# Cognitive Development during Middle Childhood

CHAPTER 12

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## Chapter Outline



## Focusing Questions

- What new cognitive skills do children acquire during the middle childhood? What are the psychological and practical effects of these new skills?
- How does memory change during middle childhood? How do these changes affect thinking and learning?
- What new changes in language emerge during middle childhood?
- What is general intelligence, and how can it be measured?
- How does school affect children's cognitive development?

## COGNITIVE DEVELOPMENT

The ADHD example at the end of the previous chapter is a good illustration of how a particular human change or condition can affect all domains of development simultaneously: it is partly physical (due to differences in the brain and brain functioning) as well as social (expectations about what is normative and what is expected), but influences the child's ability to think, as well as his feelings and relationships with others. It is also a relatively unusual condition, the kind we called *nonnormative* in Chapter 1. Therefore,

it does not directly represent the most common or even universal changes in thinking or social life in middle childhood, the ones we have been calling *normative.* In this section, we describe the normative changes with respect to children's cognition (or thinking). As you will see, though, understanding the "usual" changes in thinking is not straightforward. Even when a cognitive development occurs widely in the school years, it usually varies in timing, intensity, and context. This caution applies to all four of the topics that follow: the development of concrete operational thinking, of information-processing skills, of language, and of general intelligence. In each of these areas there are "typical" developments in middle childhood, but also diversity.

## Piaget's Theory: Concrete Operational Skills

**concrete operations** Logical thinking about concrete or tangible objects and processes; especially characteristic of middle childhood.

As we discussed in Chapter 2, Jean Piaget developed a comprehensive theory of cognitive development from birth through adolescence. During middle childhood, according to this theory, children become skilled at **concrete operations**, mental activities focused on real, tangible objects and events. Concrete operations have three interrelated qualities, none of which is reliably present among preschool children: decentration, sensitivity to transformations, and reversibility (Piaget, 1965; Wadsworth, 1996). *Decentration* means attending to more than one feature of a problem at a time. For example, in estimating the number of pennies spread out on a table, a school-age child probably will take into account not only how large the array is but also how far apart individual pennies seem to be. *Sensitivity to transformations* means having different perceptions of the same object and combining them in logical ways. For example, when judging whether two clay balls have the same volume after one ball is squeezed into a pancake, a school-age child concentrates on the actual process of change in appearance—the transformation—rather than on how the clay looks either beforehand or afterwards. *Reversibility* of thought means understanding that certain logical operations (for example, addition) can be reversed by others (subtraction). All in all, the concrete operational child constructs a view of the world that emphasizes quantitative relationships for the first time. Now many facts seem logically necessary that earlier appeared arbitrary or even incomprehensible. In judging whether the amount of clay stays the same after being squashed flat, the child now reasons that the amount *must* be the same if nothing was added or taken away when the clay was squashed.

Concrete operations cause important transformations in the cognitive skills children develop in the preoperational period. In classifying objects, children can group things in more than one way at a time by about age seven. They know that a person can be *both* a parent and a teacher at the same time, for example, rather than just one or the other. They also understand that some classifications are inclusive of others, for example, that a particular animal can be both a dog and a pet. As a result, they usually can answer correctly a question such as "Are there more boys in your class or more children?" Preschool children, in contrast, often fail to answer such a question correctly unless it is further simplified or clarified.

### Conservation in Middle Childhood

**conservation** A belief that certain properties (such as quantity) remain constant despite changes in perceived features such as dimensions, position, and shape.

Some cognitive skills make their first real appearance during middle childhood. Probably the best known of these skills is **conservation**, a realization that certain properties of an object necessarily remain constant despite changes in the object's appearance. An example of conservation of quantity is the one described in Chapter 9 in which two tall, narrow glasses contain exactly the same amount of water. If you empty one glass into a wide, low tray, you create a substantial perceptual change in the water; it looks quite different than before and quite different than the water in the remaining tall glass, as Figure 12.1 shows. Will a child know that the wide tray has the same amount of water the tall glass does? If he does, he conserves, meaning he shows a belief in the water's underlying constancy despite a perceptual change.

Piaget (1965) found that after about age seven, most children did indeed conserve quantity in the water glass experiment. In fact, he found that by a year or two later, children conserved on a lot of other tasks as well, including the ones illustrated in Figure 12.1. Each task depicted requires believing in some form of invariance despite perceptual change.

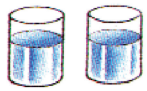
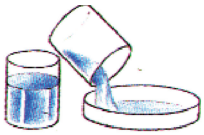
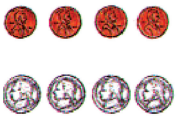
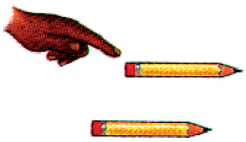
| | Original Setup | Alter as Shown | Ask Child | Usual Answer |
|---|---|---|---|---|
| **Conservation of liquid** |  |  | Which has more liquid? |  Has more |
| **Conservation of mass** |  |  | Do they both weigh the same, or does one weigh more than the other? |  Weighs more |
| **Conservation of number** |  |  | Are there still as many pennies as nickels, or more of one than the other? |  More |
| **Conservation of length** |  |  | Are they the same length, or is one longer? |  Is longer |
| **Conservation of length** |  |  | Is one pencil as long as the other, or is one longer? |  Is longer |

**FIGURE 12.1**
Conservation Experiments

As Piaget demonstrated, conservation (or the perception of invariance) emerges on a wide scale in middle childhood. In some cases, the child realizes that amounts of liquid or of solid mass remains constant; in other cases, he or she realizes that length or number remains constant. Early in middle childhood, however, the child often holds one of these beliefs without necessarily holding another, or holds one belief only on some occasions and not on others.

The clay balls, like the water glasses, require believing that mass remains constant; the bent wires and the pencils, that distance or length remains constant; and the coins, that number remains constant.

## Conservation Training

Specialists agree that children do not begin life conserving but instead acquire this skill somehow. How do they do it? Piaget argued that biological maturation and countless experiences with physical objects that show conservation properties enable children to mentally construct conservation. These experiences are numerous and diverse, and although they can be taught explicitly, Piaget believed they have a fuller, more general influence on development if allowed to emerge naturally.

But many psychologists have tried to teach conservation anyway. In recent studies, investigators tried to prevent children from being distracted by coaching them to talk about what was happening ("Nothing is being added or taken away") or to compare the important dimensions closely ("Watch the height *and* the width"). Such efforts do produce greater conserving in a large number of children, though not in all (Wadsworth, 1996). Conservation has even been taught successfully to children with developmental delays and intellectual disabilities (Hendler & Weisberg, 1992).

However, trained children often do not maintain conservation concepts the same way "natural" conservers tend to do; they are more likely to give up their belief when even slightly challenged. "Natural" conservers are more steadfast in their commitment to conservation (although even they can be led to give it up if an experimenter shows strong skepticism about it). All in all, it seems that conservation may not develop during childhood as inevitably as Piaget first believed.

The same can be said about other forms of logical thinking that emerge during middle childhood (Piaget, 1983). Piaget noted, for example, that children become able to *seriate,* or arrange objects in sequence according to some dimension such as length or size. They understand *temporal relations,* or the nature of time, better than they did as preschoolers; an eight-year-old knows that time unfolds in a single, constant flow marked by calendars, clocks, and landmark events. And children at this age can represent the *spatial relations* of their surroundings. They can make maps and models of familiar places, such as their homes, their classrooms, or the local shopping mall.

## Piaget's Influence on Education

Although Piaget commented on educational issues (Piaget, 1970), he never intended his research to serve as a theory of education. At no time, in particular, did he offer advice about problems that normally concern teachers, such as how to teach reading or other conventional school subjects, how to motivate students, or how to evaluate students' learning. Nonetheless, his ideas and approach have significantly influenced educators, particularly those in early childhood education (Elkind, 1994a). At the heart of this influence is Piaget's *constructivist philosophy:* the assumption that children develop their own concepts through active engagement with the environment. Also at the heart is Piaget's emphasis on stages of cognition. These two ideas have jointly influenced teaching methods, curriculum content, and methods for assessing student progress.

### *Teaching Methods*

Educators have borrowed Piaget's idea that true knowledge originates from active manipulation of materials (Samuelsson & Carlsson, 2008; Seifert, 1993). Children learn about weights, for instance, by actually weighing various objects on a scale rather than by reading about weights in a book or hearing their teacher talk about them. A commitment to active learning, in turn, encourages teachers and curriculum planners to put more tangible activities into educational programs wherever possible, as well as to sequence activities from the tangible to the abstract. Reading about insects still has a place in learning about those creatures, but collecting (and handling) some real bugs probably should come first. Moreover, virtual or computerized "hands-on" learning serves similar purposes and has similar benefits (Klahr, Triona, & Williams, 2007).

