

**JUMP Mathematics**  
**Lambeth Pilot Programme**  
**Summer 2006**

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## INTRODUCTION

JUMP (Junior Undiscovered Mathematics Prodigies) mathematics is a teaching programme developed by Canadian author and mathematician John Mighton. Its basic premise is that all children in mainstream schools, including those children with special educational needs or a history of failure in the subject, can excel at mathematics. Success in mathematics, which is well within the grasp of all children, develops the confidence and the cognitive abilities that children need to do well in other subjects. The targeted and creative use of questioning, praise and encouragement by the teacher creates the classroom atmosphere where all can succeed.

JUMP mathematics envisages a fully numerate society, “. . . when the teaching of mathematics is brought to children and adults – but especially to children – in an exciting and dynamic way and where all who experience mathematics through such teaching become successful at math and, thereby, are helped to realise their potential as full and functioning members of society.”

The programme materials include teacher manuals and pupil workbooks. A characteristic of the materials is the careful scaffolding that provides simplified models of a problem at the outset, in easily managed steps. Pupils are expected to take these steps themselves; with growing confidence and maintained focus from constant success, pupils are rapidly led to work more independently, and discover more complex mathematical principles on their own (guided discovery).

During the 2006 summer term, 24 Lambeth primary schools participated in a pilot programme to evaluate the JUMP mathematics methods and materials. The purpose of this report is to present the findings of the pilot programme in terms of benefits and constraints in the use of JUMP in Lambeth schools, and identify possible ways forward.

The information gathered for this review is based on a pupil attitudinal questionnaire taken at the start of the teaching programme, the results of pupil tests completed at the start and the end of the programme, and, significantly, the comments and opinions of participating teachers.

The review focuses on the following areas:

- pupil attitudes to mathematics
- pupil progress in mathematics
- impact on teaching
- suitability of the materials
- next steps

Statistical information on pupil progress is contained in Appendix 1.

## SUMMARY OF FINDINGS

1. The response to the JUMP pilot programme has been overwhelmingly positive, from the interest shown at the time that schools were first invited to participate, to the enthusiasm of the final review meeting on 18 July. Without exception, all participating teachers want further involvement with JUMP and continuing professional development in the philosophy and principles of the programme, as well as access to the full range of JUMP materials and resources. The information gathered to compile this initial report has been taken from teachers and pupils; follow-up and extension of this work in the 2006-07 school year will include the perceptions of headteachers and parents.
2. The success of the programme is even more notable when the specific circumstances are taken into account. The summer term is a busy one, with a multitude of events that disrupt the school timetable for days or even for weeks. None of the schools were able to give the full amount of teaching time (a daily hour-long lesson for 30 school days), and none of the schools completed the teaching programme. In spite of this, there were extraordinary gains made across almost all schools.
3. **Pupil attitude:** All teachers reported a significant improvement in attitude in the vast majority of pupils participating in the pilot. The children became far more confident and were eager to speak out and actively participate during mathematics lessons. Teachers also commented on increased self-esteem of pupils who had hitherto (for years in some cases) seen themselves as failures in the subject. Behaviour also improved; children who had been disruptive during lessons were engaged, focused and enthusiastic during the JUMP sessions.
4. **Pupil progress:** The children were tested before the programme started, and took the same test paper at the end. A significant number of children improved their scores enough to move one, or even two, sub-levels. For those children who did not change level, there were improved test scores, and many more questions attempted. Many teachers felt that the improvements in children's understanding was considerably greater than their test scores might indicate.
5. **Impact on teaching:** Teachers were hugely in sympathy with the JUMP principles, and focused strongly on supporting the development of children's confidence and self-esteem. The most significant development noted was the importance of breaking down mathematical concepts into very small single steps. Many teachers recognised that what they had previously thought of as a single step was in fact four or even five steps, and said that the process of reflecting on this was already impacting on their teaching across the board.
6. **Suitability of the materials:** The breakdown of mathematics into tiny steps as indicated above is a major strength of the JUMP materials, and supports both teacher subject knowledge and pedagogy. Pupils enjoyed the structure of the workbook pages, and were keen to work through them. Most teachers had gone to considerable lengths to ensure that children saw the work as high value (special folders, stickers, pencils, etc). The North American idiom of some of the text was not an issue.
7. **Next steps:** This pilot programme has shown that both teachers and children derive considerable benefits from the JUMP mathematics programme. Plans are underway for wider dissemination of these benefits to pilot and non-pilot schools alike. An important piece of follow-up work will be tracking the progress of the JUMP pupils through the autumn term in Y6, to check that the reported improvements in both attitude and attainment are sustained. Generous support and additional funding from the JUMP organisation in September 2006 means that an additional 5000 Lambeth pupils will be able to benefit from the programme through 2006-07.

