IPMA

International Project on Mathematical Attainment

REPORT on the Third Meeting of Country Coordinators

Latimer, England, 8 – 11 March 2002

1. Introduction

This is a report on the weekend meeting which was held at the *PricewaterhouseCoopers* Conference Centre at Latimer, Buckinghamshire. The agenda for the meeting is given in **Appendix 1** and a full list of participants in **Appendix 2**. We were pleased that the *IPM*A coordinators from all but one of the participating countries were able to attend.

We are very grateful *PricewaterhouseCoopers* for the continued support of our project, in particular to Debbie Bird and Clare Gardner, and also to the staff at Latimer who made our stay so memorable. All the participants made significant contributions throughout the meeting and everyone gained from the interactive discussions which took place.

In this report we will give summaries of the main points made by each of the coordinators and also of the follow-up discussions, although each coordinator has been invited to make his or her individual country report available through the internet to a wider audience. These will be added as they are received to the *IPMA* internet site at:

http://www.ex.ac.uk/cimt/ipma/menu.htm

We have deliberately not insisted on a uniform style as many of the coordinators had their unique way of analysing and interpreting their data and we hope that by using their manuscripts directly we will capture their particular focus and emphasis.

The meeting was preceded by a seminar on the use of University Practice Schools in a number of participating countries as a model for teacher training. This will be reported separately.

2. Project Overview

David Burghes, the Project Director, outlined the methodology of the longitudinal study, particularly emphasising the following.

1) Each country has a coordinator who is responsible for its participation in *IPMA*, including choosing schools which broadly represent a region of the country, although are not necessarily representative of the whole country.
2) The coordinators are responsible for the administration of yearly tests which provide a measure of progress.
3) Value-added scores based on the yearly progress made from the initial attainment level are computed for each pupil, class and school within each country, based on that country's database. Additionally, value-added scores are computed using the data from all countries as the basis.
4) Lesson observations are made to record teaching strategies, particularly for teachers who have extreme value-added scores (positive or negative).

5) Questionnaires and interviews with teachers, and possibly pupils, will be used to provide more information about effective practice.

6) The correlation of lesson observations, questionnaires and interviews with the value-added data will enable coordinators to make recommendations for good practice in primary mathematics teaching in their own country.

7) Video clips of effective practice will be made in each country in order to provide coordinators with an international dimension to their analysis.

8) Regular meetings of coordinators will be held to discuss factors affecting progress and ultimately to make international recommendations for good practice.

Professor Burghes also stressed that although it was very tempting to use the now extensive database as an international league table, this was not the purpose of the project, as the samples are not necessarily representative and factors such as the starting age would clearly have a dramatic effect on attainment levels initially but might be irrelevant in the long term.

However, the individual value-added scores for each country are of paramount importance. Once a pupil has taken two of the yearly tests, a value-added score is computed from

$$\text{V.A} = \frac{\left(T_{n+1} - T_n\right)}{\partial T} - 1$$

where T_{n+1} and T_n are the scores on Test (n + 1) and Test n and ∂T is the average gain made by pupils starting with a score of T_n. In this way, if a pupil makes the average gain, he or she will have a value-added score of zero. Positive and negative value-added scores correspond to above and below average gains respectively.

As progress increases above the average, so does the value-added score and note that it depends on the baseline score, T_n. Thus we are comparing individual pupils only with other pupils in their country who had similar attainment at the start of the school year.

The director stressed that it is important for coordinators to use the value-added data to identify good (or poor) practice and to correlate the outlier values with the observation data, questionnaires and interviews. The variation in the value-added scores for classes within a country are crucial for obtaining evidence of effective practice in that country.

Factors which need to be considered in addition to teaching styles and strategies could include:

- curriculum and sequencing of topics
- teaching time for mathematics
- school and national assessment policy
- resources used, including IT
- school organisation, including setting and/or streaming
- integration of SEN pupils
- starting age for primary education and the role of kindergarten
- teacher training
- the status of teachers in the community and their working conditions
- national initiatives.

This list is not comprehensive and national coordinators must consider other important factors that may be influential in their particular country.

The challenge ahead is to be able to relate influencing factors to the analysis so that each country coordinator can feel confident in the robustness of their conclusions, sharing these with other coordinators and gaining from the discussion concerning good practice in each country. We recognise that each country has its own set of problems and issues but also that there must be influencing factors which are common to all countries. We need an openness in our attitudes and discussions in order to recognise that no one country has all the answers and that we can all gain through collaboration and cooperation.

3. Summary of Country Reports

The brief reports below summarise some of the main points made by each country coordinator. More detailed reports are available for many of the countries and can be accessed by clicking on the country name or by going to the main menu.

