Chapter 5

Middle and late childhood

Learning outcomes

By the end of this chapter you should:

- *be able to evaluate the importance of peer relationships;*
- *be able to discuss critically the mastery of cognitive tasks that takes place in childhood, including early mathematical and scientific thinking;*
- *critically understand the development of reading and writing skills;*
- *understand the possible impact of atypical development on experiences such as schooling;*
- *have developed your ability to reflect on the importance of the socio-cultural context for development;*
- *have developed your problem solving and logical reasoning.*

Introduction

One of the most important changes that happen towards the end of early childhood is the start of formal compulsory schooling. In this chapter we consider children's development during the early school years – from four until 11 years of age. Although many children have already had some experience of social contexts and environments outside the home, starting school is still seen as an important milestone in Western society. Indeed, it opens up a very different set of social, emotional and cognitive experiences for children. While, for many children, these experiences will be negotiated with ease, for others, perhaps most notably those children whose developmental course is atypical, this journey may be much more difficult. Peer relationships become increasingly important during middle and later childhood. The nature and understanding of friendship also changes as children negotiate their place within their peer group. Transformations in cognitive and language skills are reflected in children's understanding of scientific and mathematical thinking, and in their manipulation of symbols as they learn to read and write.

Cognitive development in middle and late childhood

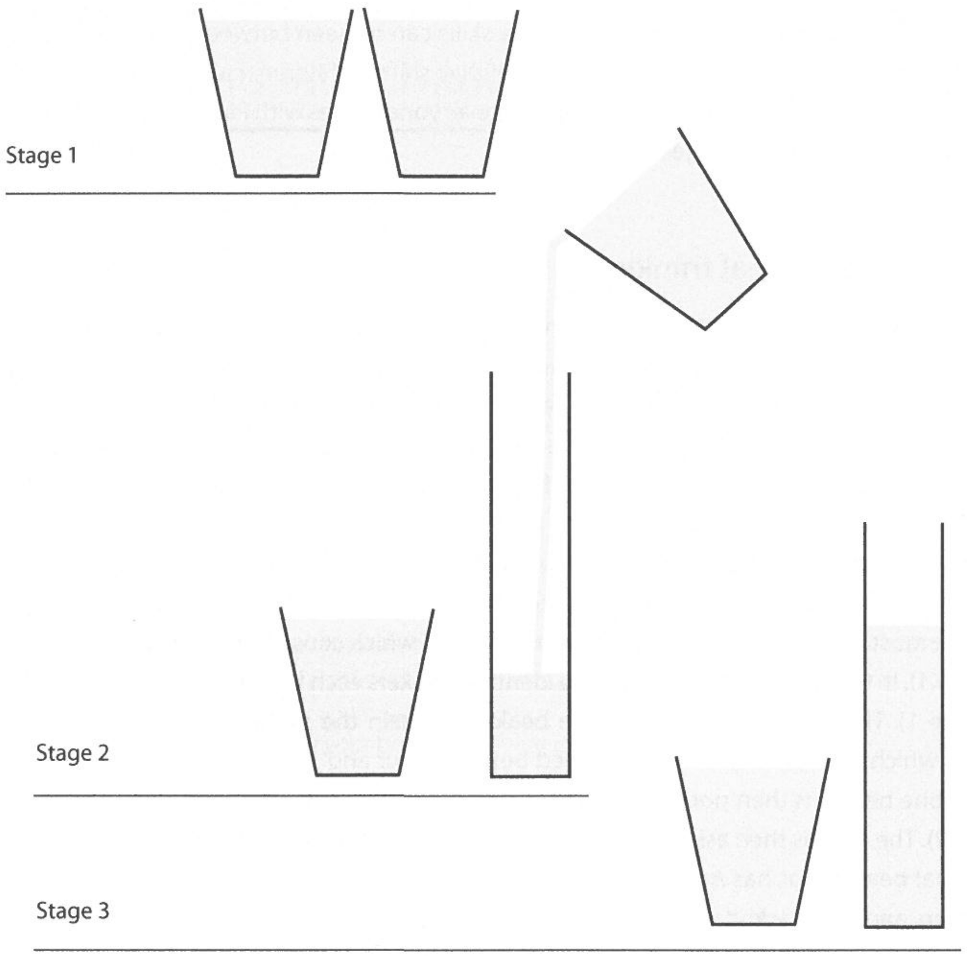
A remarkable transformation in children's cognitive skills can be seen between the ages of four and 11. According to Piaget (1923), this marks a qualitative shift as children make the change from preoperational to operational thinking. However, not everyone agrees with Piaget's assessment of what develops or how these changes occur.

Developing operational thinking

As you learned in the previous chapter, according to Piaget (1923), a key milestone for children in the early part of the preoperational stage (the symbolic functioning sub-stage) is the ability to develop mental representations of an object that is not present. In the later part of the preoperational stage (intuitive thinking), children also begin to use primitive reasoning. However, according to Piaget, children's reasoning is still flawed. The main limitations to thinking at this age are **centration** and a lack of understanding of **reversibility**. These limitations of thinking are best illustrated by **conservation** tasks (Inhelder and Piaget, 1964). Conservation tasks measure awareness that altering an object's appearance does not change its quantitative properties. Probably the most well known of these is the beaker test, in which conservation of liquid is tested (see Figure 5.1). In this task a child is shown two identical beakers each filled to the same level with liquid (Stage 1). They are then asked if these beakers contain the same amount of liquid – a question to which the majority of children aged between four and seven years will say yes. The liquid from one beaker is then poured into a third beaker that is taller and thinner than the first two (Stage 2). The child is then asked if the amount of liquid in the tall thin beaker is the same as in the original beaker that has *not* been altered (Stage 3). Children in the preoperational stage usually say no, and when asked why not, justify their answers by referring to the differing height of the liquid in the two beakers. Children older than seven or eight years who have reached the concrete operational stage usually say yes, the amounts are the same, and can justify their answer in terms of reversibility ('If I poured the liquid back into the first beaker it would still look the same).