## BACKGROUND

The JUMP mathematics programme was developed by mathematician and author John Mighton, and has had considerable success in Canada. John Mighton visited Lambeth in 2005, and a pre-pilot that ran for two weeks at Hill Mead Primary School in summer that year was well-received. Positive findings from this led to a follow-up visit to Toronto in February 2006, and all Lambeth schools were invited to participate in a pilot programme during the summer term 2006.

### STUCTURE AND CONTENT

The six-week teaching programme was scheduled from 22 May to 07 July 2006. The JUMP units to be taught were taken from the Grade 3 workbooks (I and II), comprising the fractions unit (2 weeks), pattern and algebra (1 week) and number sense (3 weeks). In practice, many schools managed only 50%-60% of this, with two or three lessons delivered weekly. A few schools taught only the Fractions Unit.

### PUPIL SELECTION:

Teachers were asked to select the pupils who, at the end of Y5, were not expected to make sufficient progress to achieve L4 at the end of Y6 (ie those pupils effectively working below L3 in mathematics). The rationale was that those children at or above age-related expectations would achieve anyway; children just below expectations would achieve with the NNS interventions (Springboard and booster), but for the children below this level, JUMP might provide the breakthrough in mathematics that five years of schooling had not given them. It was left to schools to consider how these parameters would best suit them – in smaller one-form entry schools the children were withdrawn in small groups; larger schools were able to stream classes so that class-size groups of children could be taught together.

### STAFFING

Schools were asked to commit to one teacher and one teaching assistant attending the two days of training, and teaching a daily JUMP mathematics lesson to the children for the duration of the six weeks. In practice, very few schools were able to sustain this, because of the many competing demands of the summer term and the implications of these for staffing and timetabling.

### TRAINING

Teachers and teaching assistants attended two days of training prior to the teaching programme. The aim of this was to ensure that all colleagues understood the basic philosophy and principles of JUMP, and to ensure that teachers and teaching assistants had the time to develop familiarity with the JUMP methods and materials. Day 1 focused on the background to the pilot, the principles and philosophy of the JUMP method, and included a detailed examination of the content and the purpose of the Fractions Unit. Day 2 focused on the rest of the materials, made links to the NNS objectives, and provided planning time for teachers to prepare for the teaching sequence with the needs of the specifically selected pupils in mind.

### THE SCHOOLS

The schools were self-selecting. A general letter was sent out to all Lambeth schools, and all those who expressed interest in and commitment to the programme (27 schools) were invited to participate. In practice, there were 24 schools that took part in one form or another.

### **SUPPORT FOR PARTICIPATING SCHOOLS**

Schools received supply cover funding for teachers attending the training sessions (£145 per teacher per day) and a further £100 per school to cover photocopying and other administrative costs. Teachers were invited to attend two twilight progress meetings during June, and a final review meeting on 18 July (which was also attended by John Mighton). A few teaching sessions were visited and observed by members of the Lambeth Primary Strategy team. All teachers were also invited to contact the Primary Strategy Manager with questions or issues that might arise in the course of the teaching programme.

### **FEEDBACK**

The conclusions drawn in this review are based on feedback from teachers and pupils throughout the duration of the programme. This was gathered verbally from teachers attending the training, progress meetings and final review meeting. Pupils completed an attitudinal questionnaire before and after the programme. Pupils also completed a mathematics test (QCA Y4 Optional SATs paper 4A and the Y4 mental mathematics test). Teachers were also asked to complete a full evaluation at the end of the programme.

## PUPIL ATTITUDE

All schools indicated that the main gain was in pupil confidence. After only a couple of sessions, children were more confident in themselves as mathematicians and as learners. This led to improved self-esteem and more active and positive participation during lessons. Teachers reported that children were obviously enjoying their mathematics lessons, many for the first time.

Another gain reported was one of improved behaviour. Children who had hitherto been disengaged or even disruptive, showed greatly improved behaviour for learning. Children enjoyed the JUMP sessions, and were disappointed if they missed a session.