3.1 Hungary

The country coordinator gave full details of the data for 4 consecutive cohorts which are being tested in each of the project schools. One key fact to emerge is that each cohort achieved very similar marks, showing consistency overall and also within schools. He is, though, concerned that this situation will change for the worse in the future, as time for mathematics is being reduced from the current 4 lessons to 3 lessons per week.

The variations shown between schools is explained by the ability of the intake. He is also concerned that while these cohorts are performing consistently, there has been an overall decline over a long time period. This is particularly true of Hungarian pupils' ability to cope with word problems which is due, at least in part, to lower levels of literacy!

Despite this problem, he was pleased to note that Hungarian pupils are still performing well in comparison with pupils of similar ability in other countries.

3.2 Japan

The Japanese coordinator introduced his country report by first indicating the scope of the project in Japan; there are two groups of primary schools in the regions of Hiroshima and Fukuoka and about 500 pupils participating.

Tests 1, *2* and *3* have now been taken by this cohort and the focus of the Japanese study has been on the 'fixity' of mathematical concepts. The test questions have been categorised in terms of grade and level and the responses have been analysed according to these categories:

High:	$PC \geq 80\%$	(PC: percentage correct)
Medium:	$60\% \leq PC < 80\%$	
Low:	$PC < 60\%$	

Progress in the test questions has been divided into the types:

$$H \to H,\ M \to H,\ M \to M,\ L \to H,\ L \to M \text{ and } L \to L.$$

Details are given in the country report, which seems to imply that the teaching and learning of mathematics during the first year was more effective than during the second year.

They have also investigated the changing pattern of each child, using 1 for correct and 0 for incorrect or no response. Thus possible categories are:

$1 \rightarrow 1 \rightarrow 1$, $0 \rightarrow 1 \rightarrow 1$, $0 \rightarrow 0 \rightarrow 1$, $0 \rightarrow 0 \rightarrow 0$, and others!

This leads to consideration of the percentage of 'fixity' of common items and to recommendations about which topics should be given greater prominence by teachers; these particularly include number sequences.

3.3 Finland

The Finnish coordinator explained that only *Test 2* and *Test 3* had been taken (as Finnish pupils start school at age 7+) but by a very large sample size (almost 2000) which is based geographically throughout Finland.

The variability in value-added scores on these two tests will now be investigated over the next year. The comparison with other countries where pupils start school either one or two years earlier will be of interest, particularly in the light of Finland's high scores in the Pisa study, which had been quite a surprise to many people involved in Education in Finland! It should, though, be noted that the problems in the Pisa tests were very close to the Finnish curriculum and, with the emphasis on word problems, part of the Finnish success can be attributed to the ease of reading in Finnish and the high levels of literacy.

3.4 Estonia

An overview of the education system in Estonia was given by the country coordinator, as he anticipated starting the project in his country in September 2002.

The Estonian system is very similar to Finland, with pupils starting primary school at age 7+. Currently there are 3 or 4 mathematics lessons, each of 45 minutes, per week which is a reduction from previous years.

3.5 Czech Republic

Similar to Hungary and Poland, the Czech Republic has tested a number of consecutive cohorts and can compare both between years and across schools

In particular, the coordinators referred to test questions which Czech pupils found difficult, partly because the topics had yet to be covered in the curriculum. There are 3 distinct schemes of work that can be used by Czech teachers and one of them, the *general school scheme*, is very slow. Also, there has been a recent change from 4-year (from age 7+) to 5-year (from age 6+) primary schools, which might have had an effect on teaching.

Nonetheless, progress from *Test 3* to *Test 4* had increased relative to other countries, after more moderate gains from *Test 2* and *Test 3*.

3.6 Singapore

Although Singapore has only 3 schools participating, this in fact provides 1000 pupils. During the year, lessons given to the project classes were videoed and these are available for analysis and dissemination.

The results from Singapore indicate a strong performance on the tests, with good progress from one year to the next.

Pupil questionnaires have been used for those at the extreme ends of the value-added scores and it appears that teaching style is not the most important factor in enhanced progress but rather home support and out-of-school tuition.

There is general acceptance of a testing-led culture in primary schools, which culminates in the End of Primary School exam. This decides which school (and stream) pupils will enter for their secondary education.

3.7 Ireland

It should be noted that in Ireland pupils start primary school at age 4+, although the early start does not result in a better performance in *Test 0*. The sample here consists of 15 schools, both rural and city, and includes three girls only and three boys only schools. Classes are not streamed or set in mathematics.

There is a new activity-based curriculum being implemented but in reality this is driven by the text books being used. In terms of assessment, there is national baseline testing but it is not compulsory and nor are later tests.

All classrooms have a computer linked to the internet but it is rarely used for mathematics teaching. Currently, special needs is of great concern as many parents are suing schools for large sums of money because of lack of specialist provision.

Teaching is still regarded as having high status, in part due to the good conditions of service. It is relatively well paid, as pay is bench-marked with other professions. The coordinator's concern, in the light of the high quality of students entering training, is the quality of the output. Such intelligent, well-motivated students should be achieving more in the classroom.