Piaget (1923) also tested conservation of number, matter and length (see Figure 5.2), with similar outcomes. So why are young children not able to conserve? According to Piaget, children under the age of seven make two important errors when carrying out this task. First of all, they centre their attention on the most salient characteristic of the task. In the beaker task they focus on the height of the liquid to the exclusion of all other features. They fail to consider characteristics such as the different shapes of the two beakers. In addition, they cannot mentally reverse the action they have just observed – they are unable to make use of the logical reasoning that the liquid must still be the same because it has only been poured from one beaker to another and could easily be poured back. When asked to judge the beakers the second time, the child is unable to make the causal link between the current and original situation. They therefore fall back on making a judgement based on how things look now.

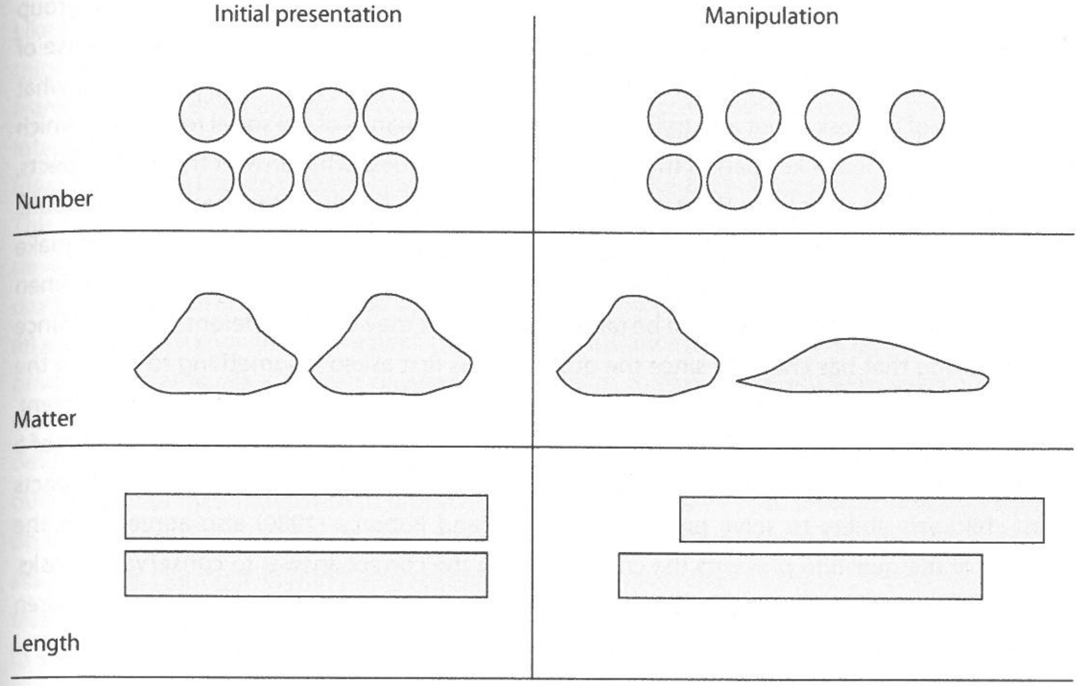
Figure 5.1: *The beaker test (conservation of liquid)*



This limited way of thinking can also be seen in Piaget's class inclusion task (Inhelder and Piaget, 1964), which demonstrates a lack of understanding of hierarchical classification. In this task children are shown a picture of a set of objects such as horses and cows and are asked 'Are there more cows or more animals?' Despite knowing that cows are a type of animal and being able to count the number of cows and animals correctly, children aged six or seven will say that there are more cows. According to Piaget, this is because preoperational children can only make one grouping at a time. Once they have put the cows in the class 'cows', they cannot mentally undo that to include the cows in the larger 'animal' class and so are unable to understand the relationship between cows and animals. Without reversible mental operations, the classes 'cow' and 'animal' cannot exist simultaneously in the child's mind.

Children develop reversible mental operations and learn to decentre around the age of seven to eight years. This means that they are able to conserve and answer the class inclusion questions

Figure 5.2: *Conservation tasks in the preoperational stage*



correctly. More importantly, they can give a logical reason for their answers. However, reasoning is still limited between seven and 11 years of age. Piaget (1923) calls this the concrete operational stage because, although children can reason logically and understand about causal relationships, they can only do so if that reasoning is tied to specific concrete examples. They cannot yet make use of hypothetical or abstract reasoning.

Not everyone agrees with Piaget's estimate of when children's ability to conserve and understand hierarchical classifications emerges. As you learned in Chapter 4, Piaget has been criticised for using tasks that are unfamiliar to the child (e.g. Hughes, 1975). Donaldson (1978) also argued that these conservation and class inclusion tasks did not make human sense to the child. Why pour liquid from one beaker to another if it makes no difference? Why ask if there are more cows than animals if we know that cows are animals? Donaldson and others since have shown that, by changing the tasks so that they make sense to the child, even four year olds are able to succeed in conservation and class inclusion tasks. For example, if the class inclusion task is changed so that it only uses cows, some standing, some lying down, and the question asked is 'Are there more cows or more sleeping cows?' (a more sensible question), then three year olds can answer correctly. The logical challenge is the same, but the task makes more sense (Donaldson, 1978).

Donaldson (1978) also criticised the procedural aspect of these tasks. In the classic Piagetian conservation tasks, the same question is usually asked twice in order to test the child's reasoning

– once before any changes are made and then again after the transformation. However, if the children are only asked the question once, after the transformation, more of the younger group get the answer right. According to Donaldson, this is because children learn to make sense of adults' questions in teaching and testing situations. The child is not only trying to work out what the meaning of the task is, but also trying to work out the demands of the social relations in which the task is embedded. A key part of this process is trying to guess what answer the adult expects, and what response will please them most (Donaldson, 1978). Children learn early on that adults do not usually ask a question twice if the correct answer has already been given. In trying to make sense of the social situation and the adult's intention, the child uses the rule of thumb that, when a teacher asks a question twice, it can be taken to mean that they want a different response. Since the only thing that has changed since the question was first asked is something to do with the materials, a plausible guess is that the tester wants the child to say that the amounts are different. According to Donaldson, for the child the implicit social rules of the situation are as much of a problem to be solved as the explicit problem that is being posed. Thus, the social context impacts upon children's ability to solve problems. Wheldall and Poborca (1980) also agreed that the wording of the question prevents the children giving the correct answer to conservation tasks. They therefore used a non-verbal version of the beaker task and found that twice as many children could conserve using this task than in the original approach.

