Responding to pupil’s needs when teaching Mathematics

The importance of mathematics to pupils with learning difficulties Mathematics can provide pupils with powerful ways of exploring, investigating and understanding the world. The potential to apply the skills of making comparisons, identifying differences, investigating relationships and establishing connections reflects the importance of the subject across the curriculum during the school years. Mathematics is vital in everyday life as it encourages logical reasoning and the ability to think in abstract ways. At the earliest stages of development, where thinking centres around concrete situations and events, pupils strive to make sense of experiences and sensations that involve changes in pattern, quantity, space and time. Such experiences help them approach problem situations flexibly, to move from random to trial and improvement responses, and on to anticipate and predict. Increasingly, pupils will plan and reflect and come to recognise and evaluate alternative solutions. In this way, mathematical skills and understanding build on the earliest perceptual and cognitive learning.

In particular, mathematics offers pupils with learning difficulties opportunities to:

• build on their awareness of events and actions to recognise changes in pattern, quantity and space in their immediate environment and in the wider world

• use their developing awareness to anticipate and predict changes

• use their awareness and developing understanding of pattern, space, shape and number, to develop problem-solving skills that contribute to making choices, taking decisions and gaining control over their immediate environment

• extend mathematical skills, experiences and understanding which allows them to visualise, compare and estimate. For some pupils this will be achieved in abstract as well as concrete contexts

• begin to think about the strategies they use and explain them to others

• develop a powerful set of thinking tools to help them increase their knowledge and understanding of the world and, during the school years, to learn effectively in different subjects across the curriculum.

In response to these opportunities, pupils can make progress in mathematics by:

• increasing the breadth of their mathematical experience

• moving from an awareness of mathematical properties through using such information to anticipate and predict and then actively solve problems

• developing the ability to form mental representations of increasingly complex and detailed mathematical information

• communicating their understanding to others with increasing clarity

• using mathematical information to make choices and decisions in an increasing range of contexts.

Number In modifying the sections of the programmes of study for number, the main focus will be to build on pupils’ earliest perceptual awareness of quantity. Before they develop counting skills, pupils use this awareness to anticipate, to predict and to modify their actions. The contexts that will reinforce this early awareness and may help pupils to progress involve one, two or three items, events or sensations. These contexts change as staff add or subtract items and increase or decrease the number of events. For some pupils, the contexts include contrasting one and lots of objects. Introducing a formal system of counting, when relevant, will support pupils’ increasing awareness of number. This development, in turn, may be supported by appropriate activities that involve manipulating numbers in concrete situations at first, then mentally and symbolically. The language used to support the development of number skills should be focused on essential vocabulary.

Teaching number across the key stages can help pupils to:

• develop awareness of number and differences in number and use this awareness to refine their responses

• acquire the skill of counting as an important tool in everyday situations

• use counting and numbers to plan and make decisions

• begin to solve number problems practically and mentally

• become familiar with numerical symbols and manipulate numbers in concrete and abstract situations.

The thinking skills and understanding that algebra is based on involve seeing relationships, making connections and deducing rules. A modified programme will build on familiar, practical situations that enable pupils to predict what will come next, and what action or response will lead to a familiar outcome. It will provide opportunities to make connections between symbols and events, for example, pupils may use relevant photographs or symbols to represent a sequence of classroom events to help them find a particular location, such as the hall for assembly. To develop their recognition of patterns and relationships, there will be an emphasis on supporting pupils’ predictions at appropriate levels. Opportunities to explore and investigate existing situations may help pupils move towards creating their own patterns and rules. A clear focus on key mathematical language and opportunities to use invented signs and symbols may help them to share their perceptions.

Teaching algebra across the key stages can help pupils to:

• develop awareness of patterns in their immediate environment in response to visual, auditory, or tactile sensations

• explore patterns and make predictions

• create patterns and communicate them to others

• deduce or suggest rules that govern a sequence.

Shape, space, geometry and measures

In modifying the sections of the programmes of study for shape, space, geometry and measures, the main focus will be to build on the way pupils respond to similarities and differences, for example, in position, movement, size, weight, duration and temperature. (In the international system of units, kilogram is the unit of mass. In practice, mass is measured by weighing; scales measure or compare a force. In the national curriculum for key stages 1 and 2, it is considered acceptable to treat weight as synonymous with mass.) Relevant experiences and opportunities for exploration, and investigation move from simple activities, in which pupils might respond by trial and improvement, to more complex situations to a more precise response. For example, pupils move from altering their reach to grasp a new and desirable item to arranging shapes or solving spatial problems in a more focused way. Such experiences within shape, space, geometry and measures can help pupils to organise and classify their environment in a meaningful way.

Teaching shape, space, geometry and measures across the key stages can help pupils to:

• develop their awareness of position, distance, movement and direction, and use their awareness to refine their responses

• develop their awareness of shape, size and weight and begin to use their understanding to recognise similarities and differences

• develop their awareness of time, duration and the sequence of everyday events

• use simple criteria to classify objects in their environment, measure by direct comparison and, later, use standard measures to help them plan or make decisions

• acquire mathematical language associated with shape, space and measures and use directional symbols.

Handling data and statistics

In modifying the sections of the programmes of study for handling data and statistics, the main focus will be to build on familiar and routine activities to provide new ways of thinking about them. At the earliest stages, contexts will include representing a situation by arranging the real objects involved in a way that makes information about them clearer. A modified programme will involve connecting photographs and objects to people and events. The emphasis in interpreting data will be on similarities and differences, and may move towards drawing conclusions about changes and trends.

Teaching handling data across the key stages can help pupils to:

• associate an object, and later a symbol, with a real event, person or item

• use symbols to represent events, people and items

• represent information or data in a variety of forms and describe them to others

• select information that is of particular relevance or interest to be represented and, once collected, draw conclusions from the outcome.