ICMI

Bulletin

of the International Commission on Mathematical Instruction

No. 22

June 1987

Secretariat
Centre for Mathematics Education
University of Southampton
Southampton, SO9 5NH
England

The International Commission on Mathematical Instruction

BULLETIN NO. 22

JUNE 1987

Editors: Keith Hirst and Geoffrey Howson
Centre for Mathematics Education
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INTERNATIONAL COMMISSION ON MATHEMATICAL INSTRUCTION

EXECUTIVE COMMITTEE 1987 - 1990

Introducing the new members of the ICMI Executive Committee

Vice-Presidents

Lee Peng Yee is Professor of Mathematics of the National University of Singapore. He studied at Nanyans University, Singapore and at Queen's University, Belfast, Northern Ireland before taking up lecturing positions in Malawi, New Zealand and Singapore. He was President of the Southeast Asian Mathematical Society in 1981-82 and has played a large part in promoting the activities of SEAMS in the field of mathematics education. For some years he was the National Representative of Singapore to ICMI.

Emilio Lluis is Research Professor at the Mathematics Institute of the National University of Mexico (UNAM). Always connected with mathematics education, he has a wide experience in teacher training. Author of several textbooks in mathematics for secondary and university level as well as for the open secondary school. Invited speaker in several international meetings in mathematics and mathematical education. Has been President of Mexican Mathematical Society (1960-62), National Association of Teachers of of Mathematics (1970-72) and Chairman of the Mathematics Department of the Faculty of Sciences, UNAM (1967-70). He is Vice-President of the Inter-American Committee on Mathematical Education. Professor Lluis was a participant in the ICMI 'School Mathematics in the 1990s' meeting.

Members

Hiroshi Fujita is Professor of Mathematics at the University of Tokyo where he has been employed in both the Physics and Mathematics Departments. He has written many papers on mathematics education and has played a significant role in curriculum planning within Japan. He is the Japanese National Representative to ICMI and was a participant in the Kuwait seminar on 'School Mathematics in the 1990s'.

Jeremy Kilpatrick is Professor of Mathematics Education at the University of Georgia, USA. He currently serves as editor of the Journal for Research in Mathematics Education. He is a member of the US National Research Council, and he is a Governor of the Mathematical Association of America. He assisted in organizing sessions on research and evaluation at the last three International Congresses on Mathematical Education and was a plenary speaker at ICME5 in Adelaide. Publications that he has edited include English translations of Soviet work in mathematics education. His interests are in research issues, instruction in problem solving, the development of mathematical abilities, and curriculum development. He was a participant in the 1986 Kuwait Seminar on 'School Mathematics in the 1990s'.

Mogens Niss is Professor of Mathematics at Roskilde University Centre, Denmark. He has served on a number of committees of the Danish Ministry of Education. His special fields of interest are applications of mathematics, mathematical modelling, curriculum planning and mathematics education in a societal context. He has contributed to a number of ICMEs, was a chief organiser at Adelaide and will organise the group on 'Problem solving, Modelling and Applications' at ICME6.

IMU representative on ICSU-CTS and ex-officio member of the ICMI-EC

Jack van Lint is Professor of Mathematics at Eindhoven University of Technology, The Netherlands. Internationally respected for his work in coding theory and combinatorics, he has also made many contributions to mathematics education. He presented a survey lecture at ICME3, a series of expository lectures at ICME4, was a chief organiser at ICME5, and an editor of the Proceedings of the Strasbourg meeting on 'The Influence of Computers and Informatics on Mathematics and its Teaching'. Jack van Lint is the Netherlands representative to ICMI.

NATIONAL REPRESENTATIVES

Please note the following amendments to the list of National Representatives.

Change of Address

AUSTRIA — Professor F. Schweiger, Institut für Didaktik der Naturwissenschafter, Universität Salzburg, A5020 Salzburg Hellbrunnerstr. 34. AUSTRIA.

COSTA RICA — Professor Bernardo Montero, Asociación Mathemática Costarricense, Escuela de Matemática, Universidad de Costa Rica, San José, COSTA RICA.

New Representatives

KUWAIT — Mr. Mansour Hussein, Mathematics Advisory, Ministry of Education, P.O. Box 7, Safat, KUWAIT.

SWEDEN — Universitetslektor Göran Wanby, Department of Mathematics, University of Lund, Box 118, S-221 00 Lund, SWEDEN.