Information-processing models provide a different challenge to Piaget's theory. Donaldson and others criticised Piaget for the tasks he used, suggesting that they did not allow younger children to demonstrate their logical reasoning. However, the assumption was still that human reasoning depends upon having mental structures for logical thinking (what Piaget calls 'operations') – what they did not agree on was the age at which these structures developed. Information-processing models consider this problem from a different angle. They suggest that children cannot do these tasks because of the demands on processes such as memory and attention, which are still developing at this age. In response, supporters of Piaget's theory (**neo-Piagetians**) have taken some of these ideas from information processing and integrated them with Piaget's original theory. For example, it is argued that development through the stages (and changes in logical structures) is made possible by increases in working memory capacity and processing efficiency (Demetriou et al., 2002).

It has also been proposed that younger children's thinking is hindered by a lack of general knowledge. According to Johnson-Laird (1993), problem solving is not based upon existing mental structures of logical thought, but depends instead on factual knowledge and our understanding of the world around us. We construct mental models – mental images of the problems to be solved – that are based on our factual understanding of the world. The difficulty for children is that they have less knowledge and information about the world – the problem is therefore a quantitative, not a qualitative, one. This is an idea that we shall explore in more detail in the next chapter.

The zone of proximal development

Like Piaget, Vygotsky (1930/1998) believed that children develop qualitatively different ways of thinking about the world. However, he had a very different idea about how this happens. As you learned in Chapter 4 (page 80), Vygotsky believed that cognitive development was based on social interactions, not individual exploration of the environment. This belief is reflected in Vygotsky's ideas about how learning takes place within what he calls the *zone of proximal development (ZPD)*. This concept refers to a child's developmental potential. According to Vygotsky, a child's actual developmental level is determined by their independent problem solving, while their potential developmental level is determined by the problem solving they can achieve with instruction from an adult or more knowledgeable peer. The ZPD is the distance between these actual and potential developmental levels. Children develop new ways of thinking and problem solving through working with more knowledgeable others on tasks that are within this zone. If children are to develop new ways of thinking, it is really important that the tasks that children are given are just out of reach of their independent problem-solving abilities, but not so difficult that they cannot do them even with help. Adults teach children new skills gradually through a process known as **scaffolding**. During a learning interaction, the teacher takes the child step by step through the task, varying the level of help given so that it is contingent on the child's needs (Wood et al., 1976). In the early stages of mastering a task, a child may need a lot of help in the form of direct instruction and modelling. As they become more capable at a task, guidance will become less directed as the child takes more control of the activity. This model presents development as an apprenticeship in which the expert (adult or other more skilled individual) teaches the novice (the child) how to succeed. It is important to remember that, for Vygotsky, teaching is something that happens all the time – parents teach children, and older siblings teach younger ones. Teaching is not restricted to formal educational settings. However, you may not be surprised to learn that this theory has been applied to a school setting.

Focus on: cultural variation in starting school

In the UK, school entry usually happens at around the ages of four or five; in other parts of Europe it may be as late as seven years; and in America school entry is usually between the ages of five and six years. There is a lot of debate concerning the 'right' age at which children should start school. The following articles consider this topic from very different angles. One is written from an American and the other a UK perspective. One is a professional academic text, the other a newspaper article. Both are freely available online.

- Stipek, DJ (2003) School entry age, in Tremblay, RE, Peters, RDeV, Boivin, M and Barr, RG (eds) *Encyclopedia on Early Childhood Development.* Montreal: Centre of Excellence for Early Childhood Development. Available online at www.child-encyclopedia.com/documents/StipekANGxp.pdf.

- Bruton, C (2007) Do we send our children to school too young? *The Times*, 6 September. Available online at http://women.timesonline.co.uk/tol/life_and_style/women/families/article 2392738.ece.

Task — Read the above two articles and then consider the following questions.

- How does the professional article differ from the newspaper account?

  Tip: think about the evidence used, the language and tone, and the purpose of the article.

- What can you learn from this comparison?

Comment

Although both articles cite some research evidence, the way this information is presented is very different. The newspaper article is written in a chatty, friendly way. Anecdotal as well as research evidence is cited. The style is deliberately personal and emotive. Newspaper articles are, after all, designed to be not only informative, but also provocative. The professional article is much more objective in style. The evidence presented is based on research, not anecdote. Reading and comparing these two sources of information is important because, as a psychologist, you need to understand that not all evidence is equal. For example, a single case study does not usually provide the defining word on a subject, although it may be a good starting point; causal conclusions cannot be drawn from correlational studies; and you must always consider the source of information and evaluate its credibility. This task is designed to help you develop your skills in this final area and help you to be a wise consumer of information.

School experiences and cognitive development

In Western societies the school provides an important context for children's continuing cognitive development. There is, however, a lot of debate about the best way for schools to help this development. *Traditional teaching methods* relied heavily upon rote learning and the direct transmission of knowledge and information from teacher to child. More *progressive teaching methods* are child-centred and based on the idea that children need to be actively engaged in the learning process. Both Piaget and Vygotsky agreed that learning had to be active. From a Piagetian perspective, this means a child exploring and discovering things for themselves (**discovery learning**). In contrast, the Vygotskian approach emphasises the importance of interaction between the learner and more experienced others. One other important difference between these

two approaches for learning concerns not so much how children should be taught, but more *what* can be taught.

According to Piaget (1923), children cannot learn something until they are **cognitively ready**. They need to have developed the appropriate cognitive structures before learning can take place; for example, children cannot learn about conservation until they have reversible mental operations. For Piaget, this meant that in school the teacher's role is to facilitate children's learning rather than provide direct instruction. On the contrary, Vygotsky (1962/1978) believed that a child can be *taught* anything as long as the activity falls within the child's ZPD. The teacher's role is therefore to provide direct instruction. In one sense, Piaget and Vygotsky are both arguing for readiness to learn. However, the important difference is that for Piaget development leads to learning, while for Vygotsky learning results in development.

