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1 Introduction

The purpose and contents of the book

I hope that this book will prove useful to teachers who are preparing students for the International General Certificate of Secondary Education (IGCSE) or O Level in Mathematics. Whether you are starting to teach or already have experience teaching, it should stimulate you to think about key issues and offer you ideas which you can develop. It also contains suggestions to encourage discussion and mutual support with your colleagues as you develop your departmental approach and resources. Through exploring the ideas in this book, you could maximise your students’ performance in examinations, and their interest in their own learning.

This book considers a skills-based approach to teaching Mathematics, aiming to:

- stimulate discussion amongst teachers;
- encourage new approaches;
- help teachers plan the use of time;
- suggest new resources;
- help teachers in their professional development.

The book is based on my own experiences over many years as a teacher, examiner and private tutor, through which I have been able to study the development of a child’s journey in the discovery of Mathematics. I have therefore come to understand some of the possible reasons for individuals’ failure to realise their full potential. Experience of classroom teaching has shown me how difficult it can be to teach every class effectively while at the same time giving individuals the help and encouragement they need. Time is at a premium in teaching and any ideas that can save time productively are always welcome. To complement this, my examining experience has shown me the areas that so often prove difficult or that consistently lose marks, and that therefore need more emphasis or attention.
The book will address the teaching of mathematical skills, both practical and theoretical, with the aim of producing students who are active learners rather than passive pupils. We want to encourage all students to take responsibility for and pleasure in their own learning, and to change ‘I can’t do Maths’ to ‘I like Maths.’

The book may at times pose as many questions as it answers, but it should help you to become more aware of your own teaching, and give practical and usable ideas for improvement.

One of the most important things that a teacher can do is to help students to value themselves as individuals. They should be allowed to ask questions, expect a reasonable answer and learn how to find out things for themselves. The Mathematics teacher should also aim to instil an interest and pleasure in numbers. Many adults will say that algebra and trigonometry were their worst part of Mathematics, and of course we will look at these topics and what might be done to remedy this. But many will also claim that numbers frighten them, and this is far more fundamental. If we can teach pleasure in and curiosity about numbers themselves we will start the student off in a much more positive way. You will find fascinating information about numbers and plenty of ideas in Numbers – the universal language (Guedj 1998). Help your students to think of numbers as interesting friends, not untrustworthy enemies.

The rest of this chapter discusses the widespread development of Mathematics internationally, and the need for teachers to continue their own professional development. Chapter 2 then outlines the skills that students need to acquire, both specifically mathematical skills and more general learning skills, and how these skills can be integrated. Chapter 3 looks at the issues that need to be considered when adopting a skills-based approach to teaching, in terms of planning and delivering lessons and assessing students’ progress, as well as giving a more general discussion of the roles of the teacher and student in this type of approach. Chapter 4 considers how to design lessons that are interesting and stimulating for both teachers and students, with a detailed example, as well as giving advice on the use of worksheets. Chapter 5 describes how to use both formative and summative assessment in assessing students’ skills in Mathematics, while Chapter 6 looks at the role of coursework. Finally, there are two appendices, which contain useful references and a glossary of key terms used in examinations and assessment, respectively.

**The international education context**

Internationally, the increased common ground in the teaching and assessment of Mathematics is making for an exciting future in the breadth of the subject for our students. It is very encouraging to see the growth in
the number of entries each session for the IGCSE. Mathematics lends itself to being understood internationally. However, if the medium of teaching and assessment is English there may be some potential obstacles to be overcome for students whose first language is not English. One problem, for example, for Arabic speakers is to understand that as English is read from left to right this has a bearing on the inequality signs as we use them.

There is already an enormous amount of very useful material published on the World Wide Web and much of it is freely available to anyone with the means to access the Internet. For example, the NRICH website (http://nrich.maths.org) offers a wealth of ideas, resources and activities to enrich your Mathematics teaching. NRICH is an online community for Mathematics teachers and students and has thousands of members from 100 countries and many more regular users.

**Relevance to professional development**

In order to keep our teaching alive and interesting, we should be prepared to continuously develop our own skills. The best teachers are those who are constantly learning themselves, adapting to the rapidly changing world and reflecting back to their students a lively interest in their subject and its relevance to everyday life.

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| Here are some questions you might like to ask yourself about your current teaching before you read the book. (Be as honest as you can – feedback from your students may well give you pointers!)
| Am I sufficiently aware of my students individually? Do I observe them and learn from them?
| How do I communicate with them? Am I on the right level, or do I talk down to them, or merely lecture them?
| Am I approachable?
| How comfortable am I with subject content? Am I so highly qualified in the subject that I find it hard to teach at a suitable level and to relate to students’ problems with understanding various concepts? Or am I nervous because I feel under-qualified, and not too sure of some parts of the syllabus? Or do I undertake the teaching of a topic that is relatively new to me as an interesting challenge, knowing that as I learn it I will be able to understand students better? |
Teacher activity 1.2

Learn from your colleagues and they can learn from you. Here are some points that you might like to discuss with your colleagues:

- Has there been anything in the last week or so that has taught you something that will help with your teaching in the future?
- Have any of you ever ‘shadowed’ a year group for a day? Shadowing can be a most interesting experience, particularly if it is a younger age group, say in their first year of secondary education, to see how they react to different teachers, subjects and styles of teaching. If you have never done this, would it be possible to arrange it?
- Do you ever sit in on each other’s classes? This can help both the observer and the observed, provided it is carried out in the spirit of cooperation and mutual help rather than criticism.
- Do you have brainstorming sessions with your colleagues about teaching different topics?
- Do you need to develop your own skills in preparation for teaching particular skills? For example, to help your students make best use of information and communication technology (ICT) in their learning activities you will need to keep your ICT skills up to date, as developments in hardware and software are so rapid.

What other steps can you take in the near future to enhance your professional development? The following suggestions may help you:

- subscribe to a Mathematics teaching journal;
- read books on Mathematics teaching;
- read examiners’ reports after working through the associated papers;
- learn about different calculators;
- teach yourself a new Mathematics topic;
- build up your own library of books, lesson plans, articles and copies of past examination papers and the syllabus;
- find out about the many TV programmes and videos available to help teachers – if you cannot receive the direct broadcasts they may be obtainable on tape;
- look on the Internet for new ideas;
- join an Internet discussion group to exchange ideas with other teachers.