3.8 Ukraine

This is the first year that Ukraine has participated, with 12 classes from 9 schools taking *Test 0* last September. As the age of pupils in Year 1 is 6+, they should have taken *Test 1* but this will in part be rectified by pupils taking *Test 2* at the end of the current school year.

The coordinator's particular interest is how to gain high levels of attainment in and enjoyment of mathematics. The three main pedagogical approaches, (traditional, Davidov and Zankov) are being implemented in the participating classes. It will be of interest to see the progress made under each system.

3.9 Russia

The Russian sample consists of 3 classes from each of 4 schools, situated in different regions of Yaroslavl. As pupils start primary school at age 7+, *Test 2* was administered first, followed by *Test 3* and *Test 4*.

There are different methodologies being used in Russian primary schools and the schools have been chosen to reflect three of these pedagogies (traditional, Davidov and Zankov). Most classes use the traditional method, characterised by:

a) the main technology being the knowledge base,

b) exercises for memory development,

c) reproductive teaching of mathematics,

and aiming to progress the average pupil.

Although the three methodologies give different initial results, the coordinator predicts that after 5 years there will be little difference. It will be interesting to see whether he is right!

3.10 China

There are two groups of pupils being tested in China, one based on primary schools in Beijing and the other in Suzhou. The results from these two locations (with about 500 pupils in each city) are not too dissimilar, although there are significant differences between individual schools.

In general, the experimental (University) schools do well as they are well resourced and attract the best teachers. Some of the poorer performing schools are rural schools, where there is no kindergarten and parents are usually farmers and therefore less well educated.

It should be stressed that education is seen as important by everyone; teachers are well respected and conditions of service are high in comparison with some countries. Usually a primary school teacher will teach only 15 lessons a week (3 a day) and will spend the rest of their time marking homework and preparing lessons. There are specialist teachers, so Mathematics teachers will normally just teach mathematics.

Although class size is high (40 to 50 pupils), the main methodology is whole-class interactive teaching, with pupils participating and demonstrating in front of the class.

There is a blackboard and OHP in each classroom and there has been an increase in the use of IT as a teaching resource, with most primary schools having a computer room or a large multimedia room.

Generally, pupils are well behaved, well motivated and keen to learn.

3.11 Poland

Polish pupils, like those in Russia and Finland, start primary school at age 7+, but made significant progress during the first two years of formal education.

In her analysis, the Polish coordinator distinguished between correct, wrong and not attempted, which gives more information concerning pupils' performance on particular questions. Also, she was able to make comparisons with earlier cohorts (having already tested these). In some questions, performance had worsened and this may be due to the recent implementation of an integrated curriculum in which the teacher becomes the facilitator, with pupils active and learning through contextual problems and investigations.

She has doubts about whether the basic structure of mathematics is being taught and there is conflict here between psychologists and mathematicians.

3.12 England

The coordinator explained that there were two distinct groups in the English cohort: one group of schools which have been following the recently implemented *National Numeracy Strategy (NNS)* and a second experimental group following the *Mathematics Enhancement Programme (MEP)* which is an English adaptation of the Hungarian approach.

Essentially, all state schools are required to follow the *NNS*, in part due to the fear of inspection. Although the coordinator was a member of the Government's *Numeracy Task Force* and had therefore had some influence on the *NNS* (for example in the use of number cards and slates), there were many pedagogical issues which he was concerned about. In particular, the *NNS* recommended a 3-part lesson consisting of

Phase 1: mental /oral starter

Phase 2: main activity (usually interpreted as differentiated group work)

Phase 3: plenary

whereas the approach of successful countries like Hungary is to have 7 or 8 (related) activities in a lesson, each one in essence having a 3-part structure (i.e. introduction, practice, review). It is therefore of interest to compare the progress of each of the groups with the other, as well as with other countries. Although the group size is relatively small, initially *MEP* pupils have outperformed *NNS* pupils with improved valued-added scores at all ability levels, but the gains are not large. In comparison with other countries, it appears that the one year earlier start (at age 5+) does not provide any sustained enhancement in attainment.

Other issues which concern the coordinator are:

- the teaching of mixed age classes (there are significant numbers of classes which are split between age groups and the approach taken is to teach the whole class rather than, as in Holland, split the class into the two year groups and teach them mathematics at different times);
- because of the pressure on results (there are compulsory national tests at the end of Year 2 and Year 6, with league tables published), schools are beginning to set and stream pupils at a very early age.

3.13 Vietnam

This is one of the countries which started participation in *IPMA* this year and hence has only completed *Test 1*, with a sample of 172 pupils from schools in Hanoi.

The coordinator presented the results, noting that some pupils scored full marks and could have scored more marks if *Test 2* had been used, but no pupil managed to answer Q.4b correctly (identifying odd numbers) as the concept is not in the mathematics curriculum for this age group.