If Vygotsky is right, could it be possible to teach a skill such as conservation to children who are not yet at the operational stage of development? Indeed, there is evidence that three- and four-year-old preschoolers who are not yet able to conserve can be taught this skill (Field, 1981). However, Field also found that four year olds were better conservers than three year olds and, once taught, were more likely to retain this skill over time. When the children in her study were retested five months after being taught to conserve, the majority of three year olds (70 per cent) had reverted to being non-conservers. In contrast, the majority of older children were more likely to have remained as conservers. The short-term nature of the conservation shown by the younger children suggests that they had not actually learned a new thinking skill, but had simply rote learned the 'correct' answers. By the time of retesting, they had forgotten what the answers were. This is further evidenced by the finding that the children who retained the ability to conserve were those who had shown that they could generalise their conservation skills to untrained quantities. This suggests that Vygotsky was right – new ways of thinking can be taught, but a child has to be ready to learn those skills.

The experiences children are exposed to in school, whether through discovery learning or direct instruction, therefore seem to influence cognitive development. But how does school influence development and is school necessary? In schools across the world children learn about a range of topics – science, maths, history and geography. Although the topic may be the same, the content may not, and variations are seen in terms of the depth and breadth of information that children are expected to cover (NRC, 1996). In maths and science, for example, an international survey found that the content covered was dictated in part by the social and cultural setting in which the child lives and the expectations of that culture (NRC, 1996). Curriculum delivery has also been found to be different within as well as across cultures (NRC, 1996; Moor et al., 2006). There has been a lot of debate in education about the extent to which schooling and curriculum content matter for intellectual development (e.g. Hanushek, 2003; Sammons et al., 2004). Separating learning and development – often expressed as the influence of school versus individual ability – is particularly difficult (Carneiro et al., 2001). It is like trying to answer that age-old question – which comes first, the chicken or the egg? Looking at cross-cultural studies of children who do not experience formal schooling may help solve this conundrum. Cross-cultural studies have shown that cognitive skills develop at different rates and may manifest themselves in different ways depending on the context in which a child lives (Cole, 1990). Nunes et al. (1993) showed, for example, how child street traders in Brazil who had not been exposed to formal schooling had difficulty finding the correct solution to hypothetical mathematical problems when these problems were given to them in written form. However, they did statistically better when the same problem was presented orally. Nunes et al. argue that this demonstrates that the children possess the ability to solve hypothetical problems, but because of a lack of experience and training in written mathematical problems, they fail when these problems are presented as they would be in a formal school setting. So does school really matter for development? Since children are able to develop sophisticated cognitive skills without attending school, the answer would seem to be 'no' – what matters is that children experience a range of learning opportunities. Development of logical thought is not influenced by schooling – it will develop anyway. However, what school does influence is *how* those skills develop and are manifest, by teaching the language and expectations of a specific cultural setting in relation to particular cognitive tasks (Cole, 1990). This happens in two ways. First, children learn the jargon necessary to access academic tests of cognitive ability at school. Second, they learn how to manipulate a new set of linguistic symbols by learning to read and write.

Focus on: atypical development and school experiences

As well as looking at the evidence from cross-cultural research, we can look at research that considers the school experiences of children who are developing atypically. In their paper 'School experiences after treatment for a brain tumour', Upton and Eiser (2006) describe how lengthy school absences can impact upon cognitive performance for school-age brain tumour survivors. They discuss how school absence interacts with a range of other factors, including the social context and the child's brain functioning, to influence the special educational needs of these children.

Task

Read the paper described above (Upton, P and Eiser, C (2006) School experiences after treatment for a brain tumour. *Child: Care, Health and Development*, 32(1): 9–17) and answer the following review questions.

- Could you develop a model to explain the development of these children using dynamic systems theory?
- What factors do you need to consider? Is this just about cognitive development, or is social development also relevant?

Comment

Upton and Eiser also note that long absences from school mean that children fall behind their classmates, and that performance is most affected in subjects such as literacy and numeracy where prior knowledge and skills are vital. This is also true for children with chronic health problems that do not involve neurological difficulties. What does this tell us about performance, ability and school? Does performance on a task necessarily demonstrate ability? Performance on tests is frequently used as a measure of cognitive ability – but what does this really tell us? You know from reading about cross-cultural studies that children may be able to think logically, but cannot demonstrate that skill if the tasks do not make social sense. Is this the same for children who have long school absences due to illness or is a different mechanism at work? Is their cognitive development delayed, disrupted, or is it simply that their knowledge of the language of performance testing is lacking? What other factors might influence cognitive development for these children? Why not use your literature search skills to find out more about this topic. What do studies of children with chronic illness show about their cognitive functioning and school attendance?

Language development in childhood: learning to read and write

Reading and writing are perhaps two of the most significant skills that children learn at school. Vygotsky saw language as an essential cultural tool for learning and he included written language as a necessary part of this. Through language, humans have shared knowledge across generations for centuries. This has often been through the spoken word. The oral tradition is common throughout the world; storytellers such as the griots and dyelli from Africa keep cultural traditions alive, using narrative to transmit cultural history and ancestry to new generations. Written language, however, expands our ability to pass information on to others. First, writing things down creates a shared memory. Second, knowledge can be disseminated much further in a written format than if communication were to be limited to the spoken word. Modern technology – for example, the internet – has created even more opportunities to share knowledge and information through the written word. Stop and think for a minute about how often you make use of the written word to learn something new (reading this book, for instance) or to communicate something to others.

One of the other major advantages of the written word is the way it enhances our cognitive functioning. Writing things down can be a great memory aid; working things out on paper expands our thinking power, allowing us to deal with a larger quantity and complexity of material. In this way, writing is able to enhance our cognitive processes (Menary, 2007). Learning to read and write opens up a whole new world of information to the child. However, it is important not to think of the child as a sponge passively soaking up knowledge. By learning to read and write, the child is also able to become an active participant in the socio-cultural world of which he or she is a member (Nelson, 1996).

