

“I KNOW THAT YOU DON’T HAVE TO WORK HARD”: MATHEMATICS LEARNING IN THE FIRST YEAR OF PRIMARY SCHOOL

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Harry completed his first year of primary school (Kindergarten) during 2004 in New South Wales, Australia. He enjoyed school; made great friends; played lots of sport; continued to read quite successfully; was well-liked by his teachers; participated in many activities; and, on reportedly rare occasions, did some mathematics.

In this paper, comparisons are made between the mathematics Harry was capable of doing before he started school and what his parents were told he actually did during his first year of school. The paper was stimulated by Harry’s response to his parents when asked, near the end of his first year, what he had learned in mathematics at school: “I know that you don’t have to work hard”.

INTRODUCTION

Children in New South Wales (NSW), Australia start school in Kindergarten in late January each year. The children must start school by the time they are 6 years old but they may start in the year that they turn 5, provided their fifth birthday is before July 31 of that year. Hence, it is possible for a new Kindergarten class to contain children aged between 4 years 6 months and 6 years.

In NSW primary (Kindergarten to Year 6) schools, there are six syllabuses related to separate key learning areas, one of which is mathematics. The *Mathematics K-6 Syllabus* (Board of Studies NSW, 2002), is based on current research and practice both in Australia and overseas and is organised to match the stages of learning through which students are expected to move. The four stages: Early Stage 1, Stage 1, Stage 2, Stage 3 represent the learning of a typical student across the Kindergarten to Year 6 continuum. While stages of learning and stages of schooling only rarely match for individual children, this organisation does provide teachers with some guidance as to what might be expected of students who are completing a particular stage of schooling. However, the *Mathematics K-6 Syllabus* is clear that

students learn at different rates and in different ways, so ... there will be students who achieve the outcomes for their Stage [of learning] before the end of their stage of schooling. These students will need learning experiences that develop understanding of concepts in the next Stage. In this way, students can move through the continuum at a faster rate. (Board of Studies NSW, 2002, p. 5)

There is clear recognition that children start school with mathematical knowledge and skills that should be considered when developing Kindergarten experiences.

Early Stage 1 outcomes may not be the most appropriate starting point for all students. For some students, it will be appropriate to focus on these outcomes whereas others will benefit from a focus on more basic mathematical concepts. Still others may demonstrate understanding beyond Early Stage 1 ... teachers need to base their planning on the evaluation of current understanding related to all of the strands. (Board of Studies NSW, 2002, p. 14)

Many researchers (Aubrey, 1997; Doig, McCrae, & Rowe, 2003; Ginsburg, Inoue, & Seo, 1999; Perry & Dockett, 2002) have investigated the mathematical power that young children can bring with them when they start formal schooling. The conclusions reached by these authors suggest that teachers in the first year of school need to take into consideration their students' past mathematical experiences and achievements when planning their mathematics programs.

When children start school, there is a lot more going on for them than just their mathematics learning (Dockett & Perry, 2004; Dunlop & Fabian, 2003). For example, compared to the less formal approaches typically found in prior-to-school settings such as pre-schools, day care centres and homes, there is a greater emphasis on whole class approaches to learning, less choice for children as to the activities in which they might involve themselves, less control over these activities and their outcomes and less support from adults. In short, demands go up and support goes down. In mathematics learning and teaching, these changes are typically manifested in terms of a more formal, less play-based, less individual-based and more teacher-centred approach to the development of mathematical ideas (Perry & Dockett, 2004; Tymms, Merrill, & Henderson, 1997).

BACKGROUND TO THE STUDY

This paper reports on a comparison between what one student, Harry, showed he was able to do in mathematics, particularly in number, immediately before he started school in Kindergarten and what he did in number during this first year of school.