ICMI General Assembly

A General Assembly of ICMI will be held at the Technical University, Budapest at 15.00 on Tuesday 26 July, 1988.

The General Assembly is a closed meeting for members of the ICMI EC and for National Representatives or their nominated deputies. Affiliated Study Groups of ICMI are invited to nominate an observer to attend the meeting. In addition, the President invites all former Presidents, Vice-Presidents and members of the ICMI EC to be present at the Assembly as observers.

A.G. Howson

ICME - 6

Sixth International Congress on Mathematical Education

Budapest, Hungary.

July 27 - August 3, 1988

ICME-6 is organized on behalf of the International Commission on Mathematical Instruction through the János Bolyai Mathematical Society with the cooperation of the Hungarian Academy of Sciences and the Ministry of Education and Culture. All main issues are decided by the International Program Committee and executed by the Hungarian Organizing Committee.

A comprehensive second announcement will be sent to all those who have shown interest in ICME-6. Please inform the HOC if this booklet has not reached you before the end of September. This second (and final) announcement will give details of the major scientific and social activities, including the plans and addresses of the chief organizers of working groups and their Hungarian co-ordinators, will provide information on accommodation, optional programs, visas, registration, transport, etc., and will also contain registration and abstract forms. Below we try to summarize the most important facts and plans about the Congress.

Scientific program:

The major activities of the Congress will be organized in the following framework:

1. Plenary sessions: lectures by invited speakers A. Ershov, J-P. Kahane, L. Lovász, B. Nebres and G. Vergnaud.

2-3. The seven action and seven theme groups are intended as a way of involving all participants of ICME-6 as active members of groups considering two aspects of their professional work: according to the age of the students and from a thematical point of view, resp. Each of the action and theme groups will occupy four 90 minute sessions, for part of which the groups will be divided into smaller subgroups.

4-5. Topic areas and international study groups will focus mostly on some specific theme or subject. Their main role is to provide exchange of information on, and to keep trace of, recent progress.

6. Survey lectures (according to the classification of action and theme groups, but independent of these) will give a broad overview of some major trends and issues in the field since the last Congress.

7. National presentations: on some key aspects of mathematical education in Argentina, Bulgaria, Malawi and Spain.

8. Fifth day special: Mathematics, Education and Society. This program is mainly motivated by increasing concern about the relations between mathematics learning and teaching and the social context in which it takes place.

9-10. Short oral communications and poster presentations.

11. Projects.

Addresses:

If you wish to contribute to the work of any of the working groups, and/or need more information about them, then please contact their chief organizers.

If you need more information on the Congress in general, then please contact

János Bolyai Mathematical Society, ICME-6
Budapest, POB 240, H-1368, Hungary.
Phone: /36/-1-427741

All matters concerning accommodation, optional programs and organizational questions are managed by

MALÉV AIR TOURS - Congress Department /Ms Elisabeth Szentirmai/
Roosevelt tér 2, Budapest, H-1051, Hungary.
Phone: /36/-1-187836
Telex: 224954 malev h or 2253 0 mairt h

There is no electronic mail address for the Congress.

Social activities:

Welcoming reception with a short concert, congress excursion, happy hour.

Deadlines:

Return of abstract form and abstract /for short communications/:

February 29, 1988.

Return of registration form, transfer of accommodation deposit and fees of most optional programs:

March 10, 1988.

Contribution to the activities of the working groups: contact their chief organizers as soon as possible.

You are kindly invited to participate in ICME-6. See you in Budapest.

On behalf of the organizers:

Á. Császár	J. Szendrei	T. Nemetz
Chair of IPC	Chair of HOC	Secretary of HOC
Chairman of J. Bolyai Mat. Soc.		

ICMI Studies

We reproduce below a description by Bryan Wilson of the ICMI Study 'School Mathematics in the 1990s'.

We are grateful to the Editors of Zentralblatt für Didaktik der Mathematik for allowing us to reprint this article.

School mathematics in the 1990s: An ICMI study

Bryan WILSON, University of Southampton

Abstract: All over the world, curriculum development work in mathematics education during the past 30 years has usually been done on an ad hoc basis, in response to immediate pressures. The impact of information technology on education is now requiring decision-makers to face more fundamental issues of purpose. To help them to do so, the International Commission on Mathematical Instruction (ICMI) has undertaken a study on school mathematics to the year 2000 A. D. This article summarises the nature and content of the study, and serves as an introduction to the published report.

