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Edited by John King

Science Achievement of Primary Students

Preliminary results from the Second International Science Study are available to show how the science achievement of Australian primary school students compares with that in other countries.

The samples of primary students were taken from those who were of age 10 years, or who were in the year level where most of the students were of age 10 years at the time of the testing program. In all countries the 10-year-old students have been exposed to some formal teaching of science, and have learned to read and write to a sufficient extent to respond to the science tests and questionnaires.

The science tests were administered in two sessions. In the first session, each student in the sample answered a 'core' test of 24 items. In the second session, each student was assigned at random to two out of the four 'rotated' tests, where

each test contained eight international items. This meant that each student answered a total of 40 items, but that data for the country overall are available on a total of 56 items.

Each of the science tests covered the four basic curriculum areas: earth science, biology, chemistry, and physics. The test items also covered three teaching objectives: knowledge, comprehension, and application.

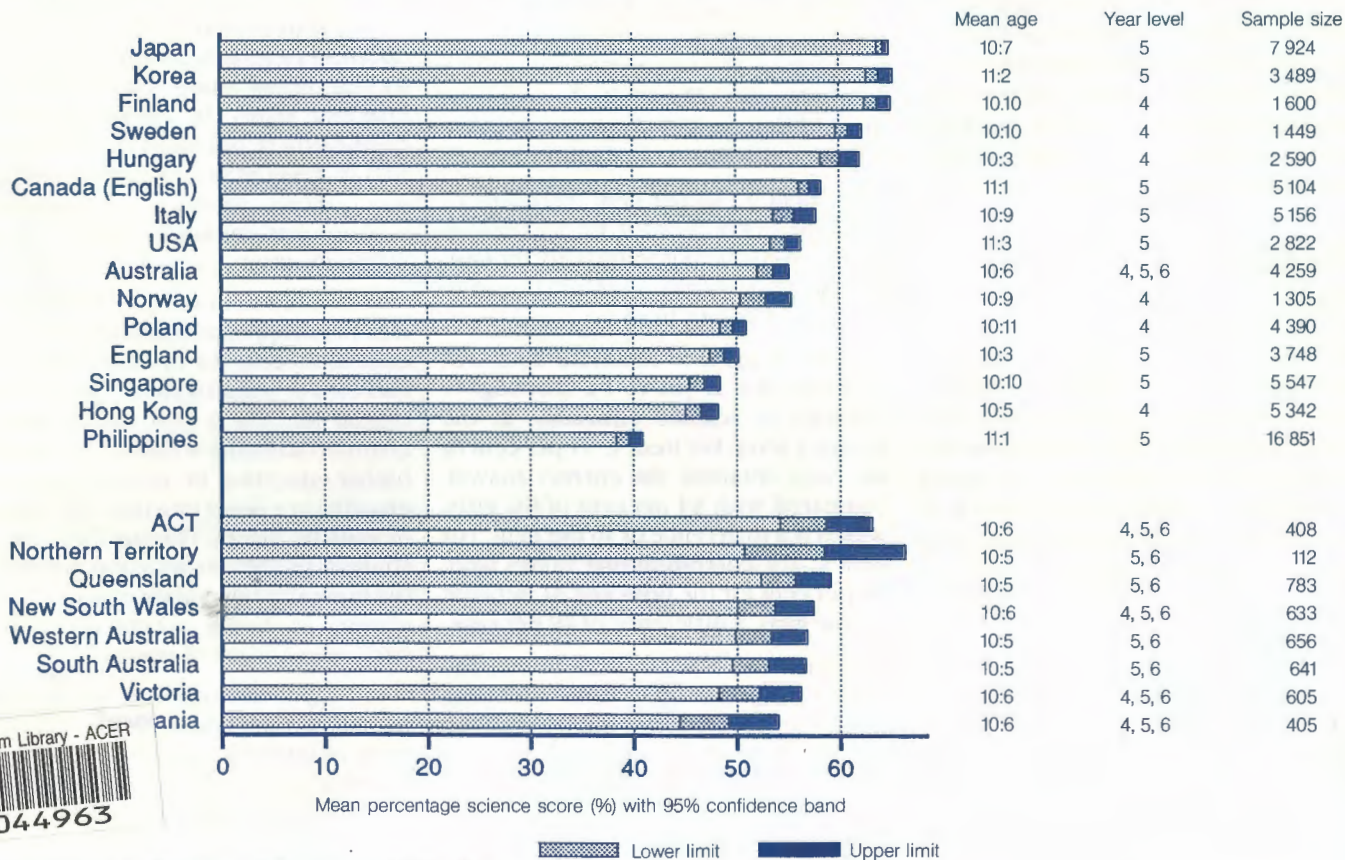
International Results

The figure presents the preliminary results for 10-year-old students for 15 countries. It shows the mean percentage of items answered correctly in the core science test of 24 items. The 'lower limit' and 'upper limit' are shown at the end of each bar. These limits define the range within which the mean value for the

whole population is estimated to lie, with 95 per cent confidence.