From 2002, there will be a new curriculum with new text books so it will be of interest to see the impact that this might have.

3.14 Greece

The Greek sample consists of 3 schools in the area of Patras but it has tested all years in these schools and will follow two cohorts through from Y1 to Y6. It is of interest to note that teachers in Greek schools are not used to assessment and the coordinator had difficulties in persuading teachers to undertake the testing. However, a new law has just been passed which ensures that assessment will be done in all aspects of education.

The coordinator noted that the mathematics content of some questions (e.g. symmetry, rotation, sequences and patterns) were not included in the Greek primary mathematics curriculum. Greek pupils had difficulties with money problems which used Euros and also with the context of some of the other questions.

The Greek coordinators are particularly interested in:

- understanding how pupils cope with questions which lie outside their mathematics curriculum, i.e. what sort of strategies do they apply;
- studying pupils' answers to specific questions in order to identify particular strategies to help understanding;
- studying pupils' mathematical development throughout their primary education.

3.15 USA

The USA sample is based on 6 schools in South Florida but it should be noted that these are representative neither of the USA nor even of Florida.

Schools 1–3 use a traditional curriculum whereas the other schools have an innovatory curriculum. Unlike most other countries (except for England), time devoted to the teaching of mathematics is increasing.

Other important aspects include:

- a high pupil mobility rate in the schools chosen;
- many schools now using computers for extra practice.

It was also noted from the data that pupils were more able to cope with unknown concepts when they were in a familiar context.

3.16 South Africa

The coordinator emphasised his reasons for conducting the South African participation; namely to see how South Africa is doing compared with other countries and despite the problems stacked against them.

In former times, money and resources had been aimed at white pupils, although 80% of the population was black, so there have been many decades of under-investment in black schooling. The government is now trying to forge an integrated society with a common national educational agenda but it is difficult to implement because of the historical influences.

The new government is keen to do away with everything associated with the past, so it is now moving towards a constructivist approach, where pupils do not have to learn facts and tables by heart and are encouraged to sit around tables, socialise and have group activities.

There will be a new curriculum in 2005 with a move to individualised learning, although many teachers are still wedded to traditional approaches. Other points to note are:

- mathematics has 7 periods (35 minutes) per week;
- there is only one national exam at Grade 12, although there are informal exams at earlier ages and reports to parents;
- the use of IT is very diverse, with good facilities at some schools but others not even having electricity;
- the government is considering changing the starting age to 7 years, rather than 5 years at present.

The coordinator discussed the first two test results from the project schools and highlighted some of the problems, including high mobility of pupils. He is particularly concerned to gain evidence to answer the following questions.

1) Do male pupils perform better than female pupils in mathematics?
(If so, when does this occur and what can be done to redress the balance?)
2) Does exposure to mathematical concepts at pre-school result in enhanced performance at primary schools?
3) Does holding back the under-achievers help to improve their performance in mathematics in the long term?
4) Does the starting age matter? Would, for example, starting at age 7+ have any long term detrimental effect on mathematical progress?

4. Value-Added Analysis

It was agreed that overall country attainment would not be directly compared, firstly as the samples being used were not designed as being representative of the country, nor in practice could they be designated as being representative; secondly, with such varying factors as starting age, teaching time, etc. as well as the obvious inequalities in resource provision, there is no real justification for making direct comparisons of all the participating countries.

Many countries have given their attainment figures in their country reports, but we would want to stress again that a simplistic league table approach is neither helpful nor fair!

However, we have compared value-added scores across countries and, grouping according to starting age, we obtain the following results. Note that only pupils who have taken all the tests have been included. (The standard deviation is shown in italics.)

a) Countries starting at age 5+ or earlier

Country	**No. of pupils**	**Tests 0 – 1** V.A	*s.d.*	**Tests 1 – 2** V.A	*s.d.*
England	261	2.11	*5.03*	– 0.76	*4.60*
Ireland	155	– 0.29	*3.76*	0.31	*4.41*
S. Africa	138	– 1.29	*6.15*	n/a	
U.S.A	295	– 1.13	*5.12*	0.51	*4.11*

There are some surprising differences here, with England appearing to progress well from *Test 0* to *Test 1* but not as well from *Test 1* to *Test 2*, where both Ireland and the USA make more progress. This perhaps could be explained by the emphasis put on national testing in the UK, where pupils are pushed very hard for the Key Stage 1 test which takes place in May, with revision often starting much earlier. Teaching to the test, for some pupils at least, produces short term gains but perhaps they are not long lasting and a great deal of teaching time can be lost through repeated practice and revision sessions. (*Test 2* is taken at the end of the year in July in England.)

To understand more fully the trends here, it is interesting to divide up the overall population into roughly three parts, i.e. *High*, *Middle* and *Low*, using the initial test score each year to do this. The valued-added data are summarised below.

