current approaches, suitable for those who are working with students who struggle in mathematics and their teachers to begin to plan investigations that will further our knowledge of how best to help such children.

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