### *Curriculum Content*

Piagetian theory has influenced specific curriculum content by providing many particular ideas about what cognitive competencies to expect from children of particular ages or levels of development (Kamii, 1994; Waite-Stupiansky, 1997). The conservation skills

Piaget's idea that thinking begins with manipulation and activity has been interpreted to support many elementary education programs that emphasize active learning. Here, a child discovers the properties of conservation of mass by shaping bowls from clay.
*Source*: file404/Shutterstock.

**What Do You Think?**

Given Piaget's ideas about how thinking develops in middle childhood, what would be a good way to evaluate students' academic work in elementary school? Work with a classmate or two to devise an evaluation plan for a favorite grade level and subject. Then see how your plan compares to plans devised by classmates and (if possible) to those composed by an experienced teacher.

described earlier imply that elementary school children should develop a greater ability to solve problems no matter *how* the problems are presented. Compared to preschoolers, older children should be less distracted by seemingly small changes in drawings in their books or seemingly insignificant changes in how a teacher phrases assignments. In Piagetian terms, the children have become more "decentered."

Likewise, acquisition of concrete operations should help school-age children in a number of other ways. For instance, many academic tasks require multiple classification, which preschoolers often do not understand reliably. A written assignment may ask children to "list all the machines you can think of that begin with *c.*" This task requires classifying objects in two ways at once: first, by whether or not something is in fact a machine, and second, by whether or not it begins with the letter *c*.

Piaget's cognitive theory has guided many curriculum planners and teachers to select and evaluate academic tasks such as these. The theory itself does not, of course, lead to accurate selections for all children, because not all children move through Piagetian stages at the same rate. In addition, most children are capable of abstract thinking to a certain extent, even if they are not as skilled as adolescents or adults are (Keating, 2011; Metz, 1995). Despite these limitations, though, Piagetian theory gives us valuable guidance about how children gradually adapt and reorganize their thinking as they grow older.

### *Assessment of Students' Progress*

Throughout his work, Piaget emphasized the importance of children's actual thought processes and what those processes actually allow children to accomplish. This approach is evident in Piaget's heavy use of partially structured interviews and problem-solving tasks. Many educators believe such dialogues and tasks offer a much better way to assess students' progress than do traditional classroom tests and assignments, which tend to emphasize knowledge that is rote and taken out of context (Hill & Ruptic, 1994; Ruiz-Primo, 2011). Recent revisions to Piaget's approach, sometimes called "neo-Piagetian" theory, have made the approach even more attractive to educators by focusing more closely on *how* children learn and proposing cognitive stages that are more specific, and therefore more accurate, than Piaget's original proposals (Case & Edelstein, 1994).

## Information-Processing Skills

A major alternative to Piaget's way of understanding the cognitive changes of middle childhood is in terms *of information-processing theory* (described in Chapter 2), which focuses on how children organize and remember information. By school age, children's short-term memories already are well developed—though not perfectly, as we indicate shortly. Their long-term memories, however, have significant limitations at the beginning of this period. For most children the limitations diminish as they get older, but for a few information processing remains a problem serious enough to interfere with school performance throughout elementary school and beyond. As with the development of concrete operational thinking, then, children simultaneously show both common trends and individual diversity in developing this form of thinking.

### Memory Capacity

According to popular wisdom, children remember better as they get older. But how true and universal is this idea really? In everyday life, children obviously do not perform as well as

adults do on some tasks, such as remembering to put away their clothes at the end of the day. But in other ways they seem to perform equally well; for example, they will remember their grandparents when they see them again after months or even years of absence.

### *Working Memory*

Some of these differences in memory may depend on which parts of the information-processing model the children happen to be using. Some tasks rely primarily on *working memory,* a feature of thinking that holds information only for a short period, perhaps up to twenty seconds, and allows mental manipulation of that information (see Chapter 2). On tasks that emphasize working recognition memory, school-age children perform less well than adults do. This tendency can be demonstrated by showing individuals a set of digits briefly and then immediately asking them whether the set included a particular digit (Cowan, 1997). Under these conditions, recognition of a test digit improved steadily, with eight-year-olds remembering only about three digits and adults remembering about seven. Not surprisingly, too, the time it took a participant to recognize a test digit *did* depend on how many digits were shown in the original set, regardless of the person's age. Showing six digits made the task take longer than showing just three, no doubt because the person evaluated the test digit against a larger number of alternatives.

**recognition memory** Retrieval of information by comparing an external stimulus or cue with preexisting experiences or knowledge.

**recall memory** Retrieval of information by using relatively few external cues.

This study assessed a variation of **recognition memory**, in which a person merely compares an external stimulus or cue with preexisting experiences or knowledge. Recognition memory is involved when children look at snapshots of a holiday celebration months in the past: their faces light up, and they may describe aspects of the celebration they had apparently forgotten. **Recall memory**, in contrast, involves remembering information in the absence of external cues, such as when trying to remember a friend's telephone number without looking it up. In research, recall is often studied by providing a list of numbers and asking participants to provide that list in the order it was provided or in backward order. Children also get better at recall tasks such as this over the course of childhood and adolescence (Conklin, Luciana, Hooper, & Yarger, 2007). Recall generally is more difficult than recognition, but it shows the same developmental trend recognition does: school-age children can recall better than preschoolers, but not as well as adults. Figure 12.2 illustrates this trend.

Another factor that plays a role in working memory is that of attention. To succeed at any of the tasks noted earlier, one must actually pay attention to what is being presented even if there is some distraction. Our ability to focus on a single thing and ignore any other stimuli, much like you are doing now by focusing on this sentence even though there is ambient noise in the room, is known as **selective attention**. Over the course of childhood and adolescence, selective attention improves in part because we get better at inhibiting responses as the frontal cortex of the brain matures (Booth et al., 2003). Thus, ten-year-old Da'Sean is much better at focusing on his prealgebra homework than when he was seven even though his sister is watching cartoons in the same room.

**selective attention** The ability to maintain focus on one thing even in the presence of distractions.

### *Long-Term Memory*

*Long-term memory (LTM)* is the feature of thinking that holds information for very long periods, perhaps even indefinitely. It is not clear how much long-term memory changes during childhood, or even whether it changes at all, because LTM relies increasingly on complex strategies of information storage and retrieval. Younger children may remember less because they have experienced fewer memorable events or because they use fewer methods of deliberately remembering information and experiences.

To understand how LTM changes during childhood, consider how children and adults recall short stories they have heard (Wolf, 1993). By age six, children already understand the basic narrative structure of stories—that such stories contain characters, situations, and plots with a beginning, a middle, and an end. Not surprisingly, therefore, children show many similarities to adults in recalling stories. Like adults, they recall important features of a story ("Goldilocks was not supposed to enter the bears' house") and ignore or forget trivial details ("Goldilocks was wearing brown shoes"). They also recall the essences of sentences rather than their exact wording.

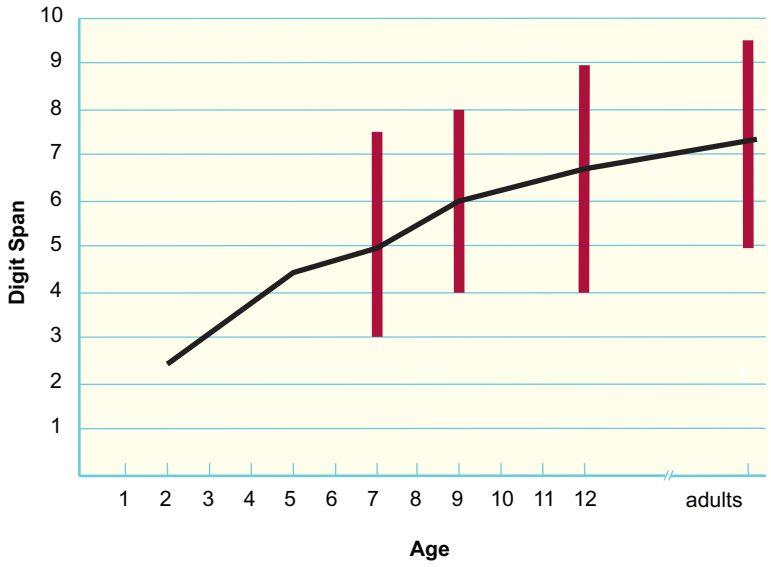



**FIGURE 12.2**
**Developmental Changes in Recall Memory**

In the study represented here, children were asked to recall a series of digits shortly after hearing them. The points on the graph represent the average number of digits subjects were able to recall, and the bars represent the ranges of typical performance at each age. Recall of digits improves during middle childhood and almost reaches adult levels by age twelve, though not quite.