One of the schools that ran the JUMP sessions with a mixed ability group of pupils reported that all the pupils had moved on in their attitude; the less confident were contributing more, while those who were naturally confident were more settled, and supportive of their peers.

These improvements were not limited to the mathematics sessions alone; children who had been withdrawn from class for the JUMP sessions maintained this change of attitude back in class, and were eager to share what they had been doing with the other children.

Teachers felt that the impact of the JUMP programme on pupil attitude and behaviour was far in excess of the gains that might be expected from the novelty factor of any 'new' programme.

### **What teachers said:**

"The children are eager, cooperative and want to learn. If a child tries to be disruptive, another child is likely to reprimand. This is in direct contrast to when the sessions started."

"From being easily defeated mathematicians who rely heavily on adult support, these children are now 'ballsy' independent learners, full of confidence, desperate to show their skills, and lovers of maths!"

"Observing the children working in class I would say that all of the children appear to be more confident and prepared to try to answer questions. The class teacher has also noticed a difference and felt that all of the group members were more confident during maths lessons."

"The group selected for JUMP were suffering from a lack of confidence in most subjects, especially maths. The buzz we created with JUMP meant that most of the class would approach me and demand 'Are we doing JUMP today?' and would be disappointed if we were not."

"The 'Have a go' attitude has been seen in other lessons."

## PUPIL PROGRESS

Many teachers felt that the children's mathematical understanding had progressed further than was indicated by their scores in the test. They said that children tackled many more questions on the re-test, including work on mathematics that had not been covered in the JUMP programme, indicating that their increased confidence was improving their overall attainment, and that they were successfully transferring skills and strategies learned in the JUMP programme.

Some teachers commented on their surprise at how much the children were able to remember from one session to the next, even over a gap of several days.

Teachers felt that the use of skip counting, and the associated hand movements for this, seemed to play a key role in children suddenly 'clicking in' to basics such as the simpler multiplication tables. This was particularly noticeable in those children who had the biggest and most long-standing blocks to their understanding and progress in mathematics.

The test was a repeat (not an alternative to) the one the children had taken at the start of the programme, so the children were not answering 'new' questions but those they had seen before. However, the extent of some of the gains made are greater than those that might be expected from having seen the questions six weeks previously.

### **What teachers said:**

"75% of the children improved considerably after only 14 JUMP maths sessions. The children all made improved scores and of the ones which did not move up a sub-level, they showed more confidence and enjoyment in maths."

"The two children who have made the greatest progress are both on SA+ and really gained lasting confidence during the sessions."

"The two weakest and most disruptive pupils showed most increase in confidence and a better than usual recall of work already taught."

"One boy made good progress; he moved up 2 sub-levels, from 3c to 3a. He became more focused and organised in his maths work, as he was a bit all over the place. Quite a disruptive character, but some of this was lost, particularly during maths lessons. The way in which everything was broken down really suited and worked for him."

"Children definitely have an improved knowledge and understanding of x-tables and number bonds. Their speed, application and knowledge of inverses are quite clear."

"All pupils made significant progress in their understanding of number bonds and exceptional progress in x-tables. They showed a greater willingness to 'have a go' on the test, and to accept that they could improve in maths. They were all sad that their programme was ending."

"I don't feel the test results reflect the huge improvement in understanding that the JUMP maths achieved. The children show a great understanding now of the patterns of numbers and 'language' of mathematics. This fundamental understanding is so vital to the children's confidence and they now feel calm and up for the challenge of new concepts and questions, rather than deciding it's impossible at first glance. . . The incremental steps, unique to JUMP (in my experience) are the key to such success."

"There are no specific individuals who surprised me but the degree of success with ALL pupils, and the sheer joy maths suddenly brought to the children was a surprise."

"I feel some progress has been made with basic skills – a better understanding and knowledge of times tables, addition and subtraction techniques."

“I have also noticed that even if a child hasn’t mastered something they are more able to explain the problem, or why they don’t understand – which means we are closer to helping them understand.”

“We worked with a group of 19 pupils, and nine of them were EAL learners. They were able to access the material and it was definitely at their level.”

“On boy made tremendous progress from below L2 at then end of Year 4 to a score of 8 in the first test, and 23 (L2A) at the end of the programme.”