Country	**Level**	**No. of pupils**	**Tests 0 – 1** V.A.	**No. of pupils**	**Tests 1 – 2** V.A.	**No. of pupils**	**Tests 0 – 2** V.A.
England	*High*	80	2.16	121	– 0.20	80	0.64
	Middle	103	2.39	87	– 1.17	103	0.52
	Low	78	1.69	53	– 1.36	78	– 0.86
Ireland	*High*	125	– 0.14	86	– 0.01	125	– 0.42
	Middle	26	– 0.55	56	0.37	26	0.01
	Low	4	– 3.25	13	2.16	4	1.67
S. Africa	*High*	39	– 4.02	Not tested yet		Not tested yet	
	Middle	44	– 2.24				
	Low	55	1.41				
U.S.A.	*High*	13	– 0.25	13	1.88	13	0.22
	Middle	68	– 1.96	107	0.76	68	– 0.79
	Low	214	– 0.92	175	0.26	214	0.28

Sample size < 20 (shaded rows)

The value-added data now shows other aspects, although any value-added scores based on samples less than 20 must be treated with caution (and less than 10 should be ignored). The English sample's gains are fairly uniform from *Test 0* to *Test 1*, although significantly less in the low part. This would appear to conflict with national data, where gains in attainment are thought to be more substantial at the lower end, in part due to less differentiation (in the past, there had been almost total differentiation in content). The value-added data is the result of comparing with other countries and not just internally.

The South African performance of its low group has a very positive value-added score, which is balanced by the relatively low value-added score from the USA. It should be noted that the USA sample is taken from schools in a very deprived area, although this does not seem to be an impediment to progress from *Test 1* to *Test 2*.

b) Countries starting at age 6+

Country	**No. of pupils**	**Tests 1 – 2**		**Tests 2 – 3**		**Tests 3 – 4**	
		V.A	*s.d.*	V.A	*s.d.*	V.A	*s.d.*
China	950	1.11	*3.74*	0.83	*3.72*	Not tested yet	
Czech Rep.	468	– 5.22	*3.10*	– 0.17	*3.85*	0.67	*4.50*
Greece	39	0.08	*4.50*	Not tested yet		Not tested yet	
Holland	169	– 1.28	*4.01*	1.93	*4.04*	– 3.16	*5.16*
Hungary	372	1.60	*3.44*	1.08	*3.33*	1.27	*4.70*
Japan	515	– 0.32	*3.15*	– 1.24	*3.08*	Not tested yet	
Singapore	972	1.15	*3.27*	– 0.85	*3.02*	– 0.33	*3.65*

Note again the difference in value-added scores in each of the years. Only China and Hungary have consistently positive value-added scores. More information can be obtained by dividing the total population into roughly three equal parts, giving the results below.

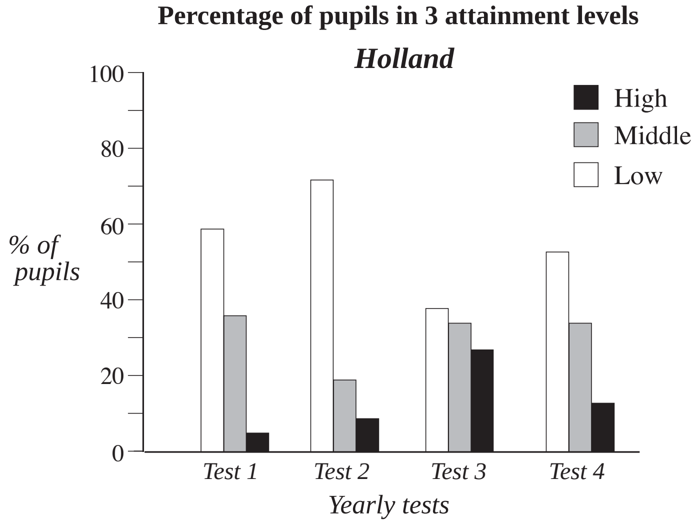
Country	Level	No. of pupils	Tests 1 – 2 V.A.	No. of pupils	Tests 2 – 3 V.A.	No. of pupils	Tests 3 – 4 V.A.
China	*High*	426	– 0.38	387	0.31	Not tested yet	
	Middle	285	1.50	400	1.07		
	Low	239	3.31	163	1.45		
Czech Rep.	*High*	91	– 4.43	13	0.87	32	0.25
	Middle	192	– 5.41	54	– 0.75	118	0.79
	Low	185	– 5.41	401	– 0.13	318	0.66
Greece	*High*	5	– 0.53	Not tested yet		Not tested yet	
	Middle	12	– 0.63				
	Low	22	0.60				
Holland	*High*	9	1.67	15	0.69	46	– 5.36
	Middle	60	– 2.11	32	1.13	58	– 3.34
	Low	100	– 1.04	122	2.29	65	– 4.43
Hungary	*High*	80	0.62	116	0.63	164	0.79
	Middle	88	2.39	134	1.31	130	1.64
	Low	204	1.65	122	1.25	78	1.66
Japan	*High*	46	– 0.58	44	0.34	Not tested yet	
	Middle	123	– 0.42	148	– 1.50		
	Low	346	– 0.24	323	– 1.33		
Singapore	*High*	462	1.11	475	– 0.51	329	0.19
	Middle	363	1.61	321	– 1.18	392	– 0.29
	Low	147	0.13	144	– 1.28	219	– 1.18