Kurzreferat: In den letzten 30 Jahren wurde Curriculumentwicklung für die Ausbildung in Mathematik fast weltweit notgedrungenerweise ad hoc betrieben. Durch die Auswirkungen der Informationstechnologien auf die Erziehung werden den Entscheidungsträgern nun grundlegendere Beschlüsse abverlangt. Um ihnen dabei behilflich zu sein, hat die Internationale Kommission für den Mathematikunterricht (ICMI) eine Untersuchung der Schulmathematik bis zum Jahre 2000 durchgeführt. Dieser Beitrag gibt Aufschluß über Wesen und Inhalt dieser Studie und dient als Einführung zu dem veröffentlichten Bericht.

1. Some questions

- What should be the major characteristics of the school mathematics curriculum in the 1990s?
- Should fresh mathematical topics be incorporated in order more closely to meet the needs of rapidly-changing employment patterns?
- Are there parts of present syllabuses that should be omitted as no longer important in an age of information technology?
- How can such technology best be harnessed to increasing the effectiveness of mathematics learning in schools?
- Will the classrooms of the 1990s look significantly different from those with which we are at present familiar?
- How can teachers be prepared for a future in which their own roles may change substantially as new technology becomes a major factor in the teaching and learning of mathematics in schools?
- What kinds of research will best serve the needs of the mathematics education profession as its members face such challenges?

Such questions are typical of those that face people who are responsible for planning the future of school mathematics. They apply in any country, whether "developed" or "developing", whether agricultural, industrial or post-industrial, whether the education system is centralised or de-centralised. They apply to all school levels: higher secondary, lower secondary, primary (elementary) and even pre-primary. They apply at all levels of responsibility within the education system, from the Minister or Director of Education, responsible for overall planning at national level, through curriculum writers and examiners, to the teachers in whose hands lies the responsibility of putting into practice in the classroom whatever curriculum plans have been made.

In this article, the word "curriculum" is used to include both the mathematical content (the syllabus) and the range of methods and working practices by which the students are enabled to understand and master it. In some countries, teachers themselves have considerable freedom to determine their school's mathematics curriculum; in others, their role is confined to translating into classroom reality the policies and plans made by others. However, these and other such fundamental questions must be faced at some level in every education system if the mathematics taught and learned in its schools is to be of maximum benefit to the society as a whole, and to the individuals who comprise it, which the schools exist to serve.

Sadly, the record of curriculum development in school mathematics world-wide over the past thirty years is not one of outstanding success. All too frequently the fundamental questions have been ignored, or deliberately circumvented, under the pressure – often political – to "modernise", to "improve", to "raise the standard of", to "get better exam results in", to "keep up with what country X is doing in" school mathematics. Curriculum development has proceeded in an ad hoc fashion, changing one aspect of the total system – syllabuses, teacher education, teaching materials, textbooks, examinations – while ignoring others. Often it has taken place too quickly, failing to recognise that the time-scale of genuine change in education is a much longer one than the time-scales to which politicians work. The result has been to leave many teachers overwhelmed by the speed of change, uncertain as to why and what they should be doing, and not infrequently paying lip-service to new directions or fashions while in practice continuing to teach in much the same way as before.

In those education systems in which the processes of curriculum development are decentralised – and, with the definition of "curriculum" being adopted, this is to some

extent true even in ostensibly highly centralised systems – there has been much duplication of effort by different individuals or groups of people, for example in producing guidelines for teachers or new learning materials for students. Such duplication has its value, mainly in terms of the enhanced professionalism which results to those participating in such decision-making and writing. Overall, however, it seems clear that the condition of mathematics education world-wide would now be healthier if more fundamental issues had been faced, and considered at greater leisure, during the decade of breakneck curriculum change in school mathematics in the 1960s. It was in the hope of encouraging such consideration in the changed circumstances of the late 1980s that the International Commission on Mathematical Instruction (ICMI) initiated the study to which this article is an introduction.

2. The ICMI study

ICMI's best known activities are its four-yearly ICME congresses. Some readers will have attended ICME 5, Adelaide, Australia, in 1984. More will probably hope to be at ICME 6 in Budapest, Hungary, in 1988. At these Congresses, a wealth of information and ideas is displayed from many parts of the world and by many leading members of the mathematics education profession. The excellent series of Congress reports [1] go some way towards systematising these riches, but inevitably the range of material covered embraces most aspects of mathematics education.

