Maths

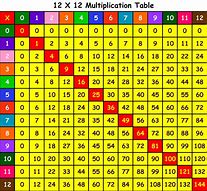
By David Cudworth, Specialist Advisory Teacher, Ups and Downs Southwest 2011

Children with Down syndrome often learn to read quickly and use their reading skills daily. Everyone supports their development in this area and reading often becomes a real strength for the individual child.

Although educators (and parents) work hard with the children on their reading, it is fair to say that the same level of attention is not always put into the acquisition of maths skills. Schools do not tend to indicate that maths is especially a problem to parents either, as early emphasis is often placed on celebrating the child’s successes in reading and in speaking.

During their childhood years children with DS have very little need to learn maths skills or use money: adults freely give them any items that they need or desire. They do not need to save money or use it in shops. When they reach adulthood, though, living in supported accommodation and working in the community, they can be more disabled by their lacking in maths skills than in any other area. If they are to know how to pay rent, utilities, food and other necessities, then they need much more than simple instruction on how to use a calculator or to add up using counters – they need to grasp the basic understandings that underlie the use of mathematics.

Understanding maths needs to start early.



Importantly, too, if more young people with Down syndrome are to access interesting courses at college, then they need to have achieved a certain level in maths – often they are prevented from being accepted onto the courses they want by the colleges themselves because they do not meet the minimum requirements in maths needed to get on to the course, even if the course is a highly practical one that requires no specific maths skills.

Most authorities agree that students with DS have real difficulty with the abstract concepts of mathematics – but how much of this is due to the syndrome and how much is due to teaching that isn’t geared towards the specific learning profile associated with Down syndrome?

If our expectations are that the pupils are not capable of learning maths, then we will not give them as much of an opportunity to learn it. With higher expectations and more consistent education, achievement for most individuals with DS improves. In any case, there is a wide variation in the ability of children with DS, and this variation makes it very difficult to second guess how far each child will go. One thing is for sure, though: there is no ceiling or plateau to the learning achievements of someone with Down syndrome.

In addition, individuals with Down syndrome are not the only students who are concrete thinkers and who have difficulty with the abstract concepts of maths. Yet much of the teaching of maths concepts in school is done at the abstract level. The focus for these students needs to switch to the functional uses of maths in daily living and to motivate the students to learn and practise useful maths skills.

Basic Skills:

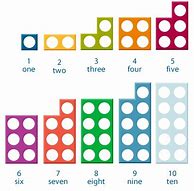
 To have an understanding of what numbers and numerals are about.  To be able to add and subtract.  To be able to use these computation skills when needed: they may learn the maths facts for addition and subtraction, but not understand when they need to do one or the other.  To experience some of the practical uses for maths such as in measurement and in telling the time.

The student who has mastered these basic skills can “survive” as an adult with appropriate support.

Children with Down syndrome should be taught maths skills in the classroom alongside their typically developing peers. In most other curriculum areas the class/subject teacher can differentiate the lesson’s objectives to meet the needs of the individual child. In maths, however, this is more difficult. Maths is much more of a sequential learning subject area, so the pupils will need to master the earlier-taught concepts before they can understand the maths activities of the general class. Children with Down syndrome go through the same stages of development as typically developing children, and this includes their acquisition of maths skills, but they reach each stage later on in their lives and they tend to stay there for longer. So, many students never reach the formal operations stage while at school that enables them to think abstractly about a situation and work out possible consequences based on experiences and formal learning. Students with DS understand so much better through hands-on learning and by real-life situations.

There is nothing wrong with the child following their own maths curriculum alongside their typically developing peers, who will obviously be working at a much different level, as long as the child is seen by themselves and their peers as working on their maths at the same time and in the same room as everyone else, especially if they are being taught alongside and by responsible and more able peers. Pupils with Down syndrome need to be with typically developing role models as much as possible in order to develop their independent learning skills and age-appropriate behaviour.

In order to teach a student with DS effectively, a knowledge of the specific learning profile is essential, and how the factors that inhibit and facilitate learning are especially relevant to maths.



Factors that Inhibit Learning

 Students with DS frequently have problems with short-term and working memory. In maths we often use short-term memory in learning numerals, computation facts and specific details about the current problem that needs to be solved. Working memory underpins the processes of maths: addition, subtraction, multiplication, division… Students with DS need help in overcoming these possible deficits in their memory. Problems with short-term memory have knock on effects on long-term memory storage. When information is not of interest to them or has little emotional impact, they may seem to remember it one day and forget the next.

 Children with DS often have fine motor problems and poor hand-eye coordination. These delays make it difficult to manipulate objects and make writing numerals difficult and slow. As a further consequence of having fine motor problems, children with DS often do not get as much experience of exploring objects in their world during the early years at home or at nursery, and so miss out on that crucial stage in learning that typically developing children experience. And because they find things harder, people tend to do things for them, which creates a vicious circle of dependence and over-reliance.

 Speech and language delay is the biggest cause of frustration for teenagers and young adults with Down syndrome. Many children with DS have difficulties with receptive language, ie understanding other people’s spoken messages. Difficulties with receptive language are especially likely to complicate maths learning, because so much of the language associated with maths is abstract or has double meaning. So, “Find the missing number”, “Write the number that is one less”, “Write the number that is between \_ and \_”, “Write the numbers in the correct order”, “What number is higher/lower than” etc are notorious problems

for pupils with DS. Specific maths vocabulary, such as the terms net and table also often cause problems, as do different ways of saying the same function: add, plus, find the sum of … take away, subtract, minus … times, multiplied by … and so on all compound the difficulties faced by pupils with DS. It is important, therefore, to teach all mathematics vocabulary and the associated concepts together.

Which number is higher?  Auditory and visual impairment also have a significant impact on the learning of maths concepts specifically. Processing information orally is much more difficult if you can’t hear properly, and the focussing difficulties faced by many children with DS mean that working out or writing equations vertically is made more difficult when you have just learned how to work them out as a number sentence (ie across the page), and vital concepts such as place value are made harder if you have problems focussing on and confusing different parts of a number or equation. Educators need to remember that children with DS are visual and kinaesthetic learners, so they are much more likely to understand concepts if they can handle real objects rather than substitutes for the real thing (such as number teddies or plastic money) or problems that are written down.

 Due to the nature of the challenges they face, many children with DS are prone to developing avoidance strategies, affected by their motivation to take risks. Many children with DS are very sensitive to failure, so are often reluctant to give things a try. So adopting an errorless learning

