

Introduction

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RATIONALE

Mathematics Education is becoming a well-documented field with many books, journals and international conferences focusing on a variety of aspects relating to theory, research and practice. That documentation also reflects the fact that the field has expanded enormously in the last twenty years. At the 8th International Congress on Mathematics Education (ICME) in Seville, Spain, for example, there were 26 specialist Working Groups and 26 specialist Topic Groups, as well as a host of other group activities.

In 1950 the 'Commission Internationale pour l'Etude et l'Amélioration de l'Enseignement des Mathématiques' (CIEAEM) was formed and twenty years ago another active group, the 'International Group for the Psychology of Mathematics Education' (PME), began at the third ICME at Karlsruhe in 1976. Since then several other specialist groups have been formed, and are also active through regular conferences and publications, as documented in Edward Jacobsen's Chapter 34 in this volume.

The growing richness of our field is a healthy sign of the activities of a vigorous community of scholars in every part of the world. It also reflects the growing importance of mathematics education in all societies and cultures. Accompanying this richness and diversity, however, is also an increasing need for structures which enable those working within the field to be informing themselves and each other about the various developments which are taking place elsewhere. This is particularly important at times when funds for research and development projects are scarce, when the politics of knowledge can generate unnecessarily competitive attitudes, and when rapidly changing societies are facing new educational challenges.

We all know the value of contrasts in the field of education. We grow mentally by dealing with contrasts, whether the contrast is between examples, algorithms, or beliefs. Without contrast neither learning nor education can happen. Of course the learning and the education occur not by just being presented with contrasts, but by having to deal with them, by reconciling, by synthesising, and by accommodating them in some way. This is obvious at a private level, and all of us carry out these activities routinely and subconsciously.

Structurally, and publicly, in terms of the development of our field of mathematics education, these kinds of activities are neither obvious nor routine. They can happen at conferences, although as was indicated above, with so many different group meetings occurring during even so big a conference

as ICME 8, it is far more likely that specialisms will dominate rather than cross-fertilisations. Also to shift the balance in favour of more ‘synthetic’ approaches to such conferences would require a conscious change of emphasis and a great deal of concerted effort.

There have also been useful proceedings from the many conferences which take place, and the four-yearly ICME’s have been a powerful source for these. However, conference proceedings rarely make good books. They fail to convey to readers the “feel” of actually being there, and they do not represent adequately the views of many who did attend. They frequently also lack the coherence which one looks for in a good book.

This then is the context which has created the need for this Handbook. It is specifically intended to meet the needs for cross-fertilisation, for facing and recognising contrasts, and for achieving syntheses in our field. Many of the chapter headings will of course have a familiar ring to them, particularly for those readers who are regular ICME attenders, but the scope and opportunity afforded by this publication has also given the authors a chance to take a wider reflective stance in our field.

The Handbook thus attempts not merely to present a description of the international ‘state-of-the-field’, but also to offer synthetic and reflective overviews on the different directions being taken by the field, on the gaps existing in our present knowledge, on the current problems being faced, and on the future possibilities for development.

It is a book which goes beyond the research perspective offered by an earlier Handbook (Grouws, 1992), itself an invaluable resource for researchers in the field, and it also deliberately seeks to cross national boundaries. The authors and editors come from a range of countries and cultures, and the chapter reviewers were also selected to enable as international a perspective as was feasible to be achieved. The co-authorship of most of the chapters was another mechanism for achieving coverage of contrast, and trans-nationalism.

AUDIENCE

The Handbook is intended to be first and foremost a reference work, and it should therefore appeal to anyone seeking up-to-date knowledge about the main developments in mathematics education. These will include

- teachers who want to know more about their subject and how it is currently being taught and thought about, rather than just the curriculum they have to teach,
- student teachers and student researchers starting out on a serious study of the subject, and looking for the significant developments, particularly as a guide to further readings and literatures,

- educational policy-makers and curriculum developers who need to be aware of the latest areas of knowledge development which could help their planning and policy-making,
- researchers who want to know the growth points, and the latest and most significant references, in aspects of research other than their own,
- teacher educators trying to shape the induction and development of teachers into the complex world of tomorrow's mathematics education.