Sample size < 20

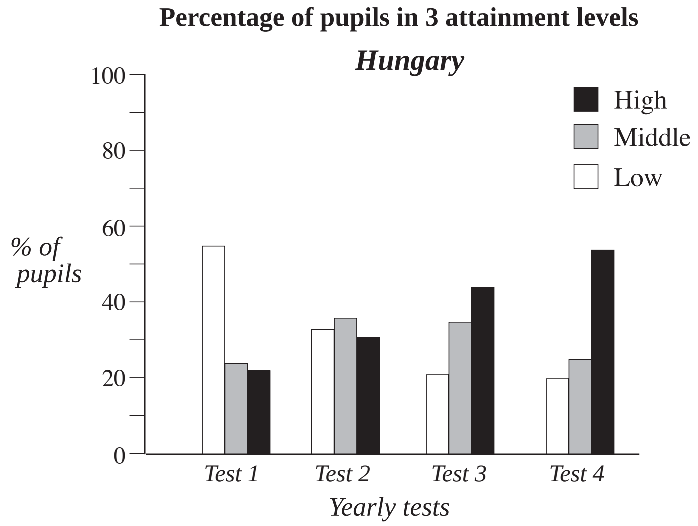
Other trends begin to emerge, for example:

- China is more successful in enhancing the lower end, but not so successful with the top end;
- the reverse occurs in Singapore over the 3-year period, where the upper end appears to be progressing well but not the lower end;
- Holland makes erratic progress, with enhanced value-added scores from *Test 2* to *Test 3* but not from T*est 1* to *Test 2* or *Test 3* to *Test 4*;
- only Hungary remains consistent, with all groups showing positive value-added scores over the 3 years.

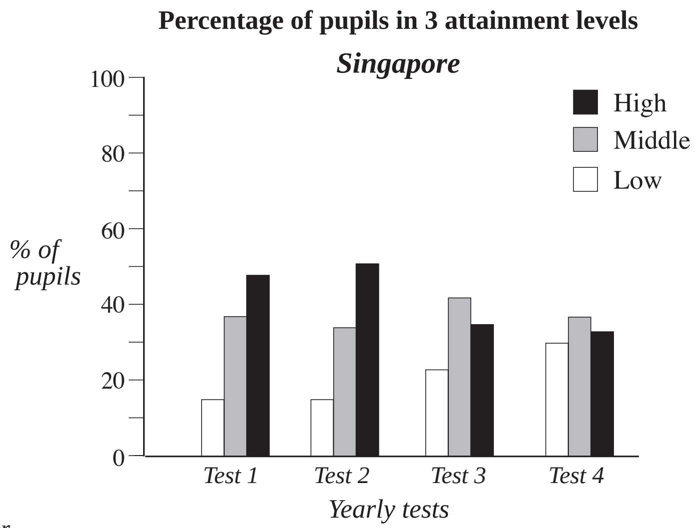
These trends can be confirmed by looking at the percentage of pupils in the three levels each year, noting that the change will take place after the impact of the progress the previous year. For example, for Holland we have the following results which show varied trends over the three years.



Hungary is more straightforward, with a steady increase in the size of the high group and decreases in the low group. In other words, Hungarian pupils are progressing steadily and very well in comparison with pupils of similar ability in other countries.



For Singapore, it is more consistent, although it is interesting to note that the lowest group has been steadily growing in size.



c) Countries starting at age 7+

Country	No. of pupils	Tests 2 – 3 V.A	*s.d.*
Finland	1817	– 1.20	*5.80*
Poland	381	5.84	*6.47*
Russia	274	0.07	*5.43*

The most significant aspect here is the very positive value-added score from Poland, which has just adopted an integrated approach to teaching subjects in the early years of primary. Again, we can glean more information by looking at the value-added scores when the total population is divided into three roughly equal parts.

Country	Level	No. of pupils	Tests 2 – 3 V.A.
Finland	*High*	498	– 0.73
	Middle	599	– 1.11
	Low	720	– 1.57
Poland	*High*	86	6.17
	Middle	132	4.97
	Low	163	6.37
Russia	*High*	137	– 0.05
	Middle	92	0.10
	Low	45	2.21

Sample size < 20

The enhanced value-added score for Poland is present in each group, but the positive Russian value-added score of the lowest group is in contrast to the nearly zero score of the highest group. It should be added that Finland includes a complete range of abilities, including special needs children.