The figure also shows the mean age of the students, the year level at which the testing took place, and the number of students in the sample. The 10-year-old students in the Australian sample were drawn from three year levels: 21 per cent from Year 4, 51 per cent from Year 5, and 28 per cent from Year 6. Year 5 was effectively the modal year level in Australia. The other countries tested students at Year 4 or Year 5.

Australia falls in the middle of the table, at 10th place out of 15 countries. Its mean score is not significantly different from that of Italy, USA, or Norway, the adjacent countries on the list. In effect, Australia ties for seventh place with these other three countries once allowance is made for the uncertainties that arise because a sample was tested rather than the complete population.



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Achievement in Science of Ten-year-old Students

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In terms of achievement levels, Japan, Korea and Finland clearly form the top group of countries. Although the students in Finland have a mean age between that of Japan and Korea, they are only in Year 4. This reflects the policy in Scandinavian countries of delaying the start of formal schooling until about seven years of age, usually after one or more years of pre-school education. Of the other Scandinavian countries, the score for Sweden is close to Finland, but that for Norway is much lower.

The need to consider the year level in looking at the scores may also be illustrated by countries at the bottom end of the list. The scores for Singapore and Hong Kong are close, although the Hong Kong students were in Year 4 while those from Singapore were in Year 5.

Australian Results

The mean score for Australia is based on weighted data that take account of the different size of the target population in each state. The Australian samples were drawn from government, Catholic and independent schools in all states.

The Australian Capital Territory, the Northern Territory and Queensland have the highest scores, although the results for the territories are based on smaller samples and hence have higher sampling uncertainties (standard errors of sampling). The scores for New South Wales, Western Australia and South Australia are bunched together in the middle of the list. Victoria and Tasmania have the lowest scores, which are significantly different from those of the Australian Capital Territory.

Test Items

This has been the first study to measure the science achievement of an Australia-wide sample of primary students. The emphasis in the teaching of primary science is on process skills rather than mere knowledge. For this reason the majority of the test items were designed to measure students' understanding of science at a level higher than that of mere recall of factual knowledge.

For each item the student was presented with five alternative responses, for example:

Item 1

The Sun is the only body in our solar system that gives off large amounts of light and heat. Why can we see the Moon?

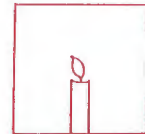
- * A It is reflecting light from the Sun. (49%)

- B It is without an atmosphere. (3%)
- C It is a star. (10%)
- D It is the biggest object in the solar system. (8%)
- E It is nearer the Earth than the Sun. (30%)

Item 2

Three candles, which are exactly the same, are placed in different boxes as shown in the diagram. Each candle is lit at the same time.

Large closed box



Candle 1

Small closed box



Candle 2

Open box



Candle 3

In what order are the candle flames most likely to go out?

- A 1, 2, 3 (12%)
- * B 2, 1, 3 (40%)
- C 2, 3, 1 (8%)
- D 1, 3, 2 (5%)
- E 3, 2, 1 (35%)

The correct response is marked in the examples with an asterisk (*). The percentage of students giving each response for Australia is given in brackets.

For Item 1, 49 per cent of the Australian students correctly answered that we see the moon because it reflects light from the sun. However, 30 per cent thought that we saw the moon because it was nearer the earth than the sun.

For Item 2, 40 per cent were able to state the correct order for the candle flames to go out, but 35 per cent thought that the flame of the candle in the open box would go out first.

These items also illustrate a serious problem that is yet to be thoroughly resolved in science education at the primary level. For Item 1, 54 per cent of the boys obtained the correct answer, compared with 44 per cent of the girls, which is a difference of 10 per cent. For Item 2, the corresponding values were 50 per cent for the boys and 31 per cent for the girls, a difference of 19 per cent.

Indeed, on most of the items in the test, the percentage of boys obtaining the correct answer was higher than the percentage of girls. In general, there are larger differences for physics items, and items where boys may have had more practical experience in handling materials and 'tinkering'.

Some Conclusions

In this international study of science achievement in primary schools, Australia occupies a middle position in the group of 15 countries. One likely reason for the higher performance of countries like Japan is that they have more systematic programs for science education in primary schools, and they ensure that more time is spent on science lessons than is the case in Australia.