But compared to adults, the recollections of school-age children include fewer inferences based on the sentences they actually hear (McNamara et al., 1991). As children get older, they begin to "read between the lines" more frequently, at least when recalling stories, and making inferences about characters' goals within a story may improve recall for a story (Lynch & van den Broek, 2007). This tendency lends color and detail to their retellings as they get older, although they sometimes risk misstating the facts of a story.

### *Implications for Elementary Education*

The structure, or "architecture," of memory may affect how children can learn during the school years. A younger student who can remember only three bits of information needs to have information organized in smaller chunks than an older student who can remember six bits at a time. The younger child may have trouble remembering a phone number long enough to dial it, for example, unless the teacher can offer some learning strategies for doing this task. More significant for learning, research shows that elementary school students' ability to solve arithmetic problems is correlated with the extent of their working memories; in one study, "larger" working memory meant greater accuracy in solving problems (Swanson et al., 1993). Children's limitations in terms of long-term memory, on the other hand, pose a different challenge: school-age children *can* remember ideas and facts for long periods, but their teachers may need to help them see connections among the stories, ideas, and other material they learn in school.

## Difficulties with Information Processing: Learning Disabilities

However, improvements in information processing do not occur uniformly for all children. During middle childhood, between 5 and 12 percent of children are diagnosed with neurodevelopmental disorders, or specific learning disabilities, disorders in basic information processing that interfere with understanding or using language, either written or spoken (Geary, 2004; Lerner, 1993; Olulade, Napoliello, & Eden, 2013). Usually a **learning disability** causes poor academic achievement, although low achievement is not in and of itself evidence of a learning disability. Learning disabilities have no obvious physical cause, as blindness or hearing impairment do, and do not result from a general slowness of thinking, as intellectual disability does.

**learning disability** Difficulty in learning a specific academic skill such as reading or arithmetic.

Learning disabilities take many forms. One of the more common forms is called *dyslexia,* literally an inability to read. The diversity of symptoms among children with dyslexia reflects the diversity among learning disabilities in general. For some children, dyslexia consists of "word blindness": they can read letters singly (such as *c, a,* or *t)* but not in combinations that make words, such as *cat.* In other forms of dyslexia, children can read words but fail to comprehend them. They can copy words accurately or transcribe them from oral dictation, but

they cannot explain what they have written afterward, no matter how simple the vocabulary. Some children with dyslexia can read combinations of digits that make large numbers; for example, they can read *123* as "one hundred and twenty-three" but not as "one, two, three," even when they try. Most children with dyslexia have these problems in combination. Yet they seem normal in every other respect; their everyday conversations seem perfectly intelligent and their motor skills just as developed as other children's verbal and motor skills.

Such problems in processing information are likely caused by learning disabilities (Olulade, et al., 2013). Some children with dyslexia may find visual recognition especially difficult or time-consuming. Several researchers have reached this conclusion after studying a phenomenon called *perceptual masking,* in which some letters are hard to read because of the presence of other letters nearby. To understand this problem, consider the following arrangement of letters:

w e k

q w e k l

a q w e k l m

s a q w e k l m n

d s a q w e k l m n p

g f d s a q w e k l m n p y b

c v g f d s a q w e k l m n p y b h t

If you look at the *e* in the top line, you probably will still be able to see the letters *w* and *k* clearly using your peripheral vision (the corner of your eye). If you look at the *e* in a line farther down, you can still see the end letters relatively clearly, but the middle letters become almost impossible to pick out clearly. Trying to notice the middle letters does help you to perceive them, but when you make this effort, the end letters become hard to discern. Perceiving one set of features in this display masks others—hence the term *perceptual masking.* Without a lot of practice, few people, adults or children, can see very many letters at once.

Some (though not all) children with dyslexia show especially strong perceptual masking (Snowling & Stackhouse, 1996). Compared to same-aged normal readers, they must stare at words for rather long periods, consciously shifting attention from one subset of letters to another in a way similar to the staring required to "see" the letters displayed on this page, similar to "normal" readers who are younger. Once they figure out the letters in a word, however, they can connect meanings with them fairly quickly and accurately.

The gap in speed between perceiving and associating may account for many errors made by children with dyslexia. A ten-year-old may look at the word *conceal* and say something like "concol," or look at *alternate* and say "alfoonite." In making these mistakes, children may literally be reading what they see and guessing about the rest. Unfortunately, they may see fewer letters than normal same-aged readers usually discern.

### *Causes of Learning Disabilities*

What causes some children to have a learning disability such as dyslexia? The symptoms sometimes resemble what happens to individuals who suffer injuries to their brains (Rourke & Del Dotto, 1994). For this reason, some professionals have suggested that many learning disabilities, including dyslexia, may reflect undetected minimal brain damage that occurred during the birth process or even before birth which discourages some parents and professionals from helping children with learning disabilities on the grounds (probably mistaken) that organically based problems are beyond control. However, relatively high rates of learning disabilities among children with a close family member, such as a parent or twin, with learning disabilities suggest some kind of genetic basis (Geary, 2004). Current thought suggests that a combination of genetics and environment likely plays a causal role in the development of learning disabilities (Peterson & Pennington, 2012).

A more helpful explanation for learning disabilities focuses on cognitive functions rather than on brain anatomy. In this view, disabilities may result from subtle differences in how the mind of a child normally organizes, focuses on, and processes information. To see what this idea means, consider what children must do to read an ordinary page of print. First, they must perceive the letters and words as visual patterns. Then they must combine those patterns into larger strings that constitute phrases and sentences resulting in phonological coding, which can be thought of as "words in their head." Finally, they must connect those strings with meanings to form ideas. While all of these steps are going on, they must also scan ahead to recognize the upcoming visual patterns on the page. If any of these steps fails to occur or occurs in the wrong sequence or at the wrong speed, a child may appear to have dyslexia. Current research suggests that difficulty in visual recognition might be caused by dyslexia rather than being a cause of dyslexia, suggesting that the breakdown occurs with the phonological coding (Olulade et al., 2013; Peterson & Pennington, 2012).

### *Helping Children with Specific Learning Disabilities*

Because learning disabilities become a problem primarily in school settings, school professionals have taken increasing responsibility in recent years for helping children who develop these problems. Most commonly, help consists of careful diagnosis of which steps of thinking cause difficulty for a child, followed by individual educational plans to strengthen those particular steps (Alexander & Slinger-Constant, 2004; Lyon, 1993). For instance, children with problems in perceptual masking can be given exercises in which they purposely work to improve this skill. Often such special work can be done in a regular class during a normal school day, but at least some of it requires individual tutoring so that the professional can monitor and give precise assistance to the child's thinking as it actually occurs. Depending on the child's needs and the school's circumstances, regular classroom teachers, parents, or trained special educators can act as tutors as well as additional sources of encouragement and support for the child. The Working With interview with Terry Wharton discusses issues of special education in more detail.

Children with learning disabilities usually are old enough to have feelings and opinions about their problems. Eventually, in fact, a major problem in some learning disabilities may become *self-consciousness* about failing to learn, in addition to any cognitive or perceptual problems as such. A child who cannot read well usually becomes painfully aware of this fact sooner or later and worries about what teachers, parents, and peers may think of her as a result. Parents can help with this problem by being optimistic about the child's eventual capacity to learn academic skills, in spite of current difficulties, and being supportive rather

There are numerous ways of helping children with learning disabilities; no single way is guaranteed to be always effective. This teacher, for example, is helping a girl with her reading by using a computer that provides extra assistance and responds to her particular learning needs.
*Source*: Rob Marmion/ Shutterstock.

**WORKING WITH** Terry Wharton, Special Education Teacher

## Giving Children a Second Chance to Learn

Terry Wharton has a wide range of experience in classroom teaching and special education. He currently teaches a class of second to fourth graders who have shown significant behavioral and emotional problems in regular classrooms. There are only eight students in his class, all of them boys, and two teacher assistants—definitely not the typical teacher-to-student ratio. Terry spoke about the philosophy guiding his program and about how he and his assistants reconcile it with conventional academic expectations for the primary grades.

**Terry:** We emphasize making the class nonpunitive and nonaversive. For these kids, school has been a disaster socially—lots of fights with classmates, conflicts with teachers and other adults. We have to provide successes and confidence to counteract the downward spiral of their self-esteem.

**Kelvin:** *How do you do that without leading to further fights and conflicts? Eight of these kids in one room could be explosive!*

**Terry:** Well, we do have to plan activities carefully and guide their choices more than usual. At the start of the year, the children only come for half a day, and I plan a series of activities they are sure to enjoy and to be able to do, like setting up a personal datebook or calendar to use later in the year. By the end of that first day, they really feel successful.

