SECOND IEA MATHEMATICS STUDY

SAMPLING REPORT

1.1 Purpose of the Report

In this comparative study of secondary school mathematics education, data was collected for variables at system, school, teacher, classroom and student levels. It is essential that the statistics obtained from measures used to quantify these variables be able to be evaluated for the degree of accuracy with which theyestimate within country parameters and for the extent to which they are comparable between countries. This report summarizes the known characteristics of the samples in participating countries and is thus concerned with sample comparability. In making cross-national comparisons between statistics for some Study variables it should be remembered that structural features of education systems, curricular differences and cultural differencer must also be considered.

1.2 International Population Definitions

Two populations were specified by the IEA International Mathematics Committee. These were selected because of intrinsic interest in mathematics education at these levels and also in order to allow comparisons to be made with results of the First IEA Mathematics Survey (Husén, 1967). Population A, the young er population, is at an age when all students are still in school in most of the participating countries and Population B is the group of students studying the highest level of mathematics taught in the school system of each country. The formal definitions are as follows:

Population A: All students in the grade (year level) where the majority has attained the age of 13.00 to 13.11 years by the middle of the school year.

Note: National Centres were advised that in the event of the 13-year old population being split equally over two grades in any country, then the grade for which the cognitive mathematics tests were most appropriate to the curriculum should be chosen

Population B: All students who are in the normally accepted terminal grade of the secondary education system and who are studying mathematics as a substantial part (approximately five hours per week) of their academic program.

Note: In the event students in the target population in most countries study mathematics for somewhat less than 5 hour per week

Some National Centres found it necessary or desirable to depart from the intention of these definitions in defining the populations at national level. For Population A, Nigeria and Swaziland students studying at an appropriate curriculum level have a mean age considerably greater than 13.00 to 13.11 years. On the other hand, students in Hong Kong and Ontario are, on average, about one year younger.

At Population B level, Ontario and Scotland have two grade levels which can be regarded as "the normally accepted terminal grade." Ontario designated one of these (grade 13) as containing the target population but Scotland's Population B sample contains students from S5 and S6 (grades 11 and 12). The Hungary sample contains a substantial proportion of students who, although studying mathematics for

"approximately 5 hours per week", are taking courses which are not pre-university type mathematics. These discrepancies will be noted under the separate 'country sections of the report.

1.3 Cross-sectional and Longitudinal Components of the Study

The full mathematics Study at Population A level was envisaged as a longitudinal study with pre-testing early in the school year and post-testing late in the same school year. The focus of interest was on the teaching and learning of mathematics at the classroom level.

The recommended sampling design was thus:

i) Stratification based, where possible, on groupings seen by each National Centre as having some significance for education in their country.

ii) Random selection of schools with probability proportional to size of the target group within each school.

iii) Random selection of two classes within each school at the target grade level. The alternative strategies used by various countries are described below under the separate country sections of the report.

Some National Centres judged that the full study would make more demands on teachers and resources than could be easily justified in their countries and other s had as their main interest either a comparison with First lEA Mathematics Survey results or an assessment of the extent to which mathematics objectives were currently being met. These countries chose to administer a cross-sectional study based on the post-test and background instruments.

Countries/systems which took part in the two components of the study are:

Longitudinal study

Belgium (Flemish) British Columbia France Japan New Zealand Ontario Thailand USA

Cross-sectional Study

Belgium French, England and Wales, Finland, Hungary, Hong Kong, Israel, Luxembourg, The Netherlands, Nigeria, Scotland, Swaziland, Sweden.

At Population B level a longitudinal study was not seen as feasible for most countries and was designated a national option. Countries participating at this level were:

Belgium (Flemish), Belgium (French), British Columbia, England and Wales, Finland, Hungary, Hong Kong, Israel, Japan, New Zealand, Ontario, Scotland, Sweden, Thailand, USA.

In addition USA and Ontario undertook longitudinal studies.

Note: i) School questionnaires for both components were identical. Teacher questionnaires for the cross-sectional component were a sub set of those used for the longitudinal component. Student questionnaires for both components were identical. Student cognitive mathematics tests contained 157 items common to both components. Comparisons between countries are based on subtests drawn from these common items. Results for all 20 countries are thus included in the report of the cross-sectional study.

ii) In Swaziland a longitudinal study based on a reduced pre-test was carried out. Cross-sectional results only have been included in the international reports.