On these science tests, the boys score higher than the girls, especially on physics items.

Some results for 14-year-old students were presented in the ACER Newsletter No. 62 (April 1988). Further information about the Second International Science Study is available from Dr Malcolm Rosier, Chief Research Officer, at ACER.

Interstate Equating of Higher Education Admission Indices

The Australian Vice-Chancellors' Committee has commissioned ACER to survey current practices in Australia concerned with the construction of aggregate scores for selection for higher education in the case of applicants who seek entry to courses in states other than the one in which they have completed their secondary education. The survey is to provide information on the different practices adopted by university and college admission centres in the different states. In addition to documenting these practices, the ACER study will analyse the assumptions underlying the various methods of translating achievement measures issued in the different states.

The study is important because the number of applicants for entry to higher education courses in other states has increased significantly. One major reason for this is that the number of qualified students wishing to undertake higher education in Australia has been growing at a faster rate than the number of available places. This has forced many students to apply as widely as possible in the hope that they might maximise their chance of being accepted for their particular course of study.

An important outcome of the study would be the production of a national table of interstate admission scores for higher education that can be used by each higher education admission centre. Further details can be obtained from George Morgan at ACER.

SUNRISE SCHOOL



Joint project of the Australian Council for Educational Research and Museum of Victoria

Sunrise School – A School of the Future Project

The Sunrise School is an innovative project being jointly undertaken by the Australian Council for Educational Research and the Museum of Victoria.

ACER is committed to research into the use of technology within education. It has decided to develop an environment that resembles as closely as possible those that might exist in the future. ACER wants to investigate ways in which electronic technologies may be used to improve educational opportunities for young Australians and to report the implications that this research has for educational practice and development. The work will include the development of new educational technologies.

The Museum of Victoria is determined to bring its collection into the 21st century in an appropriate form. This means the Museum's taking advantage of electronic storage, manipulation, and dissemination technologies to offer information beyond that which it phys-

ically holds, and to make this new collection accessible from within and outside the Museum's location. Thus, the Museum has a commitment to research into the ways in which the general public, and particularly those in educational institutions, may want to access information, and into the uses the public will have for such information. This research will also include technological development.

The Sunrise School has connections with many centres of technological and educational excellence around the world. It is based in Victoria but is a national forum whose aim is to be of equal value to all young Australians in the future. A unique feature of the project is that it is not aligned with any particular educational system, state or independent.

Further information about the Sunrise School can be obtained by contacting Liddy Neville, Project Director, at ACER.

SEMINAR ON INTELLIGENCE



Melbourne, Australia
24 to 26 August 1988

Overseas speakers for this seminar of international significance include:

- Professor John B. Carroll (USA)
- Professor R. B. Cattell (USA)
- Professor Arthur J. Cropley (West Germany)
- Dr John P. Das (Canada)
- Professor Andrea A. Di Sessa (USA)
- Professor Robert Glaser (USA)
- Professor John L. Horn (USA)
- Professor Earl Hunt (USA)
- Professor Rainer H. Kluwe (West Germany)
- Professor James W. Pellegrino (USA)
- Professor Kjell Raaheim (Norway)
- Professor Marc N. Richelle (France)
- Professor Robert J. Sternberg (USA)

The program will feature two symposia and numerous sessions and workshops. Further details and registration forms are available from Mrs Yvonne Allen, the Secretary of the Planning Committee at ACER on (03) 819 1400.



The Minister for Science, Technology, and Industry, Senator John Button, launched the Sunrise School in Melbourne on 30 June. Senator Button (3rd from left) is pictured with Dr Barry McGaw, Director of ACER, George Proimos, Lisa Williams, and Lisa Mainelli, Sunrise School students, Mr Robert Nordlinger, chairman of the Sunrise School board, and Ms Liddy Neville, Project Director.

National Guide to Literacy Project Continues

The April *Newsletter* reported the commencement of the project National Guide to Literacy, sponsored by the Curriculum Development Centre (CDC) and using the services of ACER staff member, Graeme Withers, on secondment to act as National Co-ordinator.

The project is now well under way with Graeme having completed a round of visits to each state and territory capital city, meeting consultative committees set up by school systems to assist with the collection of materials. His impression from these meetings is that administrators, consultants and teachers share the original view of the

project, as proposed by the Council of CDC – 'that monitoring of children's progress in reading, writing and other facets of that very complicated concept we call literacy is best done in schools, by teachers in classrooms. They already know a lot about it – the aim of this guide is to share that knowledge on a nationwide basis,' he says.