**Kelvin:** *Given your students, how much is it like ordinary school?*

**Terry:** Oh lots, actually! Academics are a priority. We have a "news" time where everyone relates some interesting personal experience. Then I read to them for a few minutes. Then they write in journals, either about the story or about something else that concerns them.

**Kelvin:** *Do the kids like the journals?*

**Terry:** I must admit, at first they resisted. They seemed very self-conscious about their writing skills and about revealing their thoughts and feelings. But lately it's been amazing; you should read them! Their growth with the journals is impressive. They talk about the story, or about their fears and hopes for their family.

**Kelvin:** *What about math?*

**Terry:** They don't seem as uncomfortable about math as they do about writing and reading; I'm not sure why. We work on basic arithmetic skills using some of the latest manipulatives.

**Kelvin:** *Manipulatives?*

**Terry:** Like sets of unit blocks that you can combine to illustrate addition problems. They seem to like that. But you know what surprised me the most? Workbooks! When I taught a regular primary-grade class, I tried to avoid those because I felt they were too structured, but these students love them; they even ask to do them! I think it gives them a feeling of clear progress and a sense of control over their own efforts. They can see clearly that they are getting work done.

**Kelvin:** *So your program is indeed academic? You do work on cognitive skills?*

**Terry:** Absolutely. The cognitive skills develop only because we're also supporting these students socially, though. The two go hand in hand. I think that's true for all children, but working with these kids with behavior problems has really brought that idea home to me.

**Kelvin:** *Where else do you see academic and social connections?*

**Terry:** With the parents, certainly. We make a big effort to involve the parents in our program. Several times a year we have "family celebrations," lunches where the child's whole family is invited. The parents have responded enthusiastically. Some parents work as volunteers in the school. They've been a real help, and even if they are not in the same classroom, it's reassuring to be in the same building as their child.

**Kelvin:** *These sound like good ideas for all classrooms and parents. Do you agree?*

**Terry:** Yes, I do. But they're especially valuable for these particular parents because they've had so many bad experiences with schools, either because of their child's problems or when they were students themselves. It builds their confidence as parents.

### What Do You Think?

1. Do you think Terry would define the word *cognitive* the same way this chapter does?
2. Terry did not comment on the fact that his class is all boys. Do you think gender is important to consider in teaching a class like this? Why or why not?
3. Terry mentions that his students enjoy workbooks for mathematics, even though he personally does not consider them a good idea initially. How do you feel about this issue? What do you suppose Piaget or an information-processing theorist would say about using workbooks?

**What Do You Think?**

Think about the methods you yourself have used to remember new information. What are they, and how are they consistent with the discussion in this chapter about how memory develops during middle childhood? Compare your own memory strategies with those of classmates. How are they similar? How are they different?

than critical of the child's efforts to do so. Teachers can help in these same ways, and in addition can encourage a positive, supportive climate in the child's classroom and school. In fact, children and adolescents with high levels of determination and self-efficacy, which can be fostered by parents and teachers, do better in school and are more likely to go on to college than those with low levels of these qualities (Field, Sarver, & Shaw, 2003).

Another major problem among children diagnosed with learning disabilities is the social stigma associated with the diagnosis. This stigma may serve as a self-fulfilling prophesy, leading some to feel hopeless about their abilities. The label of having a learning disability also puts many children at increased risk for bullying (Mishna, 2003). The social impact of school is so important, in fact, that we discuss it again later in this chapter. First, though, let us look at another major cognitive change of middle childhood: the development of language. As we will see, this development also has both cognitive and social effects.

## Language Development in Middle Childhood

As we saw in Chapters 6 and 9, language development is a gradual process, one that continues to unfold during middle childhood. Vocabulary keeps growing, of course, and the ways children use words and sentences become more subtle, more complex, and more like adults' (Anglin, 1993). Contrary to the impressions young school-age children sometimes give, though, they have not necessarily mastered syntax. They often are confused by a number of common sentence forms until well into the elementary school years. To six-year-olds, for example, the sentence *The baby is not easy to see* means "The baby cannot see very well"; the sentence *I don't think it will rain tomorrow* is likely to mean "I know for a fact that it won't rain."

Mistakes like these may hardly be noticeable to parents and teachers if a child otherwise has normal language ability and has been acquiring only one language since birth. A school-age child can make himself understood for most everyday purposes and can express basic feelings. What is primarily still missing at this age is an extended vocabulary and skill in the more subtle or specialized uses of language—needs that therefore become the focus of many elementary school programs. The fact that language is actually changing or "developing" during middle childhood, in fact, may seem obvious only if a child is acquiring *two* languages during this period. In that case, the basic issues of language acquisition all come to the fore: problems in phonology (the sounds of a new language), lexicon (vocabulary), syntax (grammar), and pragmatics (language use). Next, we investigate the cognitive and social effects of bilingualism.

### Bilingualism and Its Effects

Although most monolinguals may not realize it, a majority of children around the world are able to speak two languages and therefore are bilingual (Romaine, 1995). Bilingualism is common in the United States even though most American households primarily use English at home; somewhere between 60 million and 65 million individuals regularly use a language other than English (U.S. Bureau of the Census, 2015a).This represents about 26 percent of the population, but the proportion is actually much higher in some cities and regions such as Los Angeles where more than 50 percent of the population speaks a language other than English at home (U.S. Bureau of the Census, 2015a).

Does bilingualism benefit children's cognitive development? Research suggests that it does, but primarily when children acquire both languages equally well and when both

Fully bilingual children have cognitive advantages over monolinguals, but only as long as both languages and their related cultures are treated with respect by teachers and society. These Latino children are well on their way to becoming bilingual. What attitudes will they encounter about their language and heritage?
*Source*: wkstock/Shutterstock.

languages are treated with respect by teachers and other representatives of the community (Bialystok & Hakuta, 1994). Language specialists call such children **balanced bilinguals**.

**balanced bilingual** A person who is equally fluent in two languages rather than more fluent in one language than in the other.

### *Cognitive Effects of Bilingualism*

For one thing, balanced bilingual children show greater cognitive flexibility—skill at detecting multiple meanings of words and alternative orientations of objects—than monolingual children do. Bilingual children can substitute arbitrary words for normally occurring words relatively easily without changing any other features of the sentence. If asked to substitute *spaghetti* for *I* in the sentence "I am cold," bilingual children more often produce the exact substitution, "Spaghetti am cold," and resist the temptation to correct the grammar ("Spaghetti is cold") as monolinguals more often do. Such flexibility shows **metalinguistic awareness**, the knowledge that language, and in this case individual words, can be an object of thought. Metalinguistic awareness develops because bilingual experiences often challenge children to think consciously about what to say and how to say it (Jimenez et al., 1995). A question such as "What if a dog were called a cat?" therefore poses fewer conceptual problems for bilinguals. So do follow-up questions such as "Would this 'cat' meow?" or "Would it purr?" Those who are bilingual are also better at aspects of cognitive control. That is, when speaking, they must inhibit one language to speak in another language, demonstrating superior executive control compared to monolingual individuals (Costa, Hernández, & Sebastián-Gallés, 2008).

**metalinguistic awareness** The ability to attend to language as an object of thought rather than attending only to the content or ideas of a language.

However, all of these cognitive advantages apply primarily to balanced bilingual children, those with equal skill in both languages. What about the unbalanced bilinguals, those with more skill in one language than in the other? Does knowledge of a second language help, even if it is limited? Some research suggests that even those children without balanced language skill demonstrate improved attentional performance on tasks (Yang, Yang, & Lust, 2011). Though many cognitive benefits have been associated with bilingualism, overall impact may be more mixed largely because of the interplay of social attitudes surrounding language differences in society (Pease-Alvarez, 1993; Yang et al., 2011).

### *Social Effects of Bilingualism*

When children acquire two languages, one language usually has more prestige than the other. In the United States, the "preferred," or most important, language almost always is English. Its prestige results not only from its widespread use but also from its association

**What Do You Think?**

Think about a language you wish you could speak fluently. Why would you like to be able to use this language? In forming your opinion, what assumptions are you making about the culture or people who use this language?

with success and power: all the important people in American society, it seems, speak English fluently. These circumstances create negative attitudes or stereotypes about people who speak other languages and challenge educators to overcome social prejudices at the same time they facilitate learning new grammar, vocabulary, and usage (Soto, 1997). Negative stereotypes also apply to those who can speak English but do so with a "foreign" accent (Gluszek & Dovidio, 2010).

The influence of language on attitudes can be documented through experiments using the *matched guise technique.* In this procedure, perfectly balanced and fluent bilinguals tape record standard messages in each of their two languages, and the messages are interspersed among other tape-recorded messages to disguise the identities of the bilingual speakers. Then listeners evaluate the competence and social attractiveness of each speaker. Time after time, two consistent trends occur in studies of this type. First, speakers of English are rated more highly than speakers of other languages. Second, listeners from non-English-speaking cultural groups rate the English speakers more highly than they do speakers of their own language. The prestige of English, in other words, comes from sources in addition to English speakers themselves.