Mathematics education is an international field of endeavour and in that spirit the Handbook should be helpful to anyone wishing to find out about interesting work being done in other countries. It is an impossible task to try to represent every new development taking place in every country, but the authors and editors have tried to learn about and include the most significant and potentially generalisable developments. One can never transplant an idea or a practice from one country to another, but one can certainly learn from the experiences of colleagues elsewhere who do use a different practice or follow a different philosophy. Other countries', and other colleagues', experiences always offer potentially interesting contrasts to one's own.

The Handbook therefore should appeal to those working at any level in the field who wish to broaden their knowledge base, and to consider alternatives to their present practices.

SCOPE AND STRUCTURE

To meet our intention that the Handbook will present a faithful survey of the variety of practices, and the range of disciplinary interconnections, which characterise the field of Mathematics Education today, it consists of 36 originally authored chapters covering the significant aspects of this growing field, organised into four sections. I have been fortunate to be able to collaborate with four outstanding international scholars – Jeremy Kilpatrick, Colette Laborde, Ken Clements, and Christine Keitel – who each took responsibility for a section, and who have ensured that the quality of the coverage in each section has been as broad as possible. The Editors have drawn upon the expertise of many competent writers and analysts, who are regular attenders at the international conferences, particularly at the four-yearly International Congresses on Mathematics Education (ICME). Each chapter has been written by one or more authors, who have been encouraged to draw on the advice from colleagues in different countries in order to increase the international perspective.

The Handbook is organised into four sections, and each section editor has provided a detailed introduction to their section. The first section (edited by Jeremy Kilpatrick), analyses the trends and issues related to the mathematics curriculum, and the goals, examinations, content and material resources relat-

ed to that curriculum. There are many challenges facing mathematics curriculum planners and material developers in all countries, as mathematics becomes a subject which is critical for all students to study, and as information technology makes its influence increasingly felt.

The second section of the Handbook (edited by Colette Laborde) surveys the variety of practices of mathematics teaching and learning at different levels and in different contexts. It ranges from elementary school to adult numeracy, and addresses the rapidly developing non-formal and informal sectors of mathematics education as well as the formal and school-based.

The third section of the Handbook (edited by Ken Clements) is concerned with different perspectives on, and the disciplinary contexts of, Mathematics Education. As the field has grown, so also has the range of theoretical and research perspectives used to analyse and interpret the practice of the field.

The fourth and final section of the Handbook (edited by Christine Keitel) is concerned with development, in terms of both the field and also the professionals working in it. Mathematics Education is a socially dependent field, and there are many professionals playing a strong role in its development. This part will complement the previous section in attending to the different social and professional groups which are shaping the interdisciplinary field for the future.

There will inevitably be some complaints and comments about the coverage which we have achieved, and we readily acknowledge that there will be overlaps, and regrettably certain 'underlaps' in our coverage. No matter how many editors, authors or reviewers are involved in an exercise such as this, the writing and the perspectives will always be subjectively framed. Undoubtedly analysts and critics will scour the references and index for the missing quotations, authors, or trends. Anxious 'upwardly mobile' academics will hunt for their names in the references and will read between the lines to see if their particular bandwagon is still rolling in their direction, or if any biases or prejudices can be detected!

Whatever the consequences are, our hope in putting this Handbook together is that it will make available to the present generation of scholars, and to future historians of education, a faithful and stimulating synthesis of the developments occurring in mathematics education towards the end of the 20th century. In addition, the Handbook chapters provides glimpses into the future in many important aspects of mathematics education, and collectively, they constitute a blueprint for mathematics education in the 21st century.

REFERENCES

- Grouws, D.A. (1992) *Handbook of research on mathematics teaching and learning*, New York: Macmillan