“V was a late addition to the group. He has SEN but loved the sessions, and had a huge boost in confidence. ‘I GET it!’ was V’s JUMP phrase!”

## IMPACT ON TEACHING

All teachers commented on their own heightened awareness of the progression towards understanding of mathematical concepts. A major strength of the JUMP programme is the way in which this progression is broken down into very small steps, so that pupils are able to achieve gradual mastery and understanding. Many teachers commented on how they were now trying to build this awareness into all their teaching; analysing those points at which their pupils become 'stuck', and breaking these down into more manageable steps.

Many teachers commented on children whose performance during the JUMP sessions exceeded expectations. A number of teachers felt that they had underestimated the ability of these pupils in the past, and that their teaching had not matched what they could do. These teachers were raising their expectations for these and for all children.

Many teachers reported on their own enjoyment of teaching the JUMP sessions. The children's enthusiasm and success fed into their own enthusiasm as teachers, and created a spiral of achievement for teachers and pupils alike.

### **What teachers said:**

"The most important learning aspect for me was the step by step approach and the small incremental extra questions."

"I'm not a confident maths teacher and having such CLEAR ideas for tasks, and the ways concepts are explained is just fantastic. The clarity helps me feel more confident and this helps me relate ideas to the children more easily. The worksheets are brilliant."

"I have always endeavoured to present topics in small steps with lots of enthusiasm and positive comments. JUMP has helped me to present topics in even smaller steps, and because of the format of the delivery I have been able to give lots more immediate and positive feedback. I also felt I was able to get to grips with the maths difficulties the children experienced and provide better feedback and advice."

"As a TA this chance to teach a large group of children has been a massive learning curve for me. I have learned that even if it takes longer teaching maths in smaller steps, it will be worthwhile in the long run."

It has made me think more carefully about identifying the small steps which lead to children understanding a new concept or strategy. It has also highlighted the need to recap or revise prior learning."

## USE OF THE MATERIALS

The detailed prescription and guidance in the Fractions Unit was found extremely helpful by all teachers as a way 'into' JUMP.

Although the teacher's notes for the other units taught in the pilot programme are less detailed, teachers felt that having worked through the Fractions Unit, they were able to develop and adapt the other units to suit their children and their own teaching styles, while remaining faithful to the JUMP principles and without jeopardising the integrity of the programme.

At our training sessions we had discussed the use of Canadian currency and North American idiom of some of the text. These were not an issue for children or teachers in the pilot programme, but would need careful handling if the materials were to be disseminated more widely.

Teachers had made considerable efforts to present the pupil materials in attractive and engaging ways but all would have preferred to have the original workbooks.

The worksheets are printed in black and white, and are plain, with little illustration. Teachers were initially apprehensive that the children would be 'put off' by this apparently dull format, but in fact they subsequently acknowledged it was an advantage. It kept the focus firmly on the mathematics, and the children, many of whom have had several years of mathematics failure, felt that they were working at age-appropriate levels, and were not being patronised with work for much younger children. This is a point which, in view of the crucial role of self-perception and esteem in mathematics learning and achievement, many publishers would do well to consider.

The worksheets provided the children with good opportunity to practise and consolidate understanding, with obvious benefits for confidence and further learning. This is totally consistent with the PNS guidance issued in December 2004 (*Raising standards in mathematics – Achieving children's targets*, Ref: DfES 1075-2004), which highlighted the crucial importance of adequate practice and consolidation work as one of the three key priorities to build on improvement and achieve high standards in mathematics: ". . . the opportunity for children to spend some time practising and refining their own knowledge and skills is very important in mathematics. . . We need to give children space and time to work independently and to help them to recognise how their personal effort has led to personal success. Practising skills that involve children in recognising whether a mental or written method is more appropriate or knowing how to carry out a routine written task precisely – one that is understood and can be explained or checked – will lead to confidence and self-reliance."

Teacher comments also indicated heightened awareness of the use of assessment for learning, a key area for development in primary school teaching, including mathematics.

### **What teachers said:**

"This is by far the most helpful teaching resource I've come across in any subject. I would like to continue to use it as the backbone of my teaching from now on in mathematics."

"I feel it is important to look carefully at the guidance for teaching a lesson and then be prepared to adapt or drop steps according to how well the lesson is progressing. It is nice to know that the materials are there and ready to be used rather than spending hours planning and preparing them. The prepared materials also allow me to think more closely about how I am presenting lesson content so that it has the greatest impact."