In the course of these meetings, Graeme collected a more or less complete range of curriculum documents issued by state and Catholic systems to assist teachers in the development and improvement of the students' skills, knowledge and commitment. 'I am



Reports from the Institutes for Educational Research

Northern Territory

The most recently established Institute for Educational Research is that of the Northern Territory. Founded in 1980, the Northern Territory Institute now has a membership of over sixty, and maintains an active program of meetings and seminars.

Topics scheduled for discussion in the 1988 program include 'Vertical Time-tabling and Associated Programs', 'Problem Solving: Perceptions from the Past', and 'Education and the Isolated Student in the Northern Territory'.

Further information on the Northern Territory Institute's programs can be obtained from the Institute's Meeting Secretary, Mr G. McKeown, c/- GPO Box 2983, Darwin, NT 5794.

Victoria

Highlights of the program being offered in 1988 include the Frank Tate Memorial Lecture, held in June in conjunction with the Victoria College, on the topic 'Changing Values in Education'; the John Smyth Memorial Lecture, to be held during the week 5-9 September; and the 'Laurie Shears Research Series', to be sponsored by the Institute's Research Group during October.

Further information concerning the Victorian Institute and its program can be obtained from Mrs C. Perry, the Institute's Secretary, c/- Victoria College, Toorak Campus, Glenferrie Road, Malvern, Victoria 3144.

Western Australia

Two initiatives by the Western Australian Institute in 1988 are a survey of the views of practising teachers on desirable topics for educational research and an early career award. The aim of the early career award is to recognise excellence early in a researcher's career and to encourage continuing contributions to research. The Western Australian Institute views the award as an incentive as well as an acknowledgement of early success, and as one means of identifying and encouraging the efforts of educational researchers in Western Australia. It is proposed to present the inaugural early career award at the Institute's annual weekend Research Forum in August.

Further information on the initiatives and program of the Western Australian Institute can be obtained from Dr T. Ryan, the Secretary, c/- Curtin University, Hayman Road, Bentley, WA 6102.

New South Wales

The conference 'Academically Gifted, Educationally Disadvantaged?' organised by the NSW Institute for Educational Research attracted a distinguished group of participants who presented a variety of well-informed personal viewpoints on the topic and who were able to provoke lively discussion. Formal presenters included the Chairman of the Senate Inquiry into Education of the Gifted, Senator Mal Colston, and the Honourable Justice Michael Kirby as well as educators in related programs from various school levels.

The book *Academically Gifted - Educationally Disadvantaged? Providing for the Intellectually Gifted and Talented* is a compilation of the papers at the conference. This book is available for \$8.00, including postage, from Dr J. Relich, MacArthur Institute for Higher Education, Box 555, Campbelltown, NSW 2530.

The NSW Institute's theme for this year is concerned with research and educational priorities. Further information on the Institute's programs can be obtained from the Honorary Secretary, Mr Geoff Howse, NSW Education Commission, 9-13 Young Street, Sydney, NSW 2000.

▶ astonished by the vitality of most of these documents - most of them are far from our sometimes-held view that such documents are dry, dull and useless. Certainly they give the lie to claims that the schools don't know what they are doing. And many of them deserve the widest possible national circulation.'

To this end, he has prepared a register of all these materials, with information as to where they can be obtained. This list will be sent to all those who have contacted him expressing an interest in the project. 'I think, when the project began,' he says, 'some people were a bit concerned that CDC were trying to push some sort of "National Curriculum" in literacy. This is far from the case. The work of the project is to support all the initiative, thought and energy that have gone into producing these documents.'

The next stage of the project, now under way, is to contact and work with a large number of teachers who have been identified by their systems as having special expertise in the assessment of literacy. 'We are going to try something new on them for a start. We've designed this oral-aural questionnaire which we

hope will get us a lot of opinion and information from busy teachers; people who mightn't feel like sitting down and answering a lot of questions in writing, but who nevertheless have a lot to say. We'll see how it goes.'

Expression of Interest Invited

Graeme is still responding to expressions of interest from teachers and others who read the April *Newsletter*, and invites further contacts. 'In particular, I'd like to contact people who teach subject specialties other than English, and who have views about the ways their disciplines or fields make an impact on students' literacy. We're always in danger of seeing literacy as language development done by English teachers, and nothing more than this. It is more, and I'd like to know what teachers in other fields have to say about the matter,' he says. 'All contacts will get copies of the bibliography and the occasional bulletins. But they also ought to be aware that they might get roped into helping us with some aspect of the project, too, like trying out the oral questionnaire.'

