In this chapter, central ideas about development and the relationship between development and education are presented. A holistic approach to an individual’s development requires an attempt to understand the individual within an overall context of what it means to be human. We need to simultaneously consider aspects of a person’s development, such as physical condition, maturity, emotional and social development, and reaction to the environment (Photo 2.1). To provide
PHOTO 2.1
Children of different ages use play as a way to socialize.

In this context and its influence on education, a definition of the term development is provided, followed by an introduction to several types of development:

- Physical development, including puberty
- Language development
- Cognitive development
- Social and emotional development

Later, these topics are discussed within the context of the classroom community. At this point, however, certain topics, such as moral development, are not on the list. This chapter’s intent is to provide a basic background for discussing some of the characteristics that a student brings to an educational setting. Once we have this basic knowledge, we can then move into other areas of a student’s development, such as moral development and the development of motivation to learn.

**Development as a Central Concept in Education**

As teachers, you probably already have some intuition about what development means to you on a daily basis in the classroom. You have probably heard or said things like “He’s big for his age,” “Puberty has hit this class big time,” “I can’t understand why they didn’t get the idea,” or “I should probably put her in another learning group.” Observations about how children and adolescents develop underlie all these comments. These observations, together with theories of development, can help teachers find ways to support optimal growth in their classrooms.

Development takes many forms. We develop cognitively; that is, our thinking changes in form, content, and complexity as we mature and participate in formal education. We develop socially, forming relationships with family, peers, friends, teachers, partners, and colleagues. Within this social framework of relation-
ships, we become increasingly adept at understanding abstract concepts, such as fairness and justice (Photo 2.2).

Our sense of who we are, our self, also develops over time, as does our ability to understand our own and others’ emotions. Similarly, physical growth follows a developmental pattern. Where all this fits into education is the focus of this chapter.

Controversies Surrounding Development

A big question in educational psychology is this: Why do we need to understand development? Before asking the question, however, it is important to be sure we are all working with the same concept of development. As with any word, different definitions and interpretations exist, depending on the field of study or the context in which the word is used. The importance of providing a clear definition of development will become more evident later in the chapter when we introduce you to the constructivist philosophy on which this text is based. To define development, then, we first need to understand some of the controversies surrounding it. These include the following:

- Nature versus nurture
- Continuity versus discontinuity
- Early versus late experience
Nature versus Nurture (Controversy 1)

One early argument in psychology centered on whether people physically inherited all their defining features (nature, or genetics) or whether it was possible to change people through education and experience (nurture, or the influence of environment). This is called the nature–nurture controversy (Figure 2.1). As with any debate, this controversy can be easy to discuss as a dichotomy (i.e., black or white, right or wrong, left or right). Instead, we ask you to consider all the debates presented in this text as continua, with opposing viewpoints on either end and varying viewpoints along the continuum. Most people tend to fall somewhere along the continuum, accepting some aspects of one idea, but leaning toward the opposite idea in other respects. The majority of people may accept one or two aspects of an issue that make one side more valid than the other. This is why a continuum is such a reasonable approach: it allows one to have an opinion or preference without completely denying the validity of the other viewpoint.

On one side of the nature–nurture controversy, it is argued that one’s genetic makeup determines the strengths, weaknesses, and outcomes for the individual. On the other side, it is argued that the way in which an individual is brought up and the environment and people encountered ultimately shape the person.

Development and Risk-Taking Behaviors

For example, a conference on behavior problems in adolescence discussed research that looked at a connection between genetics and adolescent risk-taking behaviors. Part of the conclusion was that genetic predisposition should be given more emphasis when looking at risky behaviors (Rowe, 1994). If we do not view this notion from the perspective of a continuum and instead assume that risk-taking behavior always leads to criminal behavior, we might conclude that nothing can be done with these teenagers.

Our society and culture hold as a basic tenet the idea that people can change if they are given the opportunity (nurture). For many of us, then, statements on the exclusive role of nature make us uncomfortable. On the other hand, researchers at this conference provided considerable support for their findings on the role of nature. Perhaps, then, some people are hardwired for problem behavior and no amount of support can change their final outcomes.

Fetal Alcohol Syndrome

Another example of the nature–nurture issue is fetal alcohol syndrome (see Info Byte 2.1). We now know that one effect of alcohol consumed by the mother before birth is a condition in the child known as fetal alcohol syndrome or fetal alcohol effect (FAS/FAE), also referred to as fetal alcohol spectrum disorder. Alcohol consumed by the mother enters the fetus and interferes with biological
development, resulting in injury to the nervous system or physical deformities. This is not a genetic problem, but rather one caused by an environmental factor. Children born with this disorder can exhibit a range of difficulties, from physical deformities (particularly facial) to mental retardation. In some instances, however, there may be no outward physical problems (FAE).