Reading

Reading is not automatic. Learning to read involves mastering and integrating a number of separate skills. English and other European languages use an alphabetic script where each symbol (letter) represents a phoneme. In order to learn to read, the child must develop a conscious awareness that the letters on the page represent the sounds of the spoken word. This happens through either a bottom-up or top-down process. In a bottom-up process we learn to spell out each phoneme and build up the word. To read the word 'cat', the word must first be split into its basic phonological elements. This is known as a 'phonics approach' to learning to read. Once the word is in its phonological form, it can be identified and understood. So the word 'cat' is first decoded into its phonological form ('kuh, aah, tuh') and is then identified. In a top-down process the whole word is recognised by its overall visual appearance. This is known as the 'whole-language approach' to teaching reading. There is much debate about which approach is best, but the evidence suggests that children use and benefit from both strategies (Siegler, 1986; Vacca et al., 2006). Once the word is identified, higher-level cognitive functions such as intelligence and vocabulary are applied to understand the word's meaning: in the case of the word 'cat', this might be 'small furry mammal that purrs'.

Many factors can influence how this learning progresses. Often children know a lot about reading before they start school – especially in homes where books are readily available and the children have been read to regularly. These children will understand that books tell stories, that they have a right and a wrong way up and that the writing goes from left to right. They may even copy the act of reading – turning the pages and using the pictures to invent a story or simply repeating a story from memory. Many children may also know the letters of the alphabet when they first start school. These children tend to be more successful in learning to read than those who have not learned the alphabet. However, this probably reflects a general interest in books and reading that has been encouraged at home (Adams, 1990). Knowledge of nursery rhymes and rhyming games also seems to play an important part in developing the understanding that words can be broken down into separate sounds (phonemic awareness). Children with a greater knowledge of nursery rhymes show a much better phonemic awareness (Maclean et al., 1987). It seems that rhymes allow children to discover phonemes.

It is this knowledge that learning to read is not just about what is taught in schools, but is in fact underpinned by activities at home, that underlies the UK Bookstart strategy (www.bookstart.org.uk). This campaign is a national programme that encourages all parents and carers to enjoy books with their children from as early an age as possible. Bookstart offers the gift of free books

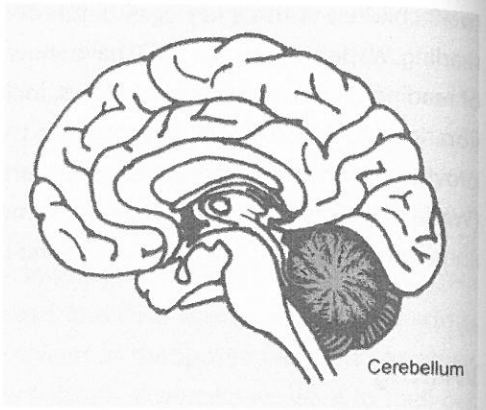
to all children at three key ages before they start school, the aim being to stimulate a love of reading. Wade and Moore (1993) have shown the programme to have had an impact on a number of reading-related activities in families, including sharing books with young children, the use of libraries and book buying. Support for the long-term advantages of early reading has been provided by the observation that Bookstart children achieve higher scores in English and maths (Wade and Moore, 1998). There is also some evidence that Bookstart enables children to acquire consistently higher levels of language and literacy development (Hines and Brooks, 2005).

Writing

Writing and reading are closely related and, some would say, inseparable. Better writers tend to be better readers, and better readers produce better writing. It makes sense that the strategies children use to read are the same ones they use in order to write. However, in addition to the cognitive and linguistic skills that children need for reading, in order to write, children also need to have developed fine motor skills. Play activities that involve the manipulation of objects, such as art and crafts, play dough, jigsaw puzzles, building blocks and so on, help to develop fine motor skills. However, there is some evidence that motor development has a much wider role to play in the development of cognitive skills, including language. Studies of children with **specific learning difficulties** have highlighted the joint occurrence of motor and language difficulties (Viholainen et al., 2002). Indeed, the observed prevalence of motor problems in children with developmental language problems has been estimated to be somewhere between 60 and 90 per cent (Viholainen et al., 2002). One possible explanation for this **co-morbidity** is that motor and language problems share a common underlying neuro-cognitive system. There is increasing evidence that, structurally, the interface for the integration of cognitive and motor functioning is the cerebellum, a peach-sized structure situated at the base of the brain (see Figure 5.3).

It has been known for a long time that the cerebellum is responsible for coordinating movement, planning, motor activities, and learning and remembering physical skills, and for a long time this was believed to be its only role. In the last 20 years, evidence from **neuro-imaging studies** and studies of patients with cerebellar lesions has shown that the cerebellum also plays an important role in a range of high-level cognitive functions, such as language, previously believed to be under the sole control of the cortex (Booth et al., 2007). According to the cerebellar deficit hypothesis (Nicolson et al., 1995), both literacy and *automaticity* problems can be explained by abnormal cerebellar function. Indeed, there is evidence from both behavioural and neuro-imaging tests that dyslexia is associated with cerebellar impairment in about 80 per cent of cases (Nicholson et al., 2001). It therefore seems that not only does motor development create the opportunity for cognitive functions to develop, as you learned in Chapters 3 and 4, but that the interrelatedness of cognitive and motor development might also be based on shared neural systems (Ojeman, 1984; Diamond, 2000).

Figure 5.3: *A cross-section of the brain, showing the position of the cerebellum*