In order to increase the accessibility of current thinking from different parts of the world on certain more restricted themes, ICMI has commissioned three studies to be completed between the Adelaide and Budapest Congresses. One study concerns the impact of computing on mathematics education, and its report is already available [2]. Another considers mathematics as a service subject. A preliminary discussion document has already appeared [3], an international seminar will be held in Udine, Italy in March, 1987, and a fuller report on the study will be published later that year. Cambridge University Press has recently published the report of a third study, "School Mathematics in the 1990s" [4].

2.1 Working methods

Any international study has to strike a balance between gathering input from a wide variety of sources and the practicalities involved in doing so. This study used a three-stage strategy. First, a discussion document was written by the authors of the final report, Geoffrey Howson (Secretary of ICMI) and the present writer, together with Ben Nebres from the Philippines, one of Asia's best known mathematics educators. This document surveyed the major areas of concern of those responsible for decision-making for school mathematics in the 1990s, and asked many questions.

The production of the discussion document was assisted by a grant from UNESCO, which also enabled it to be widely circulated within the international mathematics education community. Comments were invited, and came from many parts of the world. Some were brief and concentrated on one particular point, others were themselves substantial contributions to the discussion. The original paper and the responses to it formed the working document for stage two.

This second stage was the convening of an international symposium with a small number of invited participants, held in Kuwait in February 1986 under the patronage of the Kuwait Ministry of Education, Kuwait University, and the Kuwait Foundation for the Advancement of Sciences. Participants were selected in such a way as to provide a balance between geographical regions, kinds of education systems, and their country's mathematical and education traditions. Their own personal expertise and eminence in the field were determining factors in the final choice. The fifteen participants, between them representing all six continents and both developing and developed countries, extensively discussed the themes of the working document. These discussions, together with other comments received, formed the raw material from which the editors produced the published report.

It is with the major themes of the report that the rest of this article is concerned.

2.2 The approach

At first sight it may seem that education systems across the world vary so greatly that any attempt to produce material on school mathematics that would apply to them all would be foredoomed to failure. This would indeed be the case if such material attempted to be predictive, or – far worse – prescriptive. It is neither conceivable nor desirable that school mathematics should be globally uniform; indeed, it is surprising that there is not much greater diversity in school syllabuses in different countries, to match the existing diversity of methodology that is familiar to anyone who has seen mathematics taught in different parts of the world. School mathematics should serve the needs of people in their own society. While mathematics education is a function of many variables, including its own history and the nature of its subject-matter, the society in which it is set is certainly one such variable. Accordingly, its practice should vary from place to place in different societies, and from time to time as society itself changes.

What is common to those in any country who are concerned with the school mathematics curriculum are the basic questions which they have to consider, some of which were posed at the start of this article. Accordingly the structure of the study is to draw attention to a series of such issues, and to discuss various considerations relevant to them in such a way as to encourage the reader to make his own decisions in the light of his own circumstances.

In order to sharpen up some particularly important issues, a format of "alternatives-and-consequences" is used. A question is asked to which various alternative responses are possible. Each of these alternatives is listed, together with the likely consequences that would ensue in any education system which adopted a particular alternative.

An example will make this clear. Within a discussion of the place of applications of mathematics within the total school curriculum – which is seen as an issue of great and increasing importance in the 1990s – three alternatives are seen to exist.

Alternative 1 Mathematics is applied within mathematics lessons.

Consequences

1. Motivation is immediate.
2. Problems will arise in many cases because extra-mathematical knowledge will be required if the contexts are to be meaningful.

Alternative 2 Mathematics is applied within other lessons.
Consequences
1. This can bind together mathematics teaching with that of Physics, Biology, Geography, . . .
2. Problems of coordination arise and of matching the needs of other subjects with pupils' mathematical preparedness and maturity.

Alternative 3 Mathematics is applied in inter-disciplinary projects.
Consequences
1. A long-standing educational goal is achieved.
2. Problems arise because of the cooperative working required and clashes with traditional curriculum organisational patterns.

Unlike some of the other occasions where this format is used, these alternatives are not mutually exclusive. In this example, the alternatives and consequences are all simple, almost obvious, but it is hoped that this manner of presentation will encourage national curriculum groups to consider such issues explicitly. People responsible in different education systems will, quite rightly, come up with different alternatives as the one that they decide to adopt. What this study is attempting to do is to stimulate consideration of such issues country by country, and to provide a framework as a starting-point from which such consideration can take place. The measure of success of the study will be the extent to which it has encouraged and facilitated the consideration of these basic questions country by country.