Negative attitudes toward non-English languages reduce children's school performance by making them less willing to use their primary, or first, language in public and reducing their self-confidence about linguistic skills in general. Fortunately, however, educational programs exist that can counteract these effects by treating children's first language as an educational resource rather than a liability. Overall, research favors *additive bilingual education,* programs that develop language skills in *both,* of a child's languages rather than attempting to replace a first language with English (Hernandez, 1997). As a practical matter, such programs usually are conducted partly in each language, depending on children's current language skills, but they do not confine either language to isolated "lessons" lasting only short periods each day. The challenge is a double one: to foster new language skills while promoting respect for a child's original language and culture. In countries where language is less strongly associated with economic or social status (for example, Canada, where about 25 percent of the population speaks French as a first language), bilingual education often does not include this double agenda (Johnson & Swain, 1997). Therefore, successful bilingual programs more often emphasize simple immersion in a second language and tend to ignore a child's first language without negative educational effects.

## Defining and Measuring Intelligence

All of the cognitive changes discussed so far—concrete operational thinking, memory development, and language—constitute aspects of **intelligence**, a term that refers to adaptability or a general ability to learn from experience. Often *intelligence* also refers to the ability to reason abstractly especially by using language, as well as an ability to integrate old and new knowledge. In recent years, some psychologists have broadened the term *intelligence* to refer to social skills, talents of various kinds (such as a talent for music), or bodily skills. The traditional orientation toward reasoning and problem solving, however, still dominates discussions of intelligence, and partly as a result many standardized tests have been developed to measure these forms of intelligence.

**intelligence** A general ability to learn from experience; also refers to ability to reason abstractly.

The multitude of definitions of intelligence can create confusion for parents and professionals who have responsibility for helping children to develop their fullest potentials. Some of the complexity can be sorted out by noting that views of intelligence can be organized around three major theoretical approaches. The oldest and therefore best developed view is the **psychometric approach**, which is based on standardized, quantitative

**psychometric approach to intelligence** A view of intelligence based on identifying individual differences in ability through standardized test scores.

measurement of abilities and achievement. More recently, researchers oriented toward *information processing* and toward *sociocultural* issues also have developed theories of intelligence, although these approaches have not been tied to standardized testing to any significant extent.

## Psychometric Approaches to Intelligence

Psychometric definitions of intelligence have developed out of *standardized tests,* all of which share three important features. First, they always contain clearly stated questions that have relatively specific answers. The questions usually draw on logical reasoning and verbal skills, which schools typically require. Second, standardized tests always include clear, standard procedures for administration and scoring. Often they provide a script for the person giving the test, as well as specific printed guidelines about when and how to credit particular answers. Third, such tests present information about how large groups of comparable individuals perform to allow evaluation of the performances of particular groups or individuals (Aiken, 1996).

### *Kinds of Standardized Tests*

Standardized tests serve many purposes, but for convenience we can classify them into two major groups: achievement tests and aptitude, or ability, tests. **Achievement tests** measure individuals' existing skills or knowledge; they try to assess current attainment in a particular realm of human behavior. Children often encounter such tests in the form of scholastic achievement tests, such as tests of reading achievement or arithmetic achievement. By nature, such tests usually draw heavily on the typical curriculum content of the subject area being tested.

**achievement test** A test designed to evaluate a person's current state of knowledge.

**Aptitude tests** measure ability or try to estimate future performance in some realm of behavior. A test of scholastic aptitude, for instance, tries to estimate a child's potential for success in school. Because of their goal, aptitude tests contain a broader range of questions than achievement tests do. A scholastic aptitude test probably would include questions from several major school subjects and draw on basic academic skills such as reading and mathematical reasoning.

**aptitude test** A measurement of ability that estimates future performance in some realm of behavior.

In practice, aptitude and achievement tests are less distinct than these definitions make them sound. Often achievement tests are very effective predictors of future performance; children's current skills in arithmetic, for instance, predict their future mathematical performance about as well as any aptitude test can do. Also, aptitude tests can successfully predict future progress only by sampling skills and knowledge children have already attained. Nonetheless, the distinction remains useful for those who develop and use tests. In general, measuring aptitude means looking to the future, whereas measuring achievement means assessing the past.

Once norms have been calculated, standardized tests, and especially achievement tests, can serve two purposes. On the one hand, they can help educators know how well particular schools or classrooms are functioning in general. For example, all classrooms using a particular curriculum can be compared with classrooms using another curriculum, or all classrooms in one school can be compared with all classrooms in the city or even with a national cross-section.

On the other hand, standardized tests sometimes can aid individual children. The most common approach involves screening students who need special educational help. If teachers find that a certain student is learning the curriculum very slowly, they may ask a school psychologist to test the child's general scholastic ability in the hope of diagnosing or clarifying his or her learning problems. Although the results of such a test cannot stand alone, they often contribute to the complex process of assessing the learning needs of a particular child. Standardized tests can also help to identify students with superior abilities in specific areas; the Focusing On feature looks at educational issues pertaining to these gifted students.

As you may suspect, standardized tests serve neither of these purposes perfectly. Factors other than ability, such as a child's health or motivation to succeed, affect performance. So do physical disabilities, such as visual impairment. More indirectly, cultural and language

differences among children affect performance on standardized tests. These additional influences deserve special discussion because they affect all children throughout society.

### *Biases of Intelligence and General Ability Tests*

Although they attempt to measure general qualities, tests of ability and intelligence contain various biases. For example, many intelligence tests rely heavily on language in all of its forms— listening, speaking, and reading. Many also emphasize problems that have specific answers and that play down divergent or creative thinking. Also, although they do not focus on speed, intelligence tests tend to favor children who answer fairly rapidly and take little time to mull over their solutions.

Because schools also emphasize all of these features, intelligence tests measure academic ability better than they do any other skill. Some psychologists, in fact, have suggested calling them measures of *academic intelligence,* or school ability, to make this limitation clear (Anastasi & Urbina, 1997).

The biggest problem with intelligence tests, however, comes from their cultural assumptions, which have originated entirely from white, middle-SES experiences in Western Europe and North America. The tests show their assumptions or biases in at least two ways. First, individual questions often demand knowledge that children can gain only by thorough immersion in white, middle-SES society. One question might ask children to describe the purpose of a garden hose, thereby assuming previous contact with a garden in their backyards. Another question might ask children to define the word *drama* or *concerto,* thereby assuming the sort of education that provides this information.

Even when tests avoid this type of bias, they suffer from other, more subtle cultural assumptions. Some ethnic groups and cultures do not value conversations that emphasize abstract or general propositions, as is common in classrooms or intellectual discussions; using this style may seem rude or at least boring (Heath, 1993). Children from these groups therefore cannot be expected to take tests that rely heavily on this form of dialogue. Also, in some cultural groups contact with strange adults is extremely rare, so children from such groups may find sitting alone in a room with an unfamiliar test administrator rather perplexing or even frightening. For such children, any questions the administrator asks may seem much less important than figuring out this adult's real motives.

## Information-Processing Approaches to Intelligence

Some psychologists have responded to the limitations of psychometric views by developing other definitions and theories of intelligence. One way or another, all of the newer approaches broaden the nature and sources of intelligence. From these perspectives, more children seem to qualify as "intelligent" than is the case when children are assessed psychometrically.

### The Triarchic Theory of Intelligence

An approach that draws explicitly on principles of information-processing theory is the **triarchic theory of intelligence** proposed by Robert Sternberg (Sternberg, 1994, 1997, 2006). This theory broadens the psychometric approach by incorporating recent ideas from research on *how* thinking occurs. To do this, Sternberg proposed three realms of cognition or, in his words, "subtheories" (hence the name *triarchic),* each of which contributes to general intelligence.

**triarchic theory of intelligence** A view of intelligence as consisting of three components: (1) adaptability, (2) information-processing skills, and (3) the ability to deal with novelty.

The triarchic theory of intelligence, developed by Robert Sternberg, identifies three different realms of thinking: componential, experiential, and contextual. Philosophically, the theory is rooted in information-processing theory.

The first realm of intelligence concerns the *components* of thinking. These resemble the basic elements of the information-processing model described in Chapter 2. Components include skills at coding, representing, and combining information, as well as higher-order skills such as planning and evaluating one's own success in solving a problem or performing a cognitive task.

