

INTERNATIONAL PROJECT FOR THE EVALUATION  
OF EDUCATIONAL ACHIEVEMENT (IEA)

Phase I

# International Study of Achievement in Mathematics

*A Comparison of Twelve Countries*

VOLUME

I

EDITED BY

TORSTEN HUSÉN

*Chairman of the IEA*

ALMQVIST & WIKSELL

STOCKHOLM

JOHN WILEY & SONS

NEW YORK • LONDON • SYDNEY



# International Study of Achievement in Mathematics I

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*International Project for the  
Evaluation of Educational Achievement, Hamburg  
Almqvist & Wiksell/Gebers Förlag AB, Stockholm*

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PRINTED IN THE UNITED STATES OF AMERICA

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## Preface

Until recently the comparative study of educational systems has had to rely largely upon descriptive material. The establishment of international agencies such as UNESCO and OECD (Organization for Economic Cooperation and Development) has intensified the exchange and the accumulation of valuable data relating to different patterns of educational organization, curricula, and teaching methods.

A growing awareness of the important role that formal education plays in promoting—or hindering—social and economic developments together with the realization that few countries enjoy sufficient resources or manpower to satisfy the steadily growing demand for educational expansion have underlined the need for a searching and critical inquiry into the efficiency of present arrangements. Those economists who have turned to the study of educational systems have looked in vain for some index of “productivity” in this field. Professor C. Arnold Anderson of the Comparative Education Center at the University of Chicago drew our attention, some years ago, to the need to introduce into comparative educational studies established procedures of research and quantitative assessment.

The study reported in these volumes is a first step in this direction. It was inaugurated when representatives of research institutes in twelve countries met at the UNESCO Institute for Education in Hamburg and formed a *Council of the International Project for the Evaluation of Educational Achievement (IEA)*.

Since the aim of the project was to test a number of fundamental hypotheses relating to the outcomes of different patterns of educational organization set in a variety of social and cultural contexts, its design was inevitably complex. It involved, moreover, several difficult technical problems which had not been encountered in any previous research. Not the least of these was the construction of measuring instruments appropriate for application in the schools of different nations. These

instruments were required for the assessment not only of knowledge and skills but also of opinions and attitudes, and the arrangements necessary to ensure their uniform administration were difficult to devise and to coordinate. Furthermore, in several of the countries concerned, those responsible for the undertaking had little or no experience of large-scale surveys involving representative samples. Even those participants who had been responsible for the planning of a number of such surveys found that the requirements of this particular project posed problems of a kind that they had not previously encountered. In these circumstances, the conduct of this inquiry—even apart from the results that it has yielded—has been a beneficial exercise for those taking part in it. That the time has become ripe for inquiries of this kind is apparent from the fact that the idea of undertaking such a project emerged simultaneously at several places (see Chapter 1).

In general terms, international studies such as this one can enable educationalists (and ultimately those responsible for educational planning and policy making) to benefit from the educational experiences of other countries. It helps educationalists *to view their own system of education more objectively* because for the first time many of the variables related to educational achievement had to be quantified in a standardized way. This exercise, as well as that of analyzing the content of mathematics syllabi and the objectives of mathematics teaching, has resulted in their being able to examine their own system in a more critical light. In many of the countries, national reports will be written assessing the national results against the background of the international data. These national reports will be published after the international report.

Since not only the outcomes but also the various independent variables were measured in at least a moderately satisfactory way, then the analyses of these data help *in the identification and assessment of the relative importance* of, for example, such factors as school organization, teacher training, organization of curriculum, school expenditure, technological level, and degree of urbanization of the countries concerned. Such information is a basic prerequisite to the formulation of sound policies by those responsible for the planning and organization of school systems.

The data which have been collected (reduced to 50 million pieces of information on computer tape) are being stored as a data bank. They may in the years to come be used by educationalists from all over the world in answering other questions which fall within the framework of the present investigation.

Machinery has been built up whereby additional international educational research projects can be carried out. A great deal has been learned both in technical and administrative matters. Now that it has been possible to identify and assess the relative importance of some variables to school achievement, it will be possible to refine the information which is collected in the future. Mathematics is, of course, only one small aspect of school achievement, and the benefits to be reaped from extending this study to other subject-matter areas are manifold.

It is hoped to continue the study in phases. The next phase will involve the assessment of achievement in several subjects at the same time. Seven groups of subject-matter experts in physics, biology, chemistry, English as a foreign language, French as a foreign language, mother tongue and civics/social studies have already prepared working papers giving a preliminary analysis of what to test in these subjects in the countries participating in IEA at the 13-year-old level, the 15/16 year old level and the preuniversity year level.

A scientific study with the breadth of the present one would not have been possible without the wholehearted cooperation of all those concerned: heads of institutes, research staffs, school administrators, teachers and pupils, and individuals who served on the various committees. Thanks to their cooperative spirit and unselfish pursuit of this project it has, in spite of great difficulties and unforeseen setbacks, been brought to a successful end. Their contributions can only imperfectly be acknowledged here.

In the first place, thanks should be addressed to the United States Office of Education (which provided the funds for the international costs of the project under contract HEW-OE3-10-046), the UNESCO Institute for Education, the University of Chicago, and Teachers College of Columbia University, as well as the national grant-giving agencies. They provided the financial, administrative, and technical support which permitted this project to be carried out. I should also like to thank my predecessor as Technical Director of the project, Dr. W. D. Wall of the National Foundation for Educational Research in England and Wales, who was one of those who conceived the idea of the study and who skilfully contributed to its planning.

Professors C. Arnold Anderson and Benjamin S. Bloom of the University of Chicago and Arthur W. Foshay of Teachers College of Columbia University were among the initiators of the project. Professor Robert L. Thorndike of Teachers College of Columbia University and Mr. Douglas A. Pidgeon of the National Foundation for Educational



Research in England and Wales were instrumental in devising and constructing the tests. Dr. Richard Wolf has been responsible for the data processing which took place at the University of Chicago.

The coordination of the project has been carried out from the UNESCO Institute in Hamburg. Needless to say, the administration and coordination of a research work of this scope has to overcome difficulties stemming from long communication lines, several languages, and different educational systems. This has demanded a good deal of skill and flexibility on the part of the coordinator. Therefore, I should like to emphasize how indebted the participating research centers are to Mr. T. Neville Postlethwaite who kept the machinery running and who was instrumental in solving many of the technical problems.

This book, like the research project of which it is a report, is a truly cooperative enterprise. Not only have the chapters been written by authors representing several language areas, but all members of the IEA group have participated in writing up hypotheses, and some have served as reviewers of particular chapters. All members of the group have suggested improvements in the report, but the final responsibility has rested with the Editorial Committee and its chairman, who exercised editorial discretion in the rare cases where authors and reviewers were not in complete agreement. Mr. Gilbert F. Peaker has been responsible for the editing of all statistics in the report. Dr. David A. Walker, Professor Maurice L. Hartung, and Professor Benjamin S. Bloom have been responsible for Chapters 3, 4 and 5 respectively of the hypotheses in Volume II. Mr. Douglas A. Pidgeon assisted Professor Hartung, and Professor Robert L. Thorndike assisted Professor Bloom. All of these persons, as well as Mr. T. Neville Postlethwaite, have helped me in the general editing of both volumes. I should like to express my gratitude to them.

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Stanford, California. 1966