The school

Harry started school in 2004. Brightview Heights Public School is located in an upper middle-class suburb of Sydney. The school is a relatively small (almost 150 students) K-6 school with a very stable staff profile. There is very strong parental and community support for the school. Brightview Heights Public School is well endowed with buildings and other resources. In short, Brightview Heights is a school with great potential for its students' learning.

The Kindergarten class

In 2004, Brightview Heights enrolled 18 children (9 boys and 9 girls) into one Kindergarten class. The children's ages ranged from 4 years 7 months to 6 years and 1 month. All but one of the children were of English-speaking background and all had attended pre-school or day care in 2003. All the children lived with at least one of their natural parents and most lived with both parents.

The teacher

The Kindergarten teacher, Mrs Jones, had taught for more than 20 years in NSW primary schools, the last 10 at Brightview Heights. This was her third consecutive Kindergarten class, although she had taught all of the first years of school—Kindergarten to Year 2—throughout her career.

The curriculum

The mathematics curriculum for the 2004 Kindergarten class was determined by the mandatory *Mathematics K-6 Syllabus* but was also influenced by a systemic numeracy program *Count Me In Too* that has been adopted by most NSW government primary schools, and a textbook *New Maths Plus K* (O'Brien & Purcell, 2003). The text

provides a sound foundation for the teaching and learning of mathematics through the use of comprehensive, student-friendly activities based on the *Mathematics K-6 Syllabus*. (O'Brien & Purcell, 2003, p. v)

Count Me In Too (NSW Department of Education and Training, 2001; Wright, Martland, Stafford, & Stanger, 2002) provides a systematic approach to the assessment and development of students' knowledge in early number.

Harry

When Harry commenced Kindergarten, he was 5 years and 6 months old. He knew none of the other children in his Kindergarten class although he had met some of them during the orientation sessions at the end of 2003. Harry was a quiet child, often shy when meeting new people and sometimes reluctant to seek assistance. At the commencement of school, he was reading at a Year 2 level. He enjoyed music, painting and writing, and he and his mother had constructed a number of books to celebrate special events in his life. He did not like "colouring in" or public performances. He was keen to start school, although, along with many other children starting school, he was concerned about what was going to happen and who his friends might be (Dockett & Perry, 2004).

DATA

The data on which this paper relies consist of the following:

- the Schedule of Early Numeracy Assessment (SENA) from *Count Me In Too*, administered to Harry four days before he commenced Kindergarten;
- written records of Harry's school number experiences as presented to his parents through his learning portfolio and completed textbook pages;
- written reports and brief discussions between Mrs Jones and Harry's parents; and
- written records of discussions between Harry and his parents about school.

These data provide a snapshot of what Harry was able to do, particularly in number, before he started school and then what he did do during his first year of school.

RESULTS

Schedule of Early Numeracy Assessment (SENA)

The SENA consists of an individual interview in which the student is asked a total of 55 questions across the topics of numeral identification, forward and backward number word sequences, subitising, and early arithmetical strategies (counting objects, addition, subtraction and beginning multiplication and division). The SENA is intended for Early Stage 1 and Stage 1 students. Harry's SENA profile, determined just before he started school, is presented in Table 1.

Number Topic	Level (of highest level) and description
Numeral identification	Level 3 (of 3): Recognises numerals to 100
Forward number word sequences	Level 4 (of 5): Can count to 30 from any number less than 30 and state the number after a given number (In fact he could count to 100 from any number less than 100 except that he consistently counted "69, 50")
Backward number word sequences	Level 4 (of 5): Can count backward from any number up to 30 and state the number before a given number (Again, was on the verge of moving to the next level: counting backwards from numbers up to 100)
Subitising	Level 2 (of 3): Can instantly recognise dice and domino patterns for numbers up to 6
Early arithmetic strategies	Level 3 (of 4): Uses larger numbers and counts on and back to find the answer

Table 1: Harry's SENA number profile before starting school

Learning portfolio and completed textbook pages

Samples of Harry's work were sent home to his parents at the end of each of the four terms in 2004. Mrs Jones explained the source of these samples in the following way:

Each sample is selected from the work undertaken in class as part of our teaching/learning program and shows the work done by your child. It does not show work specially undertaken in class for the portfolio.

