

Introduction

Between 1994 and 1998 a team of researchers at First and Best worked on the first ever project to provide a complete set of materials for teachers of dyslexic students. Following the successful completion of this course, some of us began to undertake work to investigate whether the principles which underpinned the work on dyslexia could be used to generate materials for use with dyscalculic pupils.

Our research has suggested that the answer is most certainly “yes” – although some additional factors have become clear as we have worked. We have now published a number of books following this research, and these materials for teachers of dyscalculic pupils all follow the same three basic points:

1. It is clear to us that children who have difficulty with maths often suffer from not having fully learned and understood some of the most basic of mathematical concepts. Thus they are continuously attempting to deal with more advanced mathematical issues (such as, for example, the division of fractions) without first having understood simpler issues (such as division). While it is true that it is best to teach dyslexic children how to spell via rules presented in a logical sequence, it is nevertheless possible for the dyslexic to learn how to spell a complex word such as “nought” while not knowing how to spell “nil”. The same does not apply in mathematics – all the logic and the methodologies of maths build on earlier principles. If a person does not understand the concept of higher and lower numbers, then that person cannot learn how to add. If a person does not know how to add it is very difficult to understand how that person might then learn how to multiply.
2. It is also clear that the best way to teach children who have a problem with maths is through using a multi-sensory approach in which they say, hear, write and handle numbers simultaneously. What we have devised is a dual system of maths in which the children learn a multi-sensory method of undertaking the four basic functions of mathematics, and from this learn how to write mathematics in a conventional way. Through much of our materials pupils work on both the multi-sensory approach and the conventional approach, seeing that both give the same answer. As the problems get more complex the multi-sensory approach becomes less usable, and the advantages of the conventional become clearer. However if a problem arises which the pupils feel is incomprehensible when handled conventionally, the pupil can always go back and use the multi-sensory approach.
3. Finally, we accept totally the notion that maths should be taught in short blocks of time, with each session building succinctly on what has gone before. Ten minutes seems an ideal time to us.

The materials in this book are not age specific – anyone who has difficulty with the five areas of maths we cover (number, addition, subtraction, multiplication, division) will be able to use the exercises in this book if guided by a suitable teacher.

Initial information.

1. How do we solve dyscalculia problems?

The approach followed in this book takes the pupil back to the very basics of maths. This does not mean that each and every child has to work through every exercise from page one. Rather it means that this book deals with the fundamentals of maths – number, addition, subtraction, multiplication, and division. If you feel that you are teaching a child or teenager who has a problem with subtraction, start with that section of the book. If that child then flies through the exercises, skip some sections and try again later. There is nothing wrong with moving on until you find an area of work with which the child or student is having difficulty.

2. Finding out where the problem is

Your knowledge of the pupil, as a teacher, and a spot of skipping back and forth through the book may not sound very elegant, but it is normally enough for you to find where to start with the child. If you have a child whose level suggests she or he ought to be able to multiply any two numbers under 20 together, then a logical place to start is at the opening of the multiplication section of the book. If the child has problems following the multi-sensory approach, however, you might go back and look at the addition section of the book. If there is still a problem, then you should go back to the very start of this volume and consider if the child does have a firm grasp of the concept of number.

However what you might then find is that the child will quickly pick up the concepts explored in the book, and you be able to move forward very rapidly without difficulty. If the child gets four out of five answers right, it is normally perfectly safe to progress. However with anything less than this it is worth going back, or creating extra examples yourself, in order to ensure that all the learning is secure before you progress. If the child hits a mental block and can't get the answer at all, then never be afraid to try something simpler. Taking the idea of multiplying two numbers under 20, if this is causing a problem return to multiplying two numbers under 11. If there is still a problem you can go to the start of the multiplication section of this book. As before, if the child still has problems you might find it worth going back to the start of the book, but be ready to move forward at speed where it is clear that your child is fully conversant with the work.

3. Working day by day

It is important that arrangements are made for the child to do some of this maths every day, for about ten minutes, at a time when the child is attentive and willing to work. For most children this means engaging the help of the parents. We have found is that virtually all parents, no matter what their socio-economic background or personal circumstances, are very willing to help their children and we believe this should be encouraged.

It is often helpful to give some basic hints to parents at this point. Remind them to work with the child in a room where there are no distractions – such as a television, or the sound of the television. Parents should also be helped to avoid any situation in which your child is tempted to rush through the work. Likewise where the child is doing this work at school the ten minutes should not be tucked away at the end of the day or at the end of a session on something else. This not only reduces the child's readiness to learn, it also sends out the wrong message to the child about the importance of this work. Furthermore, although the work is set out on a day-by-day basis, this is not a rigorous requirement – adjust your work pattern to suit the requirements of the child.

We all know that children normally don't like subjects they are poor at – which means that most dyscalculic children do not welcome this extra work on maths with open arms. So it is important for parents to find not only the right time of day to do the work, and to make sure it is just ten minutes, they also need to be encouraged to give the child a simple reward each time the ten minutes is completed without complaint. We return to the issue of rewards in a moment.

4. Look for uncertainties

Children who have dyscalculic problems don't get better by having answers told to them and being shown explanations. They must do the work themselves – they must take the problems and solve them. Because this is how we work throughout this book you can readily observe any uncertainties your child has. And once you have found them you can resolve the issue by going through the relevant section of this book in full.

Parents should be made aware of the fact that uncertainty is one of the learning tools of this book. A child's uncertainty is not something to be commented on adversely. Rather the opposite is true – uncertainty means that a problem area is being located – and only through this can progress be made. Uncertainty is the start of progress, not a sign of past failure.