**Focusing On . . .**

## Gifted Students: Victims or Elite?

For years some educators have worried that *gifted students* (those capable of high performance in some or all academic areas, social leadership, or the performing arts) (see Table 12.1) become bored with the normal curriculum, isolated from their peers socially, and sometimes unproductive in school and career (Ross, 1993). Their "problem" was too much talent, but gifted students were believed to be potential victims of conventional schooling in the way students with learning or physical disabilities are and, similarly, often face the stigma of labeling (Berline, 2009).

**TABLE 12.1** Some Characteristics of Gifted Students Renzudlli (1994)

| Characteristic | Examples |
|---|---|
| Well-above-average ability | Can think abstractly; skilled at verbal and numerical reasoning; adapts well to novel situations; rapid and accurate memory |
| Task commitment | Shows high level of interest, enthusiasm, perseverance, and self-confidence; sets high standards for success |
| Creativity | Shows original thoughts; open to new experiences and information; curious, speculative, sensitive to detail and to aesthetic characteristics of ideas and things |

In response to these concerns, some schools have created programs of gifted education. Typically these include a "pull-out" program: for an hour or two each week, students designated as gifted work in a separate classroom on activities designed to meet their needs or more commonly in high schools a school-within-a-school model that provides a special curriculum to students (Matthews & Kitchen, 2007). Often students work independently on projects of their own choosing, such as learning about local butterflies, designing a computer program, or creating a portfolio of paintings. Sometimes they are also linked with community experts (called *mentors)* who help them develop these interests. Regular classroom teachers are encouraged to recognize their interests and abilities by-allowing time to pursue the projects and periodically grouping gifted children together for tasks related to the regular curriculum (Gallagher & Gallagher, 1994).

This portrait of gifted education is attractive but highly controversial. A number of educators, parents, and political leaders argue that gifted education creates an overprivileged group of students (Margolin, 1994). In the pull-out programs, students receive much more time and attention from teachers than in a typical classroom and enjoy more freedom in using their time. Ironically, it is argued, the curriculum for gifted students is much *less* rigorous than that for regular students; gifted children do not necessarily read more books, write more essays, or learn more mathematics than others

The second realm of intelligence concerns how individuals cope with their *experiences.* How effectively do they respond to novelty in solving new problems? For example, a person may follow a dinner recipe accurately when it is written in imperial measurements (ounces, teaspoons) but fail miserably when the same recipe is presented in metric units (milliliters, grams). How quickly can that person adjust to the new form of the task and solve it as automatically as was possible with the old form?

The third realm of intelligence concerns the *context* of thinking. People show this form of intelligence to the extent to which they can adapt to, alter, or select environments relevant to and supportive of their abilities (Sternberg & Wagner, 1994). In taking a university course, for example, a student may try diligently to complete the course assignments as given, in essence adapting himself to the environment of the course. If this strategy does not work satisfactorily, the student may complain about the assignments to the professor in an effort to alter them. If the altered assignments do not work for him, the student may drop the course and select another. All of these behaviors show contextual intelligence (though not necessarily of a kind that may please professors!).

Table 12.2 summarizes the three realms of thinking, or cognition. These realms describe the processes of intelligence in more detail than classic psychometric approaches to intelligence have done. They also suggest an explanation for why

**Focusing On . . .**

### Gifted Students: Victims or Elite? *continued*

do. There has been a call to improve the curriculum of gifted programs by incorporating more critical thinking, problem solving, social studies, and foreign languages (VanTassel-Baska, 2006).

Furthermore, the gifted programs tend to treat students as if they were broadly talented in all areas, even though research and professional teachers' experiences suggest that many students have selected talents— math but not English, for example, or music but not athletics (Gardner, 1997). This makes gifted programs more compatible with the preexisting strengths of high-SES families and white, English-speaking families, which may constitute a subtle form of racism. In fact, African American students are significantly less likely to be part of gifted programs and are disproportionally placed in special education programs that provide unequal education (Blanchett, 2006; Darlin-Hammond, 1997).

Gifted education responded to these criticisms by making entrance into gifted programs more flexible: relying less on standardized test scores and more on students' own interest in volunteering for the program. Another is to arrange more activities for gifted students in the regular classroom and fewer in pull-out situations (Maker, 1993). A third is to redefine gifted education as *enrichment:* activities that tie conventional curriculum goals (reading, arithmetic) to students' own prior interests and talents. All students may be invited to pull-out activities, and activities focus on particular areas of the normal curriculum.

Integrating gifted and regular education in these ways is more equitable but does not eliminate the basic educational controversy underlying gifted education: fostering excellence and fostering equality of education. Some researchers argue, for example, that having highly talented students work with less talented ones may accentuate rather than reduce elitism. Differences between higher and lower performers become obvious to all students, day in and day out, and create tensions within the classroom that can be reduced when the gifted program is integrated into classrooms and schools (Berlin, 2009; Gallagher, 1993). Students may still prefer classmates with similar levels of academic motivation, both to work with and to be friends with; so informal social segregation may develop even in a room that is officially integrated. Enrichment activities also are harder to schedule if they invite volunteers and focus on specific school subjects; they cannot overlap with regular class times because some students are ahead and motivated in the enrichment subject but may need extra help in the "regular" subject that they miss. That leaves lunch periods and before and after school for enrichment periods, times that teachers may need for class preparations and "refueling." Despite problems, many excellent enrichment programs exist in schools and have succeeded reasonably well in creating flexible yet challenging learning opportunities.

#### What Do You Think?

Some educators argue that the idea of a "bored gifted student" is a contradiction in terms. Why do you think they believe this? What do *you* think of this possibility?

individuals sometimes seem intelligent in different ways: perhaps one person has an advantage at internal processing of information, another adjusts to new experiences especially well, and a third has a knack for adapting, altering, or selecting appropriate environments in which to work. Given these possibilities, it would not be surprising

**TABLE 12.2** The Triarchic Theory of Intelligence

| Realm of Intelligence | Examples |
|---|---|
| Componential | Coding and representing information; planning and executing solutions to problems |
| Experiential | Skill with novel problems and familiar problems in novel settings; skill at solving problems automatically as they become familiar |
| Contextual | Deliberate adaptation, alteration, and selection of learning environments to facilitate problem solving |

if psychometric tests favored certain children and cultural groups more than others, because the environments of some families and cultures foster the learning of testlike behaviors more than others do.

### *Gardner's Theory of Multiple Intelligences*

Like Sternberg, Howard Gardner (1993a) has proposed that general ability consists of several elements or factors. However, Gardner has defined these factors in ways that reflect the influence of culture and society even more explicitly than the triarchic theory does. He argues that not one but **multiple intelligences** exist and take the following forms (Davis, Christodoulou, Seider, & Gardner, 2011):

**multiple intelligences**
According to Howard Gardner's theory of intelligence, alternative forms of intelligence or adaptability to the environment.

- *Language skill* A child with this talent speaks comfortably and fluently and learns new words and expressions easily. She also memorizes verbal materials, such as poems, much more easily than other children do.
- *Musical skill* This child not only plays one or more musical instruments but also sings and discerns subtle musical effects. Usually musical talent also includes a good sense of timing, or rhythm.
- *Logical skill* A child with this skill organizes objects and concepts well. Using a microcomputer, for example, comes easily, as does mathematics.
- *Spatial skill* This child literally can find his way around. He knows the streets of the neighborhood better than most children his age do; if he lives in the country, he can find his way across large stretches of terrain without getting lost.
- *Kinesthetic, or body balance, skill* This child is sensitive to the internal sensations created by body movement. As a result, she finds dancing, gymnastics, and other activities requiring balance easy to learn.
- *Interpersonal skill* A child with interpersonal skill shows excellent understanding of others' feelings, thoughts, and motives.
- *Intrapersonal skill* A child with intrapersonal skill has a good understanding of his own. For children with either interpersonal, intrapersonal, or both of these skills, handling social encounters comes relatively easily.
- *Naturalist* This child has the ability to identify and categorize different things in the natural world such as plants and animals.

This boy's skill playing the piano, keeping time, and playing accompaniment for himself demonstrates an important part of intelligence: musical ability.
*Source*: Arvind Balaraman/ Shutterstock.

Gardner argues that these intelligences are distinct, for several reasons. First, some of them can be physically located within the brain. Certain language functions occur within particular, identifiable parts of the brain, as do kinesthetic or balance functions. Second, the intelligences sometimes occur in pure form; some individuals with intellectual disabilities play a musical instrument extremely well, even though their language ability may be limited and they cannot reason abstractly. Third, each intelligence involves particular, core skills that clearly set it off from the others. Being musical requires a good sense of pitch, but this skill contributes little to the other intelligences.

Like Sternberg's ideas, the theory of multiple intelligences implies criticisms of psychometric definitions of intelligence and of the standardized intelligence testing associated with psychometric definitions. Strictly speaking, however, the notion of multiple intelligences may really criticize the *use* of conventional tests beyond their intended purposes.