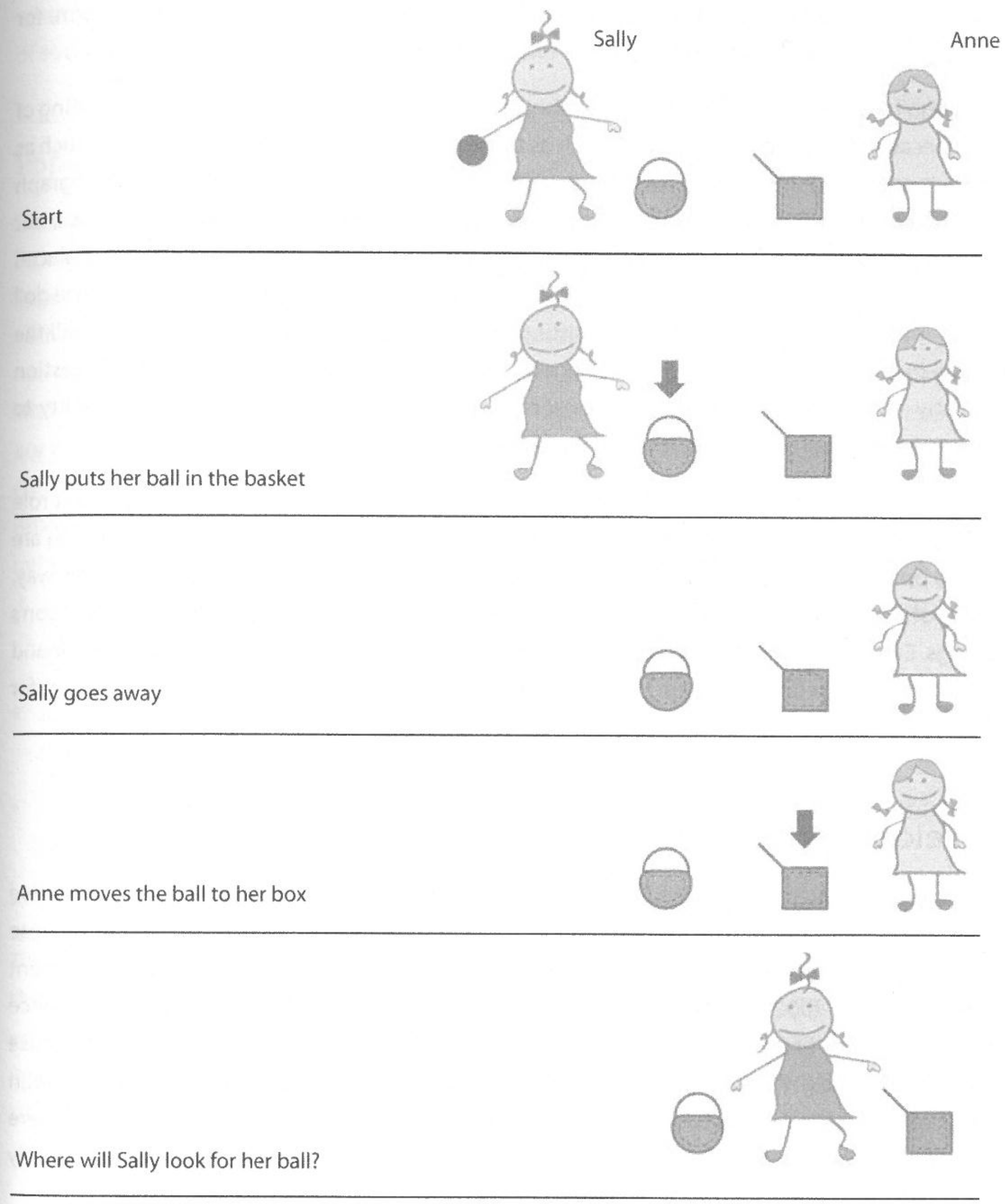


Theory of mind

An important area of cognitive development that takes place during the school years is children's understanding of mental states; they develop what is known as a **theory of mind.** Theory of mind refers to the understanding that other people may have different thoughts, knowledge, desires, feelings and beliefs (Harris, 2006). Even preschoolers try to attribute knowledge and mental states to others; however, it is not until around the age of four years that children are thought to demonstrate a coherent theory of mind (Gopnik, 1993). Some theorists argue that this ability demonstrates a qualitative shift in children's thinking (e.g. Wellman and Gelman, 1998). However, others disagree, arguing that the tasks used to test for theory of mind underestimate children's abilities (Siegal and Peterson, 1994). This is very similar to the debate about other areas of cognitive development considered earlier in this chapter and, as in that debate, a lot of effort has gone into trying to change the tasks used to make more human sense, thus allowing children to demonstrate their understanding of mind at an earlier age.

The task most commonly used to assess theory of mind is the 'false belief task' (Wimmer and Perner, 1983). There are a number of variations of this task, but probably the most famous is the 'Sally Anne task' (Baron-Cohen et al., 1985). Children are told or shown a story involving two characters, Sally and Anne, who have a basket and a box, respectively (see Figure 5.4). Sally also has a ball, which she places in her basket, and then she leaves to take a walk. While she is out of the room, Anne takes the ball from the basket, eventually putting it in the box. Sally returns, and the child is then asked where Sally will look for the ball. If the child answers that Sally will look in the basket, where *she* put the ball, they have demonstrated understanding of mind; they recognise that Sally has a different mental representation of the situation from theirs – they possess knowledge Sally does not. The results of research using false belief tasks have been fairly consistent: most typically, developing children are unable to pass the tasks until around the age of four. However, it has been suggested that this is because younger children misinterpret the key false belief question – 'Where *will* Sally look?' – to mean 'Where *should* Sally look?' (Siegal and

Figure 5.4: *The Sally Anne task*



Peterson, 1994). If this is so, their wrong answer is actually correct. Indeed, three year olds have been found to perform better when the question is reworded to a less ambiguous form, for example 'Where should Sally look *first of all*' (Siegal and Beattie, 1991).

It has also been suggested that three year olds are unable to demonstrate their understanding of mind because of the burden that tasks such as these place on immature processing skills, such as memory and reasoning (Flavell and Miller, 1998). This has been tested by the 'false photograph task' (Leslie and Thaiss, 1992), which has the same burden in terms of memory and inference, but does not require children to consider another's mind. In this task, children are shown a doll placed sitting on a box. They are then given an instant camera and asked to take a photo of this. The doll is then moved to a new position such as sitting on a mat. The child is then asked, 'Where will the doll be in the developing photo?' Once again, four year olds are able to answer this question correctly – three year olds are not. This strongly suggests that the three year olds' inability to answer the false belief task is at least partly related to poorer processing skills.

Although clearly a cognitive skill, theory of mind is also a social skill that plays an important role in our ability to get on with others (Liddle and Nettle, 2006). If you have theory of mind, you are able to put yourself in somebody else's shoes, to imagine what it is they are feeling. In this way, theory of mind is a part of empathy – our ability to understand and identify with another person's feelings. Empathy is also believed to play an important role in fostering pro-social behaviour and social competence (Eisenberg and Fabes, 1998; Hoffman, 2000), both of which are important for good peer relationships during the school years.