## NEXT STEPS

Despite the rather unscientific nature of this pilot, and the many and varied constraints and difficulties imposed by the timing of the programme during the summer term, there can be no doubt that the programme has been highly successful, and has provided many benefits for teachers and pupils alike. An important piece of follow-up work will be to track the progress of the pupils who participated through the new school year, to ensure that the improvements to attitude and understanding in mathematics are maintained.

All Lambeth schools were invited to participate in the pilot. Although 24 (out of 59) took part, schools are eager to benefit from the lessons learned from the pilot, and there is an expectation that all schools will be given the opportunity to take advantage of any benefits that JUMP may have to offer.

A proposed outline for the continuation and development of the work is as follows:

- i) Selected pilot schools:** Track progress of JUMP pupils through the autumn term in Y6; provide full set of all JUMP materials (Y3-Y6) for teachers to adapt and use as they see fit within the requirements of the National Curriculum for Mathematics and the guidance of the mathematics strand of the Primary National Strategy.
- ii) Non-Pilot schools:** Re-run the pilot programme (keeping the same structure and content and focusing on the same group of pupils in Y5), in January 2007.
- iii) Intensively supported schools:** Re-run the pilot programme (keeping the same structure and content and focusing on the same group of pupils in Y5 and Y6) in the autumn term 2006, and then repeat for Y3 and Y4 in the spring term 2007.

The JUMP organisation has worked tirelessly to support and encourage this work in Lambeth. They have generously doubled the value of our London Challenge funding, which means that this proposed outline can be offered to schools.

### What teachers said:

"I would really like to see all JUMP maths materials produced so far . . . to incorporate methods and step by step approaches in conjunction with the NNS unit plans for KS2. I would really like another batch of teachers (Y5 and maybe Y4 and Y3) to be introduced to the JUMP maths principles."

"Please let me know of any developments with the course – I would love to be involved if I could. Thank you for having me on such a great pilot!"

"Happy to do it all again next year!"

## APPENDIX 1: Statistical information on pupil progress

### 1. Background

Not all schools had returned all the requested data by the end of the summer term. This statistical summary will be updated and augmented through the autumn to include additional information as it is made available.

The information that follows is based on the performance of 119 pupils from 10 of the participating schools. The JUMP classes were organised in a number of different ways (some in small withdrawal groups, others in larger classes, or as part of the whole class), and the children received varying amounts of the programme, for the reasons outlined elsewhere (timetabling issues in the summer term, etc). As a result, some schools saw more significant or more uniform improvement in pupil scores and pupil levels than others. However, the pupils have been taken as a whole to increase the size of the sample.

### 2. Test scores.

The children were tested using the 2003 version of the QCA optional test for Y4 (Paper A and the mental mathematics paper) with a maximum 55 marks. The children took the same test before and after the JUMP teaching programme. Most (90%) improved their overall score; 58% improved by 6+ marks, 17% improved by 11+ marks and 6% by 16+ marks. One child improved her score by 23 marks. 14% of the children effectively doubled their scores from May to July.

### 3. National Curriculum levels

The test is a L2-L3 test, awarding levels 2A to 3A. In practice, because of the nature of the pilot and in the interests of accommodating all schools that wished to participate, a significant number of children (28 children or 24%) were working below L2A before the teaching programme. After the programme, it was children from this group who demonstrated some of the greatest gains. The following table shows pupil levels before and after the programme.

		NC Level achieved in July Number of children (percentage)				
		<2A	2A	3C	3B	3A
NC Level achieved in May (Number of children)	<2A (28)	8 (28.6%)	14 (50%)	6 (21.4%)	--	--
	2A (28)	--	11 (39%)	14 (50%)	3 (11%)	--
	3C (43)	--	--	20 (46.5%)	18 (41.9%)	5 (11.6%)
	3B (14)	--	--	--	3 (21.4%)	11 (78.6%)
	3A (6)	--	--	--	--	6 (100%)

The test did not extend beyond L3A, so it may be that some children could have achieved L4C. As indicated earlier, the teaching sequence was not planned to include children working at this level (which is within age-related expectations for Y5). The 6 children who were at this level before the start of the JUMP programme all improved their scores by 6+ marks in the second test in July.