## Sociocultural Approaches to Intelligence

Sociocultural definitions of intelligence give even more importance than information-processing theories do to the social setting. In the **sociocultural perspective**, intelligence is not actually "in" individual persons but instead resides in the interactions and activities that occur *among* individuals (Wertsch et al., 1995). In this view, it is not the individual who adapts to, learns, and modifies knowledge but the person and his or her environment in combination. For example, a child may make many mistakes on a test of arithmetic computation but be able to locate the most economical items at the local candy store almost infallibly, even if the items come in odd sizes (1⅞ versus 2¼ ounces) or odd prices (34 cents versus 49 cents) (Chaiklin & Lave, 1993). That is because the knowledge needed for comparison shopping is contained not only in the shopper's mind but also in the overall structure of shopping in the candy store's environment. With practice, a child learns how to sort out pricing clues that depend very little on the computational procedures learned in grade school. Some of the clues involve rough estimations, such as when the prices of two items differ widely but their sizes differ only a little. Others involve nonarithmetic knowledge, such as recommendations from other shoppers or memories of where the store kept the bargains on previous visits. The intelligence needed for comparison shopping thus is only partly "in" the child; the rest is more accurately said to be distributed among the store shelves, the conversations with other shoppers, and the history of events at the store.

**sociocultural perspective on intelligence** A view of intelligence that emphasizes the social and cultural influences on ability rather than the influence of inherent or learned individual differences.

A key concept in understanding the sociocultural view of intelligence is the *zone of proximal development (ZPD),* originated by the Russian psychologist Lev Vygotsky and discussed in Chapter 6 (Vygotsky, 1978, 1997). The ZPD refers to the level of problem solving at which a child cannot solve a problem alone but can do so when assisted by an adult or a more competent peer. For example, a six-year-old may find the telephone directory too difficult to use alone but may be quite able to look up a phone number when given a bit of help from a parent. Implicit in the ZPD is the idea of shared knowledge, or shared cognition. Knowledge of how to use the phone directory exists at first in the interaction or relationship between two people—parent and child—and only gradually becomes located fully within the developing child. Likewise, knowledge of academic skills such as reading and mathematics also begins in the interactions between adults and children and only later becomes internalized by individual children. In fact, as the internalization progresses, children tend to perform better on tests of reasoning and language and therefore seem more "intelligent" in the psychometric sense.

Good balance, as shown by this girl, is not a prominent goal of the academic curriculum, but it may be an expression of a fundamental form of human intelligence: kinesthetic ability.

*Source*: Nataliya Turpitko/ Shutterstock.

Note that in emphasizing the social context of intellectual development, the sociocultural approach turns the issue of cultural bias on psychometric tests into an outcome to be expected and explored rather than a problem to be overcome or minimized. This changes the key question about intelligence from one about individuals to one about groups and communities. Instead of asking why some individuals seem more intelligent than others, the sociocultural view points out that some social *settings* may nurture and encourage individuals who show extra measures of talent, skill, and knowledge more than individuals from other settings. In this sense, some families, classrooms, and workplaces may be more "intelligent" than others.

Even though building a model boat may be too difficult for these children to do alone, they are able to successfully turn some scrap wood into a seaworthy vessel when assisted by a more experienced adult. Change in performance because of such assistance is part of what Vygotsky meant by the zone of proximal development.

*Source*: Brendan Delany/ Shutterstock.

The differences are well known by all psychologists interested in intelligence, including those who do not approach the topic from a sociocultural perspective. What is unique about the sociocultural perspective is the priority it gives to the impact of the community on individuals' cognitive development (Salomon & Perkins, 1998).

## School Influences

Next to the family, school probably is the single most important influence during middle childhood. Each year children spend about eleven hundred hours at school and often many additional hours in school-related activities. Experiences at school give children opportunities to develop cognitive skills, language, and various talents and abilities. School also provides an arena for social development: for developing a self-image and self-esteem, cultivating peer relationships, and learning to deal with the diversity and conflicts that are an inevitable part of most people's lives. In the next chapter we look at social developments like these more fully, not only as they unfold in school but also in the lives of children more broadly. First, though, we will look at how school affects children's learning and therefore their cognitive development as well. Schools—and classrooms in particular—affect learning in three main ways: through fostering particular patterns of discourse, through the social biases of students and teachers, and through assessment (or evaluation) of student's learning. These factors also influence students' social development, but for now we will focus on how they affect learning and cognition.

### Participation Structures and Classroom Discourse

**discourse** Extended verbal interaction.

**participation structures** Regular patterns of discourse or interaction in classrooms with unstated rules about how, when, and to whom to speak.

Classrooms provide particular patterns and styles of **discourse**, or language interaction, that influence how, when, and with whom children can speak (Gee & Green, 1998). Recurring patterns of classroom interaction are sometimes called **participation structures** and probably seem familiar if you have attended school for many years. They correspond roughly to common teaching strategies, except that participation structures include not only the teacher's behavior but students' behavior as well. Table 12.3 lists several of the most common participation structures.

As you may have noted from your own experience as a student, however, participation structures do not always work as intended, nor do they usually have the same effect on

**What Do You Think?**

Should standardized tests of ability be used in schools? If so, when and with whom, and for what purpose? Consult with several classmates about this issue. Then, if possible, compare the opinions of several professionals, such as a special education teacher and an occupational therapist. How do you think their work affects their opinions?

**TABLE 12.3** Common Participation Structures in Classrooms

| Structure | Teacher's Behavior | Students' Behavior | Assumptions |
|---|---|---|---|
| Lecture | Talk; tell ideas; answer questions | Listen; take notes; ask questions | Students think about what teacher says; do not daydream |
| Discussion | Set topic or broad question | Say something relevant; take others' comments into account | Know something about the topic before beginning class |
| Group work | Set general task; select group members | Work out details of solution to task | Do a fair share of the work; cooperate; compromise as needed |

all students. One reason is that students bring to a classroom different expectations about discourse language and about work relationships: what seems like an invitation to work on a group project to one student may seem like an invitation to relax to another, in spite of a teacher's explicit efforts to focus students on work per se. This can be a problem if the discourse a student experienced at home has differed significantly in style from the discourse typically used at school.

Another reason is that teachers' discourse is always heavily laced with **control talk,** patterns of speech that collectively remind students that the teacher has power over their behavior and verbal comments. Even during "indirect" participation structures such as discussion or group work, teachers regularly do all of the following, among other things, to remind students of the teacher's influence:

**control talk** A style or register of speech used by teachers to indicate their power over activities, discussion, and behavior of students.

- *Designate speakers* by calling on one student rather than another
- *Declare when a comment is valuable or irrelevant* by saying, for example, "That's a good idea" or "How can you relate [your comment] to what we were just talking about?"
- *Changing the topic or activity* by saying "Now let's do X [instead of Y]."

Hopefully teachers' control talk empowers rather than silences students by providing fair opportunities for individual children to express ideas, ask questions, and engage in higher-order thinking (O'Connor & Michaels, 1996; Orland-Barak & Yinon, 2007). There is a constant danger, however, that teachers' talk will empower only certain students at the expense of others. The inequity can occur when certain students get called on more than others or the ideas of certain students are declared to be irrelevant or inappropriate more often than the ideas of other students. One way to combat control talk and bias is to have teachers critically evaluate their own performance in the classroom (Orland-Barak & Yinon, 2007). As we note in the next section, such inequities sometimes do occur in practice as a result of social biases on the part of both teachers and other students. But they are not inevitable.

## Social Biases That Affect Learning

Observations of classroom teaching show that both teachers and other students sometimes respond differently to a student on the basis of gender, race, or ethnic background in ways that parallel gender, racial, and ethnic biases in society at large. On the average, for example, teachers are more likely to speak to boys from a physical distance, such as from across the room, and to speak to girls at close range, such as at arm's length (Delamont, 1996; Wilkinson & Marrett, 1985). During discussions and question-and-answer sessions, furthermore, teachers tend to call on boys 10 to 30 percent more often than on girls, depending on the subject and grade level (Measor & Sykes, 1992). Both behaviors create an impression in the minds of students that boys are somehow more important than girls—more worthy of public notice. However, other studies have demonstrated that children, particularly boys, perceive that teachers treat boys more harshly than girls (Myhill & Jones, 2006).

Classmates, too, show biases like these. During group work, for example, teammates sometimes reproduce society's gender and racial biases: speaking and listening to boys more than to girls, for example, and to white children more than to nonwhite children (Cohen, 1994). However, when similar bias was investigated examining not just race but proportion of African American and Caucasian children in a classroom, an interesting pattern appeared: When the number of African American children in a classroom increased, measures of bias decreased (Jackson, Barth, Powell, & Lochman, 2006).