Developing peer relationships

It has been estimated that, in middle childhood, 30 per cent of a child's social interactions involve peers – three times more than in early childhood (Rubin et al., 1998). There is evidence that these school playground experiences have both an educational and a social value for child development (Blatchford et al., 2002). However, not all peer interactions are positive and there is also evidence that the incidence of bullying and aggression in the playground is sufficiently widespread to cause serious concern (e.g. Whitney and Smith, 1993), and racist and sexist teasing and fighting has been observed (e.g. Kelly, 1994; Short, 1999). There is evidence that, in both the US and the UK, there has been a move to reduce the time allocated for the lunch break in order to tackle unnecessarily aggressive and aimless behaviour, bullying and peer rejection (Blatchford et al., 2002).

However, this may not be helpful – and may even exacerbate the very behaviour it wishes to eliminate. Blatchford et al. (1990) suggested that a child-governed break-time culture from which adults are excluded exists in the playground. While this culture is not always a benign one, it is nevertheless extremely important to children, because of the freedom from adults that it affords. The developmental advantage of this is that, without adult intervention, children have to learn to

regulate playground games and space themselves. They must also discover how to manage teasing and bullying. In so doing, Blatchford argues, they are able to develop a sophisticated set of social understandings.

Popularity

During middle childhood, some children seem to have many friends, while others only have a few. Indeed, a central concern of most school-age children is popularity, also known as social status. Popularity is defined by the majority of peer interaction researchers as the number of children who name a target child as 'liked', 'disliked', 'friend' or 'best friend' (Newcomb et al., 1993). Using these nominations, the extent of children's popularity can be classified into one of four groups: children with the most 'liked' nominations are popular; children with the most 'disliked' nominations are rejected; children with very few (or even no) nominations are neglected; and children are considered controversial if they are both nominated frequently by some and actively disliked by others. A relationship has been found between children's popularity levels and their social behaviours as follows.

- *Popular children*: demonstrate high levels of positive social behaviour and cognitive ability and low levels of aggression and withdrawal compared with average children.
- *Rejected children*: are more aggressive and withdrawn and less sociable and cognitively skilled than average children. They tend to be perceived as 'different' by their peers.
- *Neglected children*: demonstrate less social interaction and disruptive behaviour but more withdrawal than average children.
- *Controversial children*: are less compliant and more aggressive than average children.

The important thing to consider is whether popular children's array of competencies makes them the recipients of positive peer nominations as Newcomb et al. believe, or whether the increased opportunities for interaction with others that popularity affords leads to an increase in social skills. Peer acceptance may, for instance, influence friendships by determining the amount of choice that children have for making friends (Azmitia et al., 1998).

Friendship

Middle childhood brings clear changes in the understanding of friendship. In early childhood, friendships are transient in nature and are often related to the availability of the other person. A friend is defined as someone you play with or with whom you share some other activity. In middle childhood, children's relationships still tend to be with others who are similar to themselves; this is partly because children are more likely to come into proximity because of similarities in age, socio-economic status, ethnicity, etc. However, there is also evidence that children also become increasingly similar to their friends as they interact (Hartup, 1996).

It is during middle childhood, however, that children begin to identify the special features of friendship that supersede mere proximity. During this period of development, children begin to recognise that friendships provide companionship, help, protection and support (Azmitia et al., 1998), are reciprocal (Selman, 1980), demand trust and loyalty (Bigelow, 1977) and last over time (Parker and Seal, 1996). That is not to say that friendships made in middle childhood endure for long periods. School-age children often have what have been called 'fair-weather friends', because friendships at this age are often unable to survive periods of conflict or disagreement (Rubin et al., 1998). There also appear to be gender differences in the time it takes to mend broken friendships. Azmitia et al. (1998) observed that, following friendship conflict, boys would typically work it through and renew the friendship in one day, whereas girls would take about two weeks. This may be because triads are more common in the friendships of school-age girls than in those of boys, causing one member of the group to feel left out. By the end of middle childhood, friendships are becoming intimate, and are characterised by an enduring sense of trust in each other. The ability to engage in mutual role-taking and collaborative negotiation develops throughout this period, leading to greater loyalty, trust and social support. For example, Azmitia et al. (1998) found that girls' expectations that friends would keep secrets rose from 25 per cent in eight to nine year olds, to 72 per cent in 11 to 12 year olds. However, this expectation developed slightly later in boys. Thus, the ability to form close, intimate friendships becomes increasingly important as children move towards early adolescence (Buhrmester, 1990).

Critical thinking activity

Developing scientific thinking

Critical thinking focus: reflection on the importance of context for development

Key question: *How do children come to understand scientific explanations of floating and sinking?*

Science, especially in primary school, is often presented as a set of facts to be learned. However, knowledge of science is much more to do with knowing how to think appropriately about a problem, and current evidence shows that children have to undergo a process of conceptual change in order to truly understand about science. Piaget argued that children cannot understand scientific reasoning until they have reached the formal operational stage of development, which usually

happens in adolescence. However, many educators and psychologists now agree that children begin to understand about the natural world and how it works from an early age (Duschl et al., 2007). The evidence suggests that they construct their own theories of how the world around them works based on their everyday experiences. While a rudimentary understanding of scientific phenomena such as density has even been demonstrated in preschoolers (Kohn, 1993), it must be remembered that these naive theories are often imperfect and may include misconceptions. Piaget (1923) argues that this is because young children do not have the cognitive structures to enable them to understand the scientific theory. According to Piaget, early misconceptions must be replaced by more accurate understanding as the child's cognitive abilities mature. However, contemporary evidence suggests that, rather than dismissing children's early theories, this knowledge should be used as a building block for scientific thinking.

Read the following paper:

Pine, KJ, Messer, DJ and St John, K (2001) Children's misconceptions in primary science: a survey of teachers' views. *Research in Science and Technology Education*, 19(1): 79–96. Available online at https://uhra.herts.ac.uk/dspace/bitstream/2299/613/1/103202.pdf.

This paper gives a clear insight into the factors that might affect the development of scientific thinking. This includes children's experiences at home, as well as the teacher knowledge and approach to topics. Pine et al. consider two science topics – balance and curvilinear motion. How might you apply some of the ideas expressed here to explain children's understanding of another scientific concept – floating and sinking? Consider the following questions.