1.4 The International Sampling Committee

The Sampling Committee for the Second IEA Mathematics Study had the following members.

Dr Malcolm Rosier, Australian Council for Educational Research, (Chairman)

Dr John Keeves, Australian Council for Educational Research

Mr Ian Livingstone, New Zealand Council for Educational Research

Mr Ken Ross, Australian Council for Educational Research

Dr Rosier was appointed Sampling Referee for the Study.

The Sampling Committee met at the Australian Council for Educational Research in Melbourne in February 1979 and prepared a sampling manual (IEA (MATHS-NZ)/A/122) which was based on the authors' experience in previous IEA studies. In addition, considerable weight was given to the published reports of Gilbert Peaker, who was sampling consultant for earlier IEA studies (Husén, 1967, Volume 1: Chapter 9 and Peaker, 1975) and to a monograph by Ross (1979). The 68-page manual contained six sections:

A. an introduction in which populations were defined and the aims of the study related to sampling designs;

B. basic sampling theory with sampling decisions tables and examples in their use;

C. factors to be considered in preparing a sampling design for the cross-sectional study and detailed procedures for each of several possible designs;

D. additional considerations and procedures needed for the longitudinal study;

E. an action schedule related to sampling indicating steps which National Centres needed to take with an appropriate time scale; and

F. questionnaires to be completed at National Centres which sought details about their population definitions. sample designs, marker variables, estimated sampling errors and schedules.

1.5 Further Guidance for National Centres

National centres forwarded details of their proposed sampling procedures to the Sampling Referee. Dr Rosier either approved the sampling plans or, in the case of many National Centres, sought further information or recommended modifications that were to be made before his approval could be given. During the phase of the Study when sampling was a major concern for National Centres, or when issues relating to samples arose, Dr Rosier issued sampling memoranda to all National Centres.

These had as subjects:

October 1980	Surv/80.18	The necessity for full sampling information from countries with an explanation of the purposes for which each element of information is needed.
		General comments of sampling designs.
		Summary of the current status of national centre sampling plans.
November 1980	Surv/80.35	Achieved samples end weighting procedures.

May 1981	Surv/81.23	Problems associated with sampling areas and intact classes.
February 1983	Surv/83.16	Comments on SIMS Sampling and Weighting.

National Research Coordinators we re also able to discuss their sampling plans and any problems they were encountering in person with Dr Rosier at international meetings in Osnabruk and Bie1efeld in January 1980 and with Mr G Pollock (Scottish Council for Research in Education) acting on behalf of the Sampling Committee at an international meeting held at Urbana in December 1980.

1.6 Recommended Sampling Procedures

The Sampling Manual (IEA (Maths-NZVA/122) detailed a variety of procedures which cou1d be followed at each stage of sampling. The most common pattern followed by National Centres was:

i) Stratification by geographical region, school type or some other variable(s) of interest in a particular country.

ii) Systematic ordering of schools within strata followed by pseudo-random selection of schools by the random start--constant interval method.

iii) Random selection of one or two intact classes within selected schools.

iv) Replacement of refusing schools either from a parallel sample or by selecting the next on the list. Inte1ded sample size was determined by a priori calculation of the sample size required to meet specific confidence limits for statistics. The calculations were based on values of intra-class correlations from previous national studies, where these were known. In general, sampling and data collection were weIl executed by participating countries. Deviations from the above procedures are out1ined in the separate country sampling descriptions in sections 2 and 3 of this report and where samples are such that there is reason to be cautious in interpreting statistics derived from them this is indicated. A conservative approach has been taken and, even for those countries in which less than very good 5amples and response rates have been obtained, enough is known about the achieved samples for informed interpretations within country, and comparison between countries, to be made.

References

Husén, Torsten (ed.) International Study of Achievement in Mathematics; John Wiley and Sons; New York; 1967.

Peaker, Gilbert F. An Empirical Study in Twenty –One Countries. A Technical Report; John Wiley and Sons; New York; 1975.

Ross, Ken. Searching for Uncertainty, A.C.E.R., Melbourne, 1979.

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