Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 49 (2003)
Heft: 1-2: L'ENSEIGNEMENT MATHÉMATIQUE

Kapitel: 1. Rationale for the Study

L'Enseignement Mathématique, t. 49 (2003), p. 205–214

COMMISSION INTERNATIONALE DE L'ENSEIGNEMENT MATHÉMATIQUE

(THE INTERNATIONAL COMMISSION ON MATHEMATICAL INSTRUCTION)

DISCUSSION DOCUMENT FOR THE FOURTEENTH ICMI STUDY

APPLICATIONS AND MODELLING IN MATHEMATICS EDUCATION

This *Discussion Document* has been prepared for the forthcoming ICMI Study 14 on *Applications and Modelling in Mathematics Education*. Its purpose is to raise important issues related to the theory and practice of teaching, learning, and assessing mathematical modelling and applications, and to stimulate reactions and contributions to these issues. Based on these reactions and contributions, a limited number of participants (approximately 75) will be invited to a *Study Conference*, which is to take place in February 2004 in Dortmund (Germany). Following the conference, a *Study Volume* will be produced whose content will reflect the state-of-the-art in the topic of applications and modelling in mathematics education, and suggest directions for future developments in research and practice. The authors of this Discussion Document are the members of the *International Programme Committee* for this ICMI Study, who are listed in §4 below.

1. Rationale for the Study

In this document we shall use the term '*applications and modelling*' broadly to cover all relations and links between the real world and mathematics.

That applications and modelling has been an important theme in mathematics education can be inferred from the extensive literature on the topic, including material

generated from a variety of national and international conferences dedicated to the subject. Two particular series are firstly the successive ICMEs (*International Congresses on Mathematical Education*), within which applications and modelling has been addressed regularly inside working and topic groups; and secondly the series of ICTMAs (*International Conferences on the Teaching of Mathematical Modelling and Applications*), which have been held biennially since 1983. While their Proceedings indicate that applications and modelling may play a more important role in some countries' classrooms than in the past, there still exists a substantial gap between the ideals of educational debate and innovative curricula, on the one hand, and everyday teaching practice on the other. In particular, genuine modelling activities are still rather rare in mathematics lessons.

The focus of work in mathematics education that centres on applications and modelling has exhibited considerable variety. Many activities have had a primary focus on *practice*, e.g. construction and trial of mathematical modelling examples for teaching and examinations, writing of application-oriented textbooks, implementation of applications and modelling in existing curricula or development of innovative, modelling-oriented curricula. Several of these activities contain *research* components as well if, as according to Niss, we consider research as "the posing of genuine, non-rhetorical questions (...) to which no satisfactory answers are known as yet (...) and (...) the undertaking of non-trivial investigations of a systematic, reflective and 'methodologically conscious' nature"[1]) in order to obtain answers to those questions.

So it is not surprising that applications and modelling continues to be a central theme in mathematics education. When dealing with questions of *how* individuals acquire mathematical knowledge, we cannot avoid its relationship to reality, especially the relevance of situated learning (including the problem of dependence on specific contexts). Today mathematical models and modelling have invaded a great variety of disciplines, leaving only a few, if any, fields where mathematical models do not play some role. This impact has been substantially supported and accelerated by the availability of powerful *electronic tools*, such as calculators and computers with their enormous processing and communication capabilities.

In the current OECD PISA Study (*Programme for International Student Assessment*), relations between the real world and mathematics are particularly topical. What is being tested in PISA is '*mathematical literacy*', that is "an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements and to engage in mathematics, in ways that meet the needs of that individual's life as a constructive, concerned, and reflective citizen."[2])

So in mounting this Study on "Applications and Modelling in Mathematics Education", ICMI takes into account reasons such as the above for addressing the importance of relations between mathematics and the real world, incorporating implications of the contemporary state of the educational debate, and in particular addressing the challenge presented by research and development needs in this field. An important aim of the Study is to identify existing shortcomings, and to stimulate further research and development activities.

---

[1]) NISS, M. Issues and problems of research on the teaching and learning of applications and modelling. In: J. F. Matos et al., *Modelling and Mathematics Education*, 72–88. Horwood, Chichester, 2001.

[2]) See the PISA mathematics framework in OECD (ed.) *Measuring Student Knowledge and Skills – A New Framework for Assessment.* OECD, Paris, 1999.