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## International Project on Mathematical Attainment

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Singapore joined the International Project on Mathematical Attainment (IPMA) \* in January 1999. This project is a longitudinal and international one (Burghes, 1998a). At present Brazil, Czech Republic, England, Finland, Greece, Holland, Hungary, Ireland, Japan, Norway, Poland, Russia, Singapore and United States of America are participating in the project. The aim of this project is to monitor the mathematical progress of children from their first year of schooling throughout primary school. It hopes to study the various factors that affect that progress with the ultimate aim of making recommendations at an international level for good practice in the teaching and learning of mathematics.

A total of 1016 pupils studying in three primary schools in Singapore are participating in the IPMA. The subjects are entire cohorts of Primary One pupils studying in these schools in 1999.

At the beginning of the school year in 1999, these pupils were tested on their knowledge of numbers. The test administered to the pupils comprised of seven items. It was constructed by the IPMA team (Burghes, 1998b) in UK. The following is a description of the tasks.

- Item 1: to complete the picture so that it has 7 dots.
- Item 2: to identify the number marked on the number line.
- Item 3: to complete addition and subtraction number sentences: finding the sums, differences, second addend, first addend which is zero, and subtrahend.
- Item 4: to order a given set of numbers less than 20 from small to big, and to identify the odd numbers among them
- Item 5: to locate positions from left and right; to recognise a triangle.
- Item 6: to add with sums less than twenty; to subtract with minuends less than twenty; to locate the answers on the given number line.
- Item 7: to find the next term in a given simple number pattern (arithmetic progressions).

In each school all the primary one pupils were given the test scripts at the same time. Their teachers read through the test prepared on overhead transparencies, question by question, allowing sufficient time for pupils to answer the question before proceeding to read the next item. Teachers were allowed to paraphrase the items so that pupils'

performance was not affected by language competency. The whole exercise took about 30 – 40 minutes.

The researchers scored the test scripts. The answers were marked either right or wrong. A score of one was given to a correct response and zero for an incorrect response. The maximum test score was twenty.

### Results of the Test

The mathematical knowledge of a typical child at the beginning of Primary One as revealed by the test may be described as follows:

- ◆ able to count to 20
- ◆ whose knowledge of ordinal numbers does not lag far behind counting but finds it relatively more difficult to name the relative position from the right than from the left
- ◆ able to distinguish triangle from other basic shapes such as circles, squares and pentagons
- ◆ able to compare and order numbers but is confused when there are too many numbers to compare and order simultaneously
- ◆ unlikely to know what is an odd or even number
- ◆ able to use counting-based strategy (e.g., using fingers) to find the correct sums and differences but tends to view '=' as an activity rather than equivalence. Hence, finds it easier to complete number sentences such as  $2 + 3 = \underline{\quad}$ ,  $6 - 4 = \underline{\quad}$  than  $2 + \underline{\quad} = 5$ ,  $\underline{\quad} + 3 = 5$ ;  $\underline{\quad} - 4 = 2$  and  $7 - \underline{\quad} = 5$
- ◆ has no difficulty finding the sums and differences of numbers less than 20 if no renaming is required but performance deteriorates when renaming is required, especially in subtraction
- ◆ whose ability in skip counting is not as well developed as addition and subtraction.

The test also shows that an atypical child in Primary One can be one who has mastered all the above skills or one who has relatively little arithmetic knowledge. Though the two or three years of pre-school education seems to give children a head-start in mathematics in school, teachers teaching Primary One must be aware of the diversity in children's pre-school mathematics knowledge. They must build on pupil's experience and differential teaching may therefore be necessary.

## References

**Burghs, D. (1998a)** Co-ordinators Manual – International Project on Mathematical Attainment. United Kingdom: University of Exeter (Centre for Innovation in Mathematics Teaching).

**Burghes, D. (1998b)** International Project on Mathematical

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