- What activities do children routinely engage in at home that may influence naive theories of floating and sinking?
- Can you apply Karmiloff-Smith's representational redescription model (described in the paper) to this understanding?
- What do you understand about why objects float and sink and where did you get this knowledge from? Do you think yours is a sophisticated view or might it include some misconceptions? Compare your ideas to the developmental progression provided by Deakin University: www.deakin.edu.au/arts-ed/education/sci-enviro-ed/early-years/pdfs/floating-sink.pdf. Do you think all adults understand the Archimedes Principle as described here? How important is it for primary school teachers to understand this fundamental physics concept?

Now read the following paper:

Hardy, I, Jonen, A, Möller, K and Stern, E (2006) Effects of instructional support within constructivist learning environments for elementary school students' understanding of 'floating and sinking'. *Journal of Educational Psychology*, 98: 307–26.

To what extent does the approach described here help overcome some of the problems raised by Pine et al.? What are the pros and cons of this method of teaching science?

You might also find the following paper, which considers how a teacher dealt with children's misconceptions of temperature and heat, of interest: www.exploratorium.edu/ifi/resources/workshops/teachingforconcept.html.

Critical thinking review

This activity helps you understand how children develop scientific ways of thinking and how school experiences are designed to nurture this understanding. Reflecting upon the influence of everyday experiences of children at home, as well as at school, should increase your awareness of the importance of different contexts for development. This also helps consolidate your understanding of key models of development, such as social constructivism.

Other skills you may have used in this activity include applying theory to real developmental contexts, and the recall of key principles and ideas.

Skill builder activity

The importance of context for logical reasoning

Transferable skill focus: problem solving – logical reasoning

Key question: *Try these two puzzles. Write down your answer to the first puzzle before moving on to the second.*

Puzzle 1

There are four cards, labelled either X or Y on one side and either 1 or 2 on the other. They are laid out like this:

X	Y	1	2

A rule states: 'If X is on one side then there must be a 1 on the other.' Which two cards do you need to turn over to find out if this rule is true?

Puzzle 2

As you walk into a wine bar you see a sign stating that 'You must be over 18 to drink alcohol here.' There are four people in the bar. You know the ages of two of them, and can see what the other two are drinking. The situation is:

- Rosie is drinking red wine;
- Gabe is drinking Coke;
- Dominic is 42 years old;
- Francesca is 17 years old.

Which two people would you need to talk to in order to check that the 'over-18 rule' for drinking alcohol is being followed?

Skill builder review

The focus of this task is the way social context can affect reasoning skills – even for adults. These two problems/puzzles require the same set of reasoning skills. However, the first of the puzzles is given in abstract terms, while the other is related to a common social situation, which makes it easier to solve. You should see from this activity how the social and cultural knowledge we have influences our learning and, therefore, how we apply and demonstrate our logical reasoning skills. How did you get on with these tasks? The solutions and their justification are given below.

Puzzle 1: The answer is X and 2, but people often answer X and 1. Turning the X over lets you check that there is a 1 on the other side of that card. You also need to check that the 2 does not have an X on the other side, as that would break the rule that X must have 1 on the other side. Turning the 1 card over will not help you because the rule only states what should be on the other side of an X card; it does not say that cards labelled with a 1 must have an X on the back. However, people often make this (logically false) assumption.

Puzzle 2: This puzzle requires exactly the same reasoning, but you are likely to find this one easier to solve. This is because the problem is embedded in a familiar social situation – and uses a well-known cultural rule. The correct solution is to ask Francesca what she is drinking, and ask Rosie her age. Your knowledge of the social situation means that you are less likely to make the same kind of mistake that you

> did in Puzzle 1 – the equivalent error in this problem would be to assume that the rule implies that, if you are over 18, you must be drinking alcohol – and so you would ask Dominic what he is drinking. In the context of this puzzle, such a suggestion seems illogical, because of what we know and understand of the cultural rules and expectations surrounding behaviour in bars.

Assignments

1. 'Peer group relationships are essential for psycho-social development in middle childhood.' Critically evaluate this statement.
2. Critically discuss the extent to which primary age children's thinking is limited by under-developed cognitive structures.
3. To what extent does learning to read and write depend upon oral language skills?

Summary: what you have learned

Now you have finished studying this chapter you should:

- be able to evaluate the importance of peer relationships and recognise their importance for psycho-social development in childhood;
- be able to discuss critically the mastery of cognitive tasks that takes place in childhood, and have some understanding of how the social context may influence children's ability to demonstrate their skills, using early mathematical thinking as an exemplar;
- critically understand the development of reading and writing skills, and how this might link to general language development;
- understand the possible impact of atypical development on experiences such as schooling;
- have developed your ability to reflect on the importance of the socio-cultural context for development by considering how children's everyday and school experiences influence the development of scientific thinking;
- have developed your problem solving and logical reasoning by engaging in and reflecting on the tasks presented in the chapter.

Further reading

Blatchford, P, Pellegrini, T, Baines, E and Kentaro, K (2002) *Playground Games: Their social context in elementary/junior school*. Final report to the Spencer Foundation. Available online at www.breaktime.org.uk/SpencerFinalReport02.pdf.

A very useful description of children's play activities at school.

National Research Council (NRC) (1996) *Mathematics and Science Education Around the World: What can we learn from the Survey of Mathematics and Science Opportunities (SMSO) and the Third International Mathematics and Science Study (TIMSS)?* Washington, DC: National Academy Press.

Identifies clearly the differences in curriculum around the globe.

Nunes, T, Schliemann, AD and Carraher, DW (1993) *Street Mathematics and School Mathematics*. New York: Cambridge University Press.

Insightful description of the way in which learning is embedded on social and cultural contexts.

Stipek, DJ (2003) School entry age, in Tremblay, RE, Peters, RDeV, Boivin, M and Barr, RG (eds) *Encyclopedia on Early Childhood Development*. Montreal: Centre of Excellence for Early Childhood Development. Available online at www.child-encyclopedia.com/documents/StipekANGxp.pdf.

Discusses the differences in school starting age cross-culturally.

Upton, P and Eiser, C (2006) School experiences after treatment for a brain tumour. *Child: Care, Health and Development*, 32(1): 9–17.

Describes a study looking at children's cognitive preference following long school absences due to chronic illness.

A number of studies assessing the effectiveness of Bookstart are available from the following website, including the study carried out in Sheffield by Hines and Brooks (2005): www.bookstart.org.uk/about-us/research.