This suggests that, as we saw in Chapter 10's discussion of gender development, children tend to reinforce one another for gender-appropriate behavior—including being assertive if, and only if, you are a boy and cooperative (or nonassertive) if, and only if, you are a girl (Maccoby 1995). But the biases are not inevitable. Some teachers and classmates do not express them at all, and educational interventions have successfully trained teachers and even classmates to include all students equitably, regardless of gender, race, or ethnic background (Cohen & Latan, 1997; Denson, 2009; Leaper, 1994).

## The Impact of Assessment

**assessment** The diagnosis of an individual's strengths, needs, and qualities.

For most children, school becomes a primary setting for **assessment**, teachers' diagnosis and evaluation of students' strengths, weaknesses, and progress at learning. Assessment has a profound impact on students' perceptions of themselves and of one another (Wigfield et al., 1998), either positive, negative, or both at once. The nature of the influence depends on the structure of goals the child experiences. Most schools and teachers use some combination of individualized, competitive, and cooperative goals, and educational research has found that each has distinct effects both on students' learning and on their social relationships.

### *Individualized Goals*

With individualized goals, each student is judged on his or her own performance, regardless of the performance of others. In principle, therefore, every student could achieve top evaluations, failing evaluations, or any mixture in between. Sometimes this kind of assessment is called "grading on an absolute standard," because performance of each individual is compared to a standard rather than to other students. It is common in the teaching of relatively structured subjects, such as elementary arithmetic, where standards can be defined clearly. Research on individualized goal structures generally has found that this arrangement heightens students' attention to mastering content and skills, and makes them relatively indifferent to judging their overall abilities or those of other students (Johnson & Johnson, 1994). Unfortunately individualized goals also make students less interested in what they can teach one another and less appreciative of (because less focused on) one another's diverse knowledge and skills. Individualized goals also do not lend themselves equally well to all content or topics; performing in a school play or on a sports team, for example, depends as much on good coordination among individuals as it does on skills possessed by individuals themselves.

### *Competitive Goals*

With competitive goals, students are assessed in comparison to one another, and some individuals therefore are judged to be better than others; there are "winners" and "losers." Competitive goals are common in school sports competitions (only one person or team can take first place), but also in many nonathletic tournaments and contests of all kinds (e.g., a schoolwide spelling bee). They are also implied, though not stated, when teachers post marks or scores in rank order for students' inspection. Competitive goals make students concerned with how they expect to perform relative to others, regardless of how well they perform in any absolute sense. Competitive goals also tend to make students think of their own abilities as fixed entities ("You either have it or you don't") rather than as the result of effort and hard work on their own part. For both these reasons, competitive goals can interfere with sustained motivation to learn, and eventually therefore reduce engagement with activities that develop thinking skills such as those described earlier in this chapter. They can also reduce the self-esteem of "losers" as well as lower the status of losers among peers. Every year, for example, about 35 percent of children drop out of competitive athletics, and the most common reason is a feeling of discouragement about losing (Gould & Eklund, 1996; Petlichkoff, 1996; Salguero, Gonzalez-Boto, Tuero, & Marquez, 2003).

### *Cooperative Goals*

With cooperative goals, individuals share in rewards or punishments, and a group's overall performance is the key to success. Cooperative goals are commonly used, for example, for major group projects or presentations in elementary school (e.g., a term project about "castles and dragons"). They focus attention on helping other group members and on attending to and being accepting of diversity among fellow students, and away from judging differences along some single scale of performance. They also promote a belief that learning or knowledge is intrinsically a shared or group phenomenon rather than something that exists only inside the heads of individuals (Salomon & Perkins, 1998).

Cooperative goals have become increasingly common in elementary schools partly because research strongly suggests that they benefit students' learning, motivation, and social relationships more than either individualistic or competitive goals, particularly in classrooms that are multicultural or otherwise diverse (Slavin, 1996). But cooperative learning does have

Educational research has found important benefits when students have cooperative, rather than competitive goals. Individuals learn from each other, both slower and faster students feel more motivated, and students become more tolerant of the differences among them.

*Source*: Monkey Business Images/Shutterstock.

**What Do You Think?**

What participation structures worked best for you in elementary school? Is there a single answer to this question either for you or for others? If you were a teacher, which structure would you try to emphasize, and why?

problems. If cooperative groups of students are not supervised enough, they can reproduce the gender and racial biases of the larger society, as described earlier in this section. This problem can be alleviated if the teacher chooses tasks that truly need diverse talents for completion (e.g., a project that needs an artist, a good writer, and a good oral presenter) and highlights this fact to students. Another problem is that some individuals in a cooperative work group may "overspecialize," that is, focus only on their own tasks and ignore helping and learning from others. Other individuals "social loaf," meaning they can take advantage of others' hard work without contributing their own fair share of effort. Teachers report that students get off-topic and socialize during work time and that preparation for these types of activities can be cumbersome (Gillies & Boyle, 2010). Some of these problems can be alleviated by combining individualized and cooperative assessments; some part of students' final grade depends on their own efforts, and another part on the group's combined performance as well as monitoring students' time management.

## The Changing Child

As noted in the previous chapter, the cognitive advances we see during childhood (and throughout life) occur in conjunction with, and are impacted by, physical and social changes. Thinking skills such as conservation or long-term memory are influenced not only by a child's own efforts to make sense of her world but also by learning experiences often provided by others. And language turns out to be more than an automatic acquisition of grammatical rules; it also involves learning how a child's community prefers to communicate. Evidently a child's social surroundings—the people around him, both young and old—make quite a difference in development during these years. In the next chapter, we look at these surroundings in more detail.

## Chapter Summary

- **What new cognitive skills do children acquire during the middle childhood? What are the psychological and practical effects of these new skills?** School-age children develop concrete operational thinking, that is, reasoning focused on real, tangible objects. A very important new skill is conservation, the belief that certain properties, such as size or length, remain constant in spite of perceptual changes. Efforts to train children in conservation have had moderate success, although when applied in a variety of circumstances, training does not persist as strongly as naturally developed conservation. Concrete operational children also acquire new skills in seriation, temporal relations, and spatial relations. Piaget's ideas about cognitive development have influenced educators' styles of teaching and the content of early childhood curricula.
- **How does memory change during middle childhood? How do these changes affect thinking and learning?** Both short-term and long-term memory improve with age, partly as a result of other cognitive developments such as growing skills in using learning strategies. Improvements in logical reasoning sometimes assist the development of long-term memory, as does increasing richness or familiarity of knowledge as schoolchildren grow older. Learning disabilities can be understood in part as the result of problems in information processing. Providing learning assistance that focuses on specific aspects of information processing can sometimes benefit students.
- **What new changes in language emerge during middle childhood?** Although school-age children already are quite skillful with language, they continue to

have difficulties with certain subtle features of syntax. Bilingual children develop certain cognitive advantages over monolingual children, at least if their bilingualism is relatively balanced; the advantages include cognitive flexibility and metalinguistic awareness. Often, however, bilingual individuals must cope with prejudices against their native language and the culture of that language.

- **What is general intelligence, and how can it be measured?** Intelligence is a general ability to learn from or adapt to experience. Traditionally, intelligence has been studied from the perspective of psychometric testing, but newer perspectives based on information-processing theory and on sociocultural principles have challenged this perspective. A view of intelligence based on information-processing theory is the triarchic theory of Robert Sternberg, which divides intelligence into components, experiences, and the context of thinking. Howard Gardner's theory of multiple intelligences identifies six distinct cognitive capacities: language skill, musical skill, logical skill, spatial skill, kinesthetic skill, and interpersonal/ intrapersonal skills. The sociocultural view of intelligence regards thinking as being distributed among individuals who interact and communicate, and it locates cognitive development in the zone of proximal development.
- **How does school affect children's cognitive development?** School provides experience in particular patterns of language interaction called participation structures. The teacher's language is marked by large amounts of control talk, comments or other linguistic markers that remind students of the power difference between students and teachers. Classroom interaction is also marked by a gender bias in which teachers and students both favor boys' comments over girls'. School is also a primary arena of assessment for children, as well as a setting that provides experience with individual, competitive, and cooperative goals.

## Key Terms

achievement test (p. 288)
aptitude test (p. 288)
assessment (p. 296)
balanced bilingual (p. 286)
concrete operations (p. 276)
conservation (p. 276)
control talk (p. 295)
discourse (p. 294)
intelligence (p. 287)
learning disability (p. 281)
metalinguistic awareness (p. 286)
multiple intelligences (p. 292)
participation structures (p. 294)
psychometric approach to intelligence (p. 287)
recall memory (p. 280)
recognition memory (p. 280)
selective attention (p. 280)
sociocultural perspective on intelligence (p. 293)
triarchic theory of intelligence (p. 289)