3. A historical perspective

Decisions on the future of school mathematics should be informed by an understanding of why mathematics holds its pre-eminent place in schools across the world, and how the familiar, or "canonical", curriculum became entrenched. The report traces its origin to the first industrial revolution, and shows how it reflects the compartmentalisation of knowledge favoured in the early Nineteenth Century in Western Europe. Each stage was seen as preparation for the next; for example, much school algebra can only be justified as a preparation for calculus. In the new age of information technology, it is necessary to review at a fundamental level the extent to which this canonical curriculum still serves the real needs of students in 1990s.

The content of the report as it considers different aspects of school mathematics for the 1990s will be indicated by examples of the kinds of questions that are posed. These questions are more specific, and hopefully more tractable, than the general questions with which this article began.

3.1 Mathematics and general educational goals
- Should the school mathematics curriculum be more self-contained at each stage, directed more specifically at the needs of those for whom that stage will be the last one of the formal study of the subject?
- If so, on what grounds are the "needs" of students to be assessed?
- What can mathematics contribute to a general, "liberal" education?
- What mathematical topics would we wish to stress in order to attain appropriate contemporary educational goals?
- How can the methods adopted to teach mathematics themselves contribute to meeting such goals?

3.2 The place and aims of mathematics in schools
- Should mathematics be a compulsory subject in schools? If so, to what stage?
- What are the implications for the design of mathematics curricula if the subject is (i) compulsory, (ii) non-compulsory for students?
- Should different mathematics curricula be provided for different groups of students at the same stage of school? If so, how may this be done in a way that is acceptable to everyone concerned?
- Should mathematics continue to stand apart as a separate subject in the school curriculum in the 1990s?
- What is the cultural significance of mathematics in any particular national context?
- How are we to exploit ethnomathematics, that range of ideas and techniques found in the student's society and environment?
- Does the information revolution require us to revise our ideas of what constitutes "useful" mathematical knowledge?
- How can evaluation and assessment procedures be developed to extend the range of "assessable" knowledge so as to incorporate more of those understandings, skills and attitudes that we wish students to acquire?
- What part should "proof" play in school mathematics in a society in which students are increasingly encouraged to adopt a "black box" attitude to technology.

3.3 The content of the school mathematics curriculum
- Can "mathematics for all" be taught successfully?
- What are the criteria for such "success"?
- What is essential in any school curriculum labelled "mathematics"? For example, can a secondary school curriculum with little geometry and almost no algebra justify the title "mathematics"?
- Is it possible, and desirable, to break school mathematics down into fields each distinguished by its own particular methods and approaches?
- What educational, mathematical and motivational purposes do applications of mathematics serve at school level?
- Can the art of applying mathematics be taught to other than a few students? If so, how may this best be done?
- How can students be helped to realise that mathematics can contribute to the solution of problems that they themselves will meet out of school?
- Can traditional goals for school geometry be rescued? Should they be?

3.4 The school and classroom in the 1990s
- How should we like a classroom to look in the 1990s?
- How are schools to respond to both the threats and the opportunities of new technology?
- How can the opportunities for individualisation of learning offered by micros be best used?
- What are the implications of new technology for the curriculum, for teaching materials, for assessment procedures and for the pre- and in-service training of teachers?

3.5 Research in mathematics education
- To what extent will current research help to solve the problems of school mathematics in the 1990s?
- In what areas should (i) more, (ii) less research effort be focussed?
- To whom should research findings be addressed?

- What changes are desirable in the way in which research is funded and carried out, in order to make its findings more easily applicable to mathematics teaching and learning?

3.6 The processes of change

- Where and how does one most effectively intervene in an education system to bring about desirable change?
- What can be learned from past intervention at different levels: governmental, educational administrative, school, teacher . . .?
- How can one help to change attitudes, values, skills and teaching styles to meet the challenge and opportunities of new technology in schools?
- How may general standards be raised (possibly involving legislation), while preserving the freedom of good individual teachers?

It is the report authors' hope, shared by all those who have actively participated in this ICMI study, that it will encourage more coherent planning in school mathematics for the coming decade than has often been the case in the past, by facilitating consideration country by country of such questions. To this end, translations into a number of languages are already being considered.