In Term 1, the worksamples for number consisted of two photocopied worksheets. The first asked the students to "Colour the group that has the most in each row and circle the group that has the least". From two to five objects were depicted. The second worksheet depicted two rows of from two to six objects and asked the students to "Circle the number that shows how many more are on the top row than on the bottom row". The Term 2 worksample consisted of two questions: a) count the rows of from four to six counters and write the corresponding numeral; b) two sets of pictures are presented—four and three in the first part and five and three in the second—and students were asked to complete sentences of the form " \square and \square makes

□”. For Term 3, the number worksamples consisted of worksheets on subtraction of single-digit numbers, supported by drawings of objects that could be counted plus another where students were asked to colour or circle the objects divided in half. In Term 4, the only number worksample included in the portfolio was a page on which Harry had written the numerals 1 to 31 in the correct positions on a blank December calendar. Highlighted was December 21, the last day of the school year.

The textbook used in Kindergarten covers the learning outcomes required by the Early Stage 1 of the *Mathematics K-6 Syllabus*. These outcomes are:

Whole number:	Counts to 30, and orders, reads and represents numbers in the range 0 to 20
Addition/subtraction	Combines, separates and compares collections of objects, describes using everyday language and records using informal methods
Multiplication/division	Groups, shares and counts collections of objects, describes using everyday language and records using informal methods
Fractions/decimals	Describes halves, encountered in everyday contexts, as two equal parts of an object (from Board of Studies NSW, 2002, pp. 156-162)

Two things are clear from the textbook pages. Firstly, almost all of the pages in the textbook are completed and have been meticulously marked with red ticks and “well done” stamps. Secondly, all of Harry’s work has been marked correct. That is, Harry has completed an entire year’s work in his textbook without making an error or, even, it appears after close scrutiny, an erasure.

Teacher comments

While Mrs Jones certainly made herself available at the request of parents, she tended not to take the initiative in discussions with Harry’s parents. When these discussions did take place, they were, for the most part to tell the parents about how well Harry was going in his school work, especially his reading. At the first formal parents’ evening, held about three weeks into Term 1, the only mention of mathematics was when Harry’s father enquired about when the individual SENA assessments might be undertaken for Kindergarten. Mrs Jones’ reply was that she was not sure because “It has been too hot to think about or do any mathematics”. (It should be noted that Sydney had experienced some very hot days in February, 2004.) At the parent/teacher interviews held in Term 2, mathematics was not mentioned either to or by Harry’s parents, except that Mrs Jones suggested that Harry was “doing very well”.

There were two formal written reports from the school to Kindergarten parents during 2004. The first, at the end of Term 1 was a brief note outlining how Harry was settling into Kindergarten. The following excerpts are illustrative:

Harry reads fluently with excellent comprehension and is making very pleasing progress. He also shows a great understanding of concepts in Mathematics. ...

Harry has become increasingly more comfortable and happy in the school environment throughout the term. I feel that he has adjusted to Kindergarten very well.

The second written report was received at the very end of the year. It consists of a brief comment from the teacher:

Harry has made excellent progress academically and in his own level of confidence at school. Harry is always happy to share his ideas and knowledge with his peers and has been a pleasure to have in the class.

and then ticks under “Demonstrating competence” (the most successful category) for all of the 28 learning outcomes listed, including the three listed under “Mathematics – Number”:

Recognises/compares the size of groups through estimating, matching and counting

Manipulates objects into equal groups (multiplication)

Manipulates groups of objects by combining (addition) or separating (subtraction).

Comments from Harry

Like many children, Harry was never been openly forthcoming in his discussions about his first year of school. He would talk about his friends, playing games during recess and lunchtime, who gained rewards or was “naughty” in class, or what happened in library, dance and drama. Hardly ever, did he mention mathematics.

