Contents

Preface

HOW TO USE THIS BOOK

This book is intended for teachers who want additional ideas for differentiating instruction in the primary school maths class. It is not intended as a text, but rather as a practical applications book.

The good news is that you don't need to read the book from cover to cover!

I understand that teachers are very busy, and I wanted to develop a helpful book, filled with practical suggestions that can be immediately useful. Many of the simple tactics and instructional ideas here are forthright and may be immediately applied in almost any classroom. The instructional sections labelled "Teaching Tactics" and "Ideas From Teachers" represent immediately applicable ideas that should assist maths teachers from prep to Year 8. In particular, the "Ideas From Teachers" sections offer real-world differentiated instructional applications that teachers have suggested over recent years. If your time is limited, feel free to skip through the book in no particular order, looking at the sections that offer these helpful, easy to implement, practical tactics. Once you apply them, you'll find that your students' understanding and enjoyment of maths skyrocket!

The "Teaching Tactics" describe instructional ideas in maths that involve more complex instructional procedures than merely a new way to use music or movement to teach a simple maths concept. These strategies represent the most effective way to differentiate within the maths class, and thereby meet the needs of all the students. These strategies are theory based, and enough information is provided for you to implement these strategies in your own class.

I have also provided "Website Reviews" in most chapters. Of course, these are not thorough critiques of these websites, nor does this brief list by any means exhaust the websites available to assist in mathematics instruction. Still, the use of these websites can greatly enhance your instructional efforts in maths. Also, the links provided here will help you in your move towards a more differentiated maths class.

Chapters 1 and 2 present the basics of differentiated instruction as applied in the maths classes. Here, the recent response to intervention (RTI) initiative is discussed briefly as it will impact the types of instructional opportunities provided in mathematics for many students in the primary years. In Chapters 1 and 2, you can learn what a differentiated maths class looks like and how to establish a differentiated maths lesson plan. The remaining chapters present instructional practices for a wide variety of specific areas in mathematics. Each of the chapters features the specific sections noted above, and each should provide you with some novel teaching ideas for differentiation in your classroom.

I sincerely hope this book assists you in your efforts to move toward differentiation in maths, and I would be more than pleased to hear your thoughts on this book and/or your suggestions for additional instructional tactics that would help other teachers differentiate lessons in their maths classes. Please feel free to contact me directly (766 Collins Rd., Toccoa, GA 30577, USA) with your thoughts or teaching suggestions. I do appreciate your thoughts, suggestions and teaching tactics, and I look forward to hearing from you!

1 The Mathematical Brain and High-Impact Teaching

Strategies in this chapter include the following:

- Ten Brain-Compatible Teaching Guidelines for Maths Instruction
- Ten Informal Tactics to Develop Number Sense
- Games and Activities for Developing Number Sense
- Ten Teaching Tactics for High-Impact Learning in Maths
- A Self-Evaluation Grid for Differentiated Instruction Lesson Planning

TEACHING MATHEMATICS THROUGH DIFFERENTIATING INSTRUCTION

Over the past two decades, we have witnessed an emerging emphasis on mathematics instruction, and as a result achievement in maths among students has been increasing (Clarkson, Fawcett, Shannon-Smith, & Goldman, 2007; Fuchs et al., 2008; Fuchs, Fuchs, Compton, et al., 2007; Harniss, Carnine, Silbert, & Dixon, 2002). In fact, within the past several years, maths scores have increased (Strauss, 2003). However, there is still a significant concern relative to mathematics performance. Recent research has documented the fact that approximately 5% to 8% of school-age children are not achieving in mathematics as well as they should, given their overall ability (Mabbott & Bisanz, 2008). In fact, these students may display a mathematics learning disability, which research suggests is rooted in a variety of factors such as poor calculation strategies, lack of automaticity in maths facts, and poor working memory (Mabbott & Bisanz, 2008; Woodward, 2006).

These problems have resulted in more research attention on mathematics in recent years. The publication of revised mathematical instructional standards both in Australia and the US have placed mathematics instruction on the national agenda, second only to the emphasis on reading. In Australia, there is a push for an Australia-wide, standardised mathematics curriculum and associated standards. In 2006, the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA), the Australian Education Systems Official Committee (AESOC) and Curriculum Corporation developed and published the *Statements of*

Learning for Mathematics, in order to define common curriculum content and move towards common, shared standards. Currently much of the mathematics curriculum can vary from state to state. In the US, one of the major mathematical organisation, the National Mathematics Advisory Panel (NMAP) have recently published revised mathematical instructional standards in their report *Foundations for Success: The Final Report of the National Mathematics Advisory Panel* (NMAP, 2008).

Even prior to release of these reports, the growing emphasis on maths standards has received some degree of research and media attention (e.g. Fuchs, Fuchs, Compton, et al., 2007; Jitendra & Xin, 2002; Johnson, 2000; Jordan, Kaplan, Locuniak, & Ramineni, 2007; Miller & Hudson, 2007; NMAP, 2008; Steen, 2007). Research has shown that the vast majority of general education teachers are familiar with the standards and frequently address these standards in their teaching (Maccini & Gagnon, 2002), indicating the overall concern teachers feel concerning mathematics achievement.

Teaching tactics: Ten brain-compatible teaching guidelines for maths instruction

The emphasis of instruction in maths has changed somewhat, however. Students are expected to master a curriculum that has shifted away from computation, rote learning and routine problem-practice activities toward an increased emphasis on reasoning, conceptual understanding, real-world problems, and connections between mathematical concepts (Johnson, 2000; MCEETYA, 2006; NMAP, 2008). Thus, much has changed in mathematics instruction, and teachers today must employ the most effective and efficient instructional methods possible for increasing cognitive involvement of all students with the maths curriculum. Teachers are searching for instructional ideas that will assist in this regard.

The concept of differentiated instruction can be of great benefit to teachers in developing and designing their mathematics instruction for students with varying ability levels in the primary education classroom. Moreover, the emphasis on brain-compatible instruction, one founding principle of differentiated instruction, can now inform teachers concerning what specific instructional tactics may result in higher learning impact, as many of these techniques not only make learning more interesting, but also increase retention over the long term (Bender, 2002; Sousa, 2008; Tomlinson, 2004). While studies of how the human brain functions in reading tasks or maths tasks have been undertaken for the past several decades, only within the last fifteen years or so has this emerging biomedical research—often referred to as brain-compatible research—progressed enough to inform teachers concerning effective instructional strategies for the maths curriculum (Fuson & Wearne, 1997; Geller & Smith, 2002; Gersten, Chard, Baker, & Lee, 2002; Sousa, 2008). In particular, one aspect of this research—multiple intelligences—while dated, seems to have been somewhat revitalised, and has recently struck a chord in the hearts and minds of educators (Gardner, 1983, 1993). This perspective has provided one basis by which many maths teachers have reformulated their instructional strategies. In fact, today many mathematics textbooks present various instructional activities based on a multiple intelligences perspective. Distinct from the multiple intelligences movement, research on brain functioning at the cellular level has likewise provided some guidance for instruction in recent decades (Bender, 2002; Sousa, 2006, 2008). Both of these support the concept of differentiated instruction.