4. References

[1] CARSS, M. (Ed.): Proceedings of the Fifth International Congress on Mathematical Education. – Boston: Birkhauser, 1986

[2] The Impact of the Computer and Informatics on Mathematics and its Teaching. – (ICMI Study Series) Cambridge: Cambridge University Press, 1986

[3] Mathematics as a Service Subject. – In: L'Enseignement Mathématique 32 (1986), p. 159–172

[4] School Mathematics in the 1990s. – (ICMI Study Series) Cambridge: Cambridge University Press, 1987

ICME 6

ICMI will set aside some of its own money, and will seek other financial support, to assist mathematics educators from developing countries to attend ICME6.

Applications for assistance should be addressed to the ICMI Secretary at Southampton. They should include brief CVs including details of participation at other international meetings and should indicate what the applicant would hope to contribute and what (s)he and her/his country would hope to gain through her/his presence at Budapest. An indication of total costs and the potential help from local sources should be given.

Please help to make the existence of these bursaries widely known.

ICMI Study Series NO.2

School Mathematics in the 1990s

Spanish speaking readers will be interested to learn that a Spanish translation of this book is due to be published shortly.

UNESCO

Grants from UNESCO have recently been received to assist educators from developing countries to attend the Udine Meeting on 'Mathematics as a Service Subject' and to distribute copies of the first two ICMI Study Series texts and the Supporting Papers to the Strasbourg Computer Meeting.

As always ICMI is most grateful to UNESCO for its valuable support and help.

Topic Areas

A list of topic areas and chief organisers is given below

CO = Chief Organiser

Video and film

CO: M. Emmer, University La Spazienza, Dip.Mat., Pizzale A. Moro, I-00185, Roma, Italy.

Visualization

CO: C. Gaulin, Laval University, Department of Mathematics, Quebec City, Quebec, G1K 7P4, Canada.

Competitions

CO: G. Berzsenyi, Lamar University, Department of Mathematics, PO Box 10047, Beaumont, TX 77710, USA.

Problems of handicapped students

CO: O. Magne, School of Education, PO Box 23501, S-20045, Malmo, Sweden.

Comparative education

CO: D.A. Quadling, 12 Archway Court, Barton Road, Cambridge, CB3 9LW.

Probabiity theory and statistics

CO: K. Travers, 505 East Armory Street, Champaign, ILL 61820, USA.

Proofs, justification and conjectures

CO: D. Pimm, Centre for Mathematics Education, The Open University, Walton Hall, Milton Keynes, MK7 6AA, England.

Language and mathematics

CO: C. Laborde, IMAG University of Grenoble, 12 Rue Bleriot, F-38100, Grenoble, France.

Students of high ability

CO: S. Kenderov, Institute of the Bulgarian Academy of Sciences, PO Box 373, BG-1090, Sofia, Bulgaria.

Mathematical games and recreations

CO: D. Singmaster, 87 Rodenhurst Road, London, SW4 8AF.

Women and mathematics

CO: L. Burton, Thames Polytechnic, Faculty of Education and Community Studies, Bexley Road, Eltham, London SE9 2PQ.

Theory of mathematics education

CO: H-G. Steiner, Universität Bielefeld, IDM, PB 8640, D-4800, Bielefeld, West Germany.

Spaces and geometries

CO: W.R. Bloom,Murdoch University, School of Mathematical and Physical Sciences, Murdoch, WA 6150, Australia.

Information and documentation

CO: G. König, Lauenburger Str. 45, D-7500, Karlsruhe 1, West Germany.

Systematic cooperation between the theory and practice of mathematical education

COs: B. Christiansen, Department of Mathematics, Royal Danish School of Educational Studies, Emdrupvej 115 B, DK - 2400 Copenhagen NV.

P.F.L. Verstappen, Stichting voor de Leerplanontwikkeling, Postbus 2041, 7500 CA Enschede, The Netherlands.

ICMI SYMPOSIUM ON THE TEACHING OF MATHEMATICS AS A SERVICE SUBJECT UDINE 6 - 10 APRIL 1987

This meeting was attended by some 40 participants drawn from 18 different countries, and from all continents. At the end of the meeting a 'final statement' was drawn up and this is reprinted below. The Proceedings of the Study will be published by Cambridge University Press early in 1988. A volume of 'Selected Papers' is planned in the Springer series of proceedings of seminars held at the International Centre for the Mechanical Sciences.