5. Make the learning fun

It is important that the ten minutes a day activity should not become something that the child hates. We would urge teachers to be as upbeat and pleasant through the

activities as possible. We recognise that some dyscalculic children may have behaviour problems. Some will resent doing extra maths. For this reason a fundamental part of doing this work – which we recognise is often highly repetitive – is encouragement and positive reinforcement.

The same message must be given to parents. They must be told to encourage the child and participate in the activities wherever possible. You will need to advise the parent that he/she should never tell the child that he or she is also “no good at maths” – they must always be positive. If the child says, “I’ll never get this right”, the parents needs to encourage the child, pointing out that many children have used this approach and learned how to do maths. Thus home and school are reminding the child of how far she or he has already progressed and pointing out that further progress is not just possible, it is inevitable. In short, the child is motivated by both the parent and the teacher.

6. Rewards

It is a central part of the philosophy of this approach that the child is rewarded for participating. In paragraph 5 above we emphasise that the activities should be fun, short and regular, but motivation also requires that we reward the child every step of the way.

The rewards used are entirely a matter for you and the parent, but they need to be consistent within each environment. You may wish to point out to parents that rewards can be:

- Playing a game
- Watching a TV programme
- Going to a particular event
- Having a friend round
- Having an extra story at bedtime
- Going to bed later
- Having a chocolate bar
- Going to a theme park

This is not to suggest that the child should not have any fun without it being a reward – the reward should be an extra, in addition to normal every day life, in return for something concrete being done.

It is sometimes argued that rewards are like bribery, and that they are therefore wrong for children. Our view is different. We firmly believe that our lives are made up of things we will do for nothing – and things that we do for reward (in the adult world this often means money). Quite where the dividing line is between bribery and reward is difficult to say – if my employer says that he will pay me an extra £1000 this year if I will take on extra responsibility, is that a reward for my work or a way of bribing me to do another job?

The fact is that children exposed to reward systems often seem to learn more, and cope better with life in general, than children who have no reward system. They certainly seem to learn more and cope better than children who are exposed to a punishment based system. Where the reward system operated at home is similar to or complimentary to that used by the school then progress is maximised.

We are very keen to hear your comments in relation to our approach to dyscalculia. You can reach us directly via email at enquiries@dyscalculia.org.uk. We welcome all comments about this book, and about dyscalculia in general, and we will make every effort to answer any questions you have about individual cases of dyscalculia, or about the topic in general.

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Part A: The meaning of numbers

Day 1.

1. You will need to obtain a large number of counters, of the type that you might have for playing Ludo or tiddlywinks. You will also need to have a pen or pencil and some paper for the child to use. Ideally obtain 20 red counters, 20 blue, 20 green and 20 yellow. These are the colours referred to in this book – however if you have other colours this will not be a problem.
2. Place two red counters down on the table and ask the child how many there are. The child must say the number, and write “2” on the paper as he/she says the answer. If there is real uncertainty with this, the child should also draw two counters and colour them in red, again saying two.
3. Continue this with other numbers up to 9, and going down to 0. The child must be able to recognise that “nothing” is a concept represented in maths by “0”. Always use the same word for “0” – if the child says “zero” stay with “zero” from that point on.

Day 2.

1. Repeat the activities from yesterday with the numbers 7 and 8.

2. If the child cannot complete this task without error, go back to yesterday's work and continue with that until the child is secure in the concept of numbers.
3. If the child can undertake activity 1 above correctly, set out two groups of counters – one of 6 and one of 3. Ask the child to count each group and write down the number as before while she or he says the numbers.
4. Ask the child, which group has the most counters? If the child cannot do this, then you should ask the child to count the six out by physically moving them one at a time and counting up to six. Then do the same with the three. If the child still cannot see which is the largest, ask the child to count to six again moving the counters, and then point out that to get to the number six you actually went past the number 3.
5. If there is still a problem with 6 and 3, go back to smaller numbers and try the work with 2 and 4.
6. As an additional aid to the child, you can return to the issue of three and six and ask the child to count upwards, with a big emphasis on three and six, thus:

One, two, THREE, four, five, SIX.

Day 3.

1. Repeat points 3 and 4 from yesterday.
2. If this is not successful revise yesterday's work. Otherwise move on.
3. If it is successful lay out 5 counters in one pile and 7 counters in another. Ask the child to count each pile and write the number on a piece of paper next to the card. As the child writes each number the child should say the number.
4. Ask the child to pile up the five counters and the seven counters, so that the piles are close together and it is clear that the seven pile is higher than the five pile.
5. Ask the child which number is higher – five or seven. There should now be two reasons for knowing the answer. You pass through five on the way to counting seven, and the seven pile is higher. So the child should say "seven is higher than five".
6. Repeat points 4 and 5 using other numbers such as four and eight, five and nine.
7. Include a couple of examples in which one of the numbers is zero. The child must see there are no counters, write "0" on the card, and say "none".

Day 4.

1. Repeat points 4 and 5 from yesterday.
2. Repeat these again, but this time asking the child which number is lower.
3. Use various pairs of numbers, including the occasional use of zero, to ensure that the child understands “lower”.
4. Mix up the questions so that sometimes the child is asked which number is higher and sometimes which number is lower.

Day 5

1. Put nine red counters on the table, and ask the child how many are present.
2. Put down one more counter and ask the child for the number of counters on the table.
3. Continue in this way up to 20. If the child is unsure, remind the child of the number you got to before – as in, “We had fourteen on the table. Here is one more – what number do we have now?” If the child really doesn’t know, say the answer. Then go back to the last number that was right, and again add one.