Harry did continue to do mathematics at home, both in terms of everyday life experiences and with specific activities devised for him by his parents. For example, he became quite adept at some computer games, many of which were either openly mathematical or had a mathematical bent. Generally, he did not talk about the mathematics he did at school, although on one occasion he did say that in mathematics at school “I know that you don’t have to work hard”.

In a book that Harry prepared at the end of 2004, reflecting on what he learned in his first year of school, the only mention of mathematics is:

Now I know

$$220 + 220 = 440$$

$$310 + 220 = 530$$

DISCUSSION

Harry is clearly not a typical Kindergarten mathematics student. He has had many experiences before starting school that have given him a flying start in terms of reaching the Early Stage 1 mathematics outcomes typically expected of children in Kindergarten. In fact, it would seem that Harry had reached almost all of these outcomes before he started school. However, little seems to have been done to harness the tremendous potential that he brought to the Kindergarten classroom, not only for his own benefit but also for the benefit of all of the children in the class.

Harry was obviously capable of being extended a long way beyond Early Stage 1 outcomes in mathematics but, at least from the evidence of what happened in school mathematics lessons, this was not done at school. There is no doubt that Harry learned many things during his first year of school. In his reflection on this year of his life, he lists the following:

the importance of friends; school rules; what to do at school; writing; how to play soccer; how to spell; how to play handball; and how to learn by “listening and paying attention”.

No doubt, all of these are important but none of them builds on Harry’s evident strengths in mathematics.

Harry undertook a SENA early in his Kindergarten year and would have completed it in a competent manner, with results similar to those achieved in the SENA completed before he started school. Such results should have suggested to the teacher that Harry needed special attention in mathematics but it appears that Harry was required to work through the same activities as the rest of the class. To his credit, he has been able to maintain his pride in his learning, at least to the extent of maintaining a perfect record in his much-used textbook. However, given that he has been able to get everything correct, then one must question how much challenge he has experienced and what learning has occurred. Where is the opportunity for Harry to develop to his full potential in mathematics when he apparently spent his time doing things that he already knew? Children faced with such lack of opportunity react in different ways. So far, Harry has continued to maintain the outward semblance of being interested in the work and, at least, being willing to complete it. However, it seems that the strongest lesson he has learned in his Kindergarten mathematics experience is that you do not have to work hard at it.

CONCLUSION

When children start school, they bring much mathematical power with them. This power has grown over the prior-to-school years and is ready to be nurtured, celebrated and extended through a purposeful and meaningful program of learning in Kindergarten. In Harry’s case, his capabilities were recognised but not extended. Continued programs that “teach” him what he already knows may eventually turn him away from mathematics and possibly from learning per se.

The solution to this issue is to implement the rhetoric of the syllabus documents, systemic number program and textbook. In the Kindergarten class at Brightview Heights, the restrictions of these programs and written materials, along with an approach that did not actively extend children in mathematics, have conspired to constrain the mathematical learning of a child who has shown great potential.

Harry’s experiences in mathematics in Kindergarten have produced dilemmas for all of the stakeholders. For the teacher, choices need to be made to allow the provision of appropriate individual as well as whole class experiences so that all children can be challenged and extended in their mathematics. Teachers need to be able to move

beyond the constraints of the syllabus, textbooks and systemic programs so that the full potential of these resources can be realised. For parents, there is a choice to be made between being “pushy” parents at school or being content—if they are able—to extend their children at home, perhaps increasing the disparity between school and home. For the Kindergarten child, the choice is the very difficult one of being like the rest of the class or being different. Should the child be compliant and accept what is handed out or be prepared to generate opportunities for challenge within the classroom? For a child in the first year of school, this is a dilemma that is undoubtedly best avoided but, as we have seen with Harry, it is one that occurs.

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