FINAL STATEMENT

Mathematics is of increasing importance in all sciences and in everyday life. It is an essential part of the general culture needed by every citizen in order to understand our world and treat information and data with a critical mind. It is already an essential tool for many professions and will become necessary for many more in the future.

Mathematics has therefore to be taught to many students whom mathematicians have not considered before - to students of subjects as widely differentiated as home economics and biology. Even in the fields where a mathematical education is a tradition - such as physics and engineering - many changes are necessary. Advances in mathematical and computational tools make mechanical techniques and even skills less important than before. Mathematical understanding becomes even more crucial when students and professionals use computers, symbolic manipulation systems, computer graphics and other kinds of new technology. For the same reasons continuing education demands an increasingly important role. The successful design of mathematical courses to meet these needs requires an increased degree of understanding and cooperation between mathematics teachers and those in other disciplines.

All mathematicians must be aware that the future of mathematics as a science depends on the way they respond to these new needs coming from other disciplines and from society as a whole.

Public opinion and governments should be made aware of the urgency of meeting these new needs. The status of service teaching and service teachers must be improved. New appointments, new means and increased resources are vital.

AFRICAN MATHEMATICAL UNION

The AMU (President, A.O. Kuku (Nigeria); Secretary General, Saliou Toure (Ivory Coast) has just issued its first twice-yearly Bulletin (AMU Secretariat, Institut de Recherches Mathématiques, 08 B.P.2030, Abidjan, 08, (Côte d'Ivoire.) This contains a diary of meetings and a proposed programme of activities for AMU which we reprint below. As readers will note, it contains several references to problems of mathematics education.

PROGRAMME OF ACTIVITIES

The programme of the AMU for the next 4 years 1986-1990 is the following:

A. A detailed enquiry and report on and a regular updating of the present statistical data and potentialities of Africa, particularly

   a. Of human resources of mathematicians and of their fields of activity (List of African mathematicians and mathematics educators),

   b. Of institutions (harmonisation of programmes and certificates), and facilities,

   c. Of project and future needs (in libraries, mathematicians etc.),

   d. Of mathematical publications in Africa.

B. Organization and functioning of the union, in particular:

   a. Organization of functioning headquarters of the AMU in Africa,

   b. Encouragement of the creation of national and regional sections of the AMU in Africa,

   c. Elaboration and publicising of internal rules of procedure of the AMU by the executive,

   d. Study of the constitution by the Executive Committee and suggesting modification in the light of past experiences,

e. Creation of commissions and sub-committees with specific responsibilities (e.g. on Mathematics Education, History of Mathematics, women in mathematics in Africa, etc.),

f. Assignment by the executive committee of specific tasks to its members.

C. Scientific activities

a. Publication of the journal "Afrika Mathematika",

b. Launching a bi-annual newsletter, an organ of detailed information and debates on the development of mathematical activities in Africa,

c. Organization of inter-Africa courses of long duration of which at least one will be dedicated to Ph.D. students,

d. Organization of inter-African colloquium, in different mathematical areas,

e. Organization of seminars devoted to mathematics education,

f. Promotion of publication of books and journals as well as distribution of such books and journals through all mathematics departments in Africa and other continents,

g. Encouragement of teaching of mathematics in National languages for at least primary school education and publication of manuals in these languages,

h. Organization of national,regional and African olympiads for the development of Mathematical talents among youth,

i. Creation of prizes for the encouragement of young African Researchers, and prizes for the popularization of mathematics (books, booklets, films, ...),

j. Creation of honours to be awarded by the A.M.U. to deserving mathematicians in Africa and beyond,

k. Initiation and promotion on a regular basis of at least one forum in Africa every year in cooperation with various Mathematics organisations.

D. Cooperation activities

a. Organization and development of regional information and scientific documentation centers,

b. Organization and development of regional centers for mathematicians to meet,

c. Encouragement of African countries to adhere to the International Mathematical Union and the International Commission on Mathematics Instruction on the basis of national sections of African Mathematical Union,

d. Encouragement and organization of the exchange of African mathematicians in Africa and the rest of the world,

e. Promotion of stays of long duration in Africa, of mathematicians from other continents,

f. Encouragement of cooperation with all other international organizations working for the promotion of mathematics in Africa such as ANSTI, CIMPA, ICTP, SAPAM....

ACKNOWLEDGEMENT

This Bulletin has been prepared with the help of a grant from UNESCO.

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