Graeme can be contacted at ACER, PO Box 210, Hawthorn, Victoria, 3122; phone (03) 819 1400.



Dr Warren Jones, Senior Research Officer at ACER, has worked on projects funded by the Victorian Post Secondary Education Committee and the Commonwealth Tertiary Education Commission. The projects focused on participation in mathematics and science in Year 12 and entry to science-based courses in higher education (see Occasional Paper No. 20 and Research Monograph No. 32 in 'New From ACER'). His current work includes an investigation of special non-award programs in higher education, which are often referred to as bridging and supplementary courses. This project is funded by the Department of Employment, Education and Training.

Intelligence: Controversy and Change

Alan Watson, Editor

This book presents the controversy over the measurement of intelligence and reviews emerging understanding of how the intellect functions. It is arranged in three parts.

In the first part of this book, some of the major participants in the debate over IQ testing present their cases. In the second and third parts, leading Australian psychologists and researchers discuss new insights into the nature of intelligence and suggest future directions for work on its measurement and nurture.

Psychologists, school counsellors, teacher educators, researchers in human science, and lay people interested in the study of intelligence will want to read this book. It provides a good introduction for students to the measurement of ability and the controversy associated with it.

Code 254BK Price \$25.00

set: research information for teachers

No. 1, 1988 ACER/NZCER

The first edition of *set* for 1988 contains research information for everyone interested in education: teachers, principals, students, lecturers, and parents. This edition covers four items on mainstreaming and integration, four items on schools and society, and six items on classrooms and learning.

Set is produced twice yearly by the New Zealand and Australian Councils for Educational Research and is available by subscription only (Australian subscribers: Code, 988PS; Price, \$25.00; Overseas subscribers: Price, \$28.00).

Helping Our Deaf Children

(Revised Edition)

Michael Parsons
NZCER 1987

The education of the deaf child, as for all children, begins with the family. *Helping Our Deaf Children* describes, in a very readable way, the techniques and approaches that can be successfully used in, and outside, the home. Areas such as causes of deafness in children,

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NEW FROM A·C·E·R

the detection of deafness, sources of help, basic communication skills, and the school years, are included.

The first edition of this book was written as a result of requests for help and advice from parents. This revised edition reviews the principles of the earlier book, and updates the developments in technology and educational provision and the improvements in our understanding of communication with deaf children. During the preparation of the new edition special care was taken to provide for Australasian readership. It is fully illustrated.

Code 044BK Price \$14.85

Profiling: A User's Manual

David Garforth and
Henry MacIntosh

Stanley Thornes (Publishers) Ltd.

This book is designed to meet the growing need for a concise, accessible, jargon-free introduction to profiles and records of achievement for use by those who lack formal specialist training in assessment.

The book sets out to answer three main questions:

- What is a profile?
- What value does profiling have?
- How do I develop and operate an effective profiling system?

Profiling could be used as a basis for short in-service courses. However, it is designed primarily as an inexpensive, readable, self-help introduction to the subject for curriculum co-ordinators and teachers.

Code 256BK Price \$11.70

Introducing Profiling: A Practical Manual

Patricia Broadfoot
MacMillan Education Ltd

This is a book for those concerned at any level with records of achievement and

profiles. Both the hardened expert and the wary newcomer will find in it a comprehensive review of existing practice and a practical guide to the many vital questions that must be answered by all those intent on advising, introducing, and developing such a recording scheme.

The highly accessible text analyses the strengths and weaknesses of a wide field of schemes that have already been developed, and uses the experiences of individual schools and teachers to illustrate the process of implementation itself.

Written by one of the leading authorities in the field of profiling, the down-to-earth, straightforward approach of this book makes it essential reading on both the background theory and the day-to-day practice of introducing profiling.

Code 257BK Price \$24.95

Joining In: A Study of the Mainstreaming of Children with Special Educational Handicaps into Kindergartens and Play Centres

Geraldine McDonald
NZCER

This is a series of four booklets based on the study. The study's main findings and recommendations are contained in *Booklet 1, Joining In: The Summary*. *Booklet 2, Joining In: Children and Learning* describes the development of a running record and learning-event check list; the report of findings from interviews is recorded in *Booklet 3, Joining In: Teachers and Parents*; and results from the use of a structured observation schedule are presented in *Booklet 4, Joining In: Children Observed*.

	Code	Price
Booklet 1	015BK	\$7.70
Booklet 2	008BK	\$7.70
Booklet 3	259BK	\$7.70
Booklet 4	258BK	\$7.70