5. Use of Information Technology in Primary Mathematics

Many of the coordinators mentioned IT in their reports and a very diverse picture of use and application arises. Some countries are giving active encouragement to its use in supporting primary mathematics teaching whereas in others there is little or no use.

When IT does play a significant role, its value is partly dependent on the quality of the software, some of which can be rather repetitive and boring. Some countries now require IT to be used in curriculum delivery and even specify the percentage of time it should be used.

Sergey Rakov (Ukraine) illustrated the dynamic geometry package which his institution has been developing and David Burghes gave a demonstration of the support given to primary mathematics teachers which is freely available on the *MEP* web site. (www.intermep.org).

The Singapore coordinators also gave some information on what their institution is doing to support teaching and learning in all subjects via a national educational intranet.

It was clear that little research had been done in any of the countries with regard to finding out what are the effective uses of IT to enhance mathematics teaching and that much of the encouragement for the use of IT has been government led.

6. Good Practice Video Clips

A number of country coordinators illustrated primary mathematics teaching by showing either videos, CD-ROMs or digital recordings of lessons. It was agreed that each country should develop an illustrative CD-ROM of good practice within its participating schools. This would initially be shared among coordinators but eventually (with the use of broadband technology) would be made available to any teachers/researchers through the *IPMA* web site.

This development would be a priority in the work of *IPMA* coordinators over the next year. It was pointed out that good practice could be identified through reputation and professional judgement but ultimately through the value-added analysis, which gives a precise judgement on the teaching effectiveness based on the progress of pupils of similar ability both within a country and internationally.

7. Postscript

All coordinators found the meeting of value. It is interesting to note both the common problems which are affecting nearly all countries and the particular problems or issues pertaining to individual countries.

At the first *IPMA* meeting, coordinators were asked to list the most important problems or issues which were affecting their country at that time with regards to mathematics education. The responses at that time are given again in **Appendix 3**. The list below gives the amended up-to-date responses of some of the coordinators at the 3rd *IPMA* meeting.

7.1 China

The high expectations of parents and society result in severe pressure on teachers and pupils; pupils must achieve a good mathematics score to enter the higher school.

7.2 Czech Republic

Primary teaching is not well paid or respected and there are many under-qualified teachers. Most teachers are female and paid maternity leave (up to 3 years) is a problem. Also, there are very few teachers interested in mathematics and this is reflected in their teaching and in their pupils' attitudes towards mathematics.

7.3 England

The impact of the Government's *National Numeracy Strategy* has led to significant gains in nationally reported tests at age 7+ and 11+ but the problems are two-fold.

- Are these genuine gains or are we better at preparing young pupils for tests?
- Given that the Government has new priorities, are these gains sustainable?

7.4 *Estonia*

The most important didactic problem being discussed in primary mathematics education is if and how should we reorientate primary school teaching from formal calculations to word problems. The main problem of educational policy is the need to decrease class size, now about 30–35, to the goal set by teachers' organisations of about 15–20.

7.5 *Finland*

Although primary teaching attracts high quality students, they are usually interested in subjects such as music and physical education rather than mathematics.

Teaching and the textbooks used, which are usually written by primary teachers, emphasise the mastery of mechanical skills rather than understanding.

7.6 *Hungary*

There has been a gradual reduction in the number of mathematics lessons in primary schools. Will this diminish the high mathematical performance of Hungarian primary schools?

7.7 *Ireland*

This coming year, we have the implementation of a revised mathematics curriculum, constructivist in nature. It has been backed up by 3 days of training this year and new resources have been provided. Will teachers focus on the content rather than the changes in approach, as too little attention is being given to the underlying philosophy, and how much change will there actually be?

7.8 *Japan*

The new curriculum being implemented in primary schools sets the curriculum time for mathematics (through the introduction of 5-day schooling and the so-called integrated learning); about 30% of the primary mathematics content has been cut. So the most important issue that is being debated is how to keep the relatively high achievement level of pupils and to promote their positive attitude towards primary school mathematics.

7.9 *Russia*

The main problem is the upgrading of teaching resources, including information technology, and more effective use of recommended methodologies.

7.10 *Singapore*

For pupils, the problem is their mathematical knowledge at pre-school level, whereas for primary teachers it is still their content knowledge of mathematics. (However, this is being addressed at the teacher training level with a compulsory module on Mathematics Curriculum Content.)

7.11 *Ukraine*

The Key problem in primary mathematics education is the comparisons of the pedagogical approaches used primary schools. They are also concerned about improving the Ukrainian mathematics education tradition with democratic Western practice without losing their current productivity.

7.12 Vietnam

Key problems relate to developing a new curriculum and include training teachers to cope with the changes as well as providing materials and equipment that correspond with the new curriculum and textbooks. There is not sufficient funding to provide the necessary support in schools for the changes.

APPENDIX 1

International Project on Mathematical Attainment (IPMA)
3rd Coordinators' Meeting

PricewaterhouseCoopers Conference Centre, Latimer, Buckinghamshire
Friday 8th to Monday 11th March, 2002

Agenda

Friday 8th March

14.00 – 16.00	Seminar on University Practice Schools
16.00 – 17.30	*PWC* reception for delegates and guests
21.00 – 22.00	Overview of meeting. Follow-up discussion on models of teacher training

Saturday 9th March

09.00 – 10.45	Summary update on progress and data analysis (D. Burghes)
11.00 – 13.00	Reports from Singapore / Hungary / Brazil / Estonia
14.00 – 16.00	Reports from Japan / Finland / Czech Republic / Ireland
16.30 – 18.00	Reports from Russia / China / USA
20.30 – 22.00	Video clips of best practice and discussion

Sunday 10th March

09.00 – 11.00	Reports from Poland / England / Vietnam / Greece
11.15 – 12.15	Reports from South Africa/Ukraine
12.15 – 13.00	Discussion on effective use of IT in teaching and learning
13.45 – 18.30	Conference Outing (weather permitting)
20.30 – 22.00	Video clips of best practice and discussion

Monday 11th June

09.00 – 10.45	Discussion on common recommendations for best practice
11.15 – 13.00	Publicity, publications, web site, future activities

APPENDIX 2

International Project on Mathematical Attainment (IPMA)
3rd Coordinators' Meeting

PricewaterhouseCoopers Conference Centre, Latimer, Buckinghamshire
Friday 8th to Monday 11th March, 2002

Participants

England	Professor David Burghes	CIMT, School of Education, University of Exeter
	Liz Holland	"
	Margaret Roddick	"
	Matthew Dominey	"
	Pippa Trevorrow	"
Brazil	Professor Ednéia Consolin Poli	Department of Education, University of Londrina
China	Yanming Wang	Department of Mathematics, Suzhou Railway Teachers' College
	Rosette Zhou	(Currently Kingsford School, ex *IPMA* China)
Czech Republic	Dr. Miroslav Bélik	J. E. Purkyne University, Usti nad Laben
	Dr. Stepan Pelikan	"
Estonia	Professor Jyri Alfanasjef	Faculty of Mathematics, University of Tartu
Finland	Professor George Malaty	Department of Mathematics Education, Joensuu University
Greece	Barbara Georgiadou	University of Patras
Hungary	Prof. Dr. Tibor Szalontai	College of Nyiregyhaza, Nyiregyhaza
	Dr. Istvan Czegledy	Director, Institute for Mathematics and Informatics, "
	Szabolcs Kis	Vice Headmaster, Eotvos Practice School, Nyiregyhaza
Ireland	Noreen O'Loughlin	Mary Immaculate College, University of Limerick
Japan	Professor Masataka Koyama	Faculty of Education, Hiroshima University
Poland	Dr. Irena Skipor-Rybacka	Adam Mickiewicz University, Poznan
Russia	Professor Eugeny Smirnov	Mathematics Faculty, Yaroslavl State Pedagogical University, Yaroslavl
Singapore	Dr. Berinderjeet Kaur	National Institute of Education, Nanyang Tech. University
	Dr. Phong Lee Koay	"
South Africa	Dr. Sechaba Mahlomaholo	Vista University, Bloemfontein
Ukraine	Professor Sergey A. Rakov	Regional Center for New Information Technologies in Education, State Pedagogical University, Kharkov
USA	Professor Denisse Thompson	Department of Secondary Education, University of South Florida
Vietnam	Dr. Do Tien Dat	Vietnam National Institute for Educational Sciences, Hanoi

APPENDIX 3

Key Problems in Mathematics Education

February, 1999

Brazil	Pupils changing school, which is now very common
England	Mathematical competence of primary teachers
Finland	Why are we good at reading/writing but not at mathematics?
Greece	Educational reform and the new curriculum
Hungary	Lack of finance
Holland	How to help SEN pupils in mainstream classes with our 'realistic' maths schemes.
Ireland	Implementation of the new curriculum
Japan	Will the recent cut in the number of hours of maths teaching result in falling standards? Maths educationists fear it will.
Norway	Streaming – when should it start?
Poland	Educational reform and the new curriculum (with teachers on yearly contracts)
Russia	Lack of finance prevents research into effective teaching methodologies at a time of innovation in primary schools.
Czech Republic	We are good at maths but why don't our pupils like it?
Singapore	Mathematical competence of primary teachers
USA	Maths content knowledge and understanding of concepts by primary teachers; educational reform has resulted in 'Maths wars' (particularly about effective teaching methodologies) in some areas of the country.