Until recently, children with FAE were thought to have escaped the influence of maternal alcohol consumption. We now know this is not the case. A distinctive characteristic of FAS/FAE is the inability to understand and remember consequences. Children with FAS/FAE may have perfectly normal physical development (although they tend to be small in stature), but have behavior problems. These children can tell you what the punishment will be if they misbehave, explain that they don’t want the punishment, and then immediately misbehave. Thus, a large number of children, adolescents, and adults, no matter what the punishment, will continue to repeat illegal and immoral acts. This recidivism has become a major judicial issue (Conry & Fast, 2000). How do you deal with someone whom you know does not have the ability to comprehend consequences?

Not every person with FAS or FAE is a criminal, however. Many are productive citizens in our community—evidence that FAS/FAE does not automatically lead to criminal behavior. How have some individuals with FAS/FAE been able to control themselves in the face of a seemingly hardwired condition? Considerable time and effort are spent on training children with FAS/FAE to behave appropriately. In other words, their environment has become a major factor in how they develop as individuals in a community.

Genetic Determinism

The nature–nurture controversy has blurred over the years due to our increasing understanding of genetics, heredity, and the influence of environmental forces. The Human Genome Project (Kitcher, 1996) is an international work designed to map the DNA structure and sequences of humans. The intent is to better understand heredity and thereby predict, control, and possibly treat diseases that are caused by chromosomal irregularities. Knowing that a certain gene carries the likelihood of a disease, however, has raised certain medical, social, and ethical issues. Genetic determinism is the belief that, if you have a certain gene or gene abnormality, you are bound to contract the related disease. This, of course, is not always the case, since in many instances a disease can be the result of environmental factors, such as life-style (Plomin & Rutter, 1998).

For example, in phenylketonuria (PKU) an individual is born with an inability to normally metabolize an amino acid, phenylalanine, in milk and high-protein foods such as meat. As a result, a normal diet will build up nonmetabolized products in the blood. This eventually results in convulsions, severe mental retardation (developmental delays), and behavioral problems. However, by restricting the intake of the amino acid phenylalanine, these symptoms and severe mental retardation are prevented. This is why babies are systematically tested for PKU. Although the genetic factor is present, a change in the environment, specifically in the diet, can change the outcome for a person.

As you delve more into the issues surrounding genetics and environment, you will find that although an individual may be born with a certain genetic potential, or genotype, it may be the environment that affects the expression of this potential, or phenotype (see Info Byte 2.2). This dynamic is called the genotype–environment interaction (Photo 2.3) (Bergman & Plomin, 1989). As a simple example, a child may be born with a genetic potential (genotype) to be tall, but due to illness or malnutrition (environment) remains short as an adult (phenotype).

Because genetics–environment interactions are complex, it is difficult to determine whether some characteristic is genetic in origin or the result of envi-
environmental factors. For any teacher with a student who has a constant learning or behavior problem, the issue may be so complex that determining “why” the behavior exists (genetics vs. environment) is strictly an academic exercise. A more constructive approach for a teacher is to focus on ideas and solutions. Problem-Based Scenario 2.1, on Jay, gives you the opportunity to think about possible strategies for dealing with such behavior issues. As you consider Jay’s development, also take into account the social issues that arise from our increased knowledge of genetics and environment. Sensitivity toward social and environmental concerns is sometimes as important for you to consider as finding ways to help the student.

Continuity–Discontinuity (Controversy 2)

As in the nature–nurture debate, there are different viewpoints on whether we grow and change slowly over time (continuity) or in distinct stages of growth (discontinuity), like a caterpillar changing into a butterfly. Many theorists discuss development in terms of discrete and very distinct stages or levels. As you will see in Chapters 3, 4, and 5, theorists have proposed different stages of human development, yet there is continual controversy about aspects of these theories. Once again, we have limitations on our ability to understand something as complex, interdependent, and interrelated as development.

In some instances, the idea of stages might be a very useful way to approach the topic of development. It allows us a chance to discuss major characteristics and teaching techniques without including too many variables at any one time. In other instances, an approach such as this may cause us to ignore opportunities or signs of growth. Here is one example. “As a friend was explaining to me that my son was too young to ride the tricycle he received for his second birthday, my
Problem-Based Scenario 2.1

Student: Jay
Teacher: Vicky

It's interesting how some names become known to teachers even before the student shows up in their class. Jay was one of those students that everyone on the staff knew about. He had been involved in truancy, mouthing off to teachers, breaking into someone's locker on a dare, leaving tests just as they got started, and leaving the school grounds after getting off the bus to spend the day at the mall, to name just a few examples. He was also suspected of putting a dead snake in the girl's change room after lunch on Monday. While he was always in some kind of trouble, the most frustrating thing was that he could be so charming as well.

Vicky was a teacher who, despite Jay's reputation, just could not believe he was the same person everyone talked about. As a grade 9 English teacher, Vicky figured she could handle Jay's behavior problems. He was always polite and, with his good looks and charming smile, seemed to be willing to turn his energy to more productive activities. All this ended abruptly when she learned it was Jay who put oil all over her car windows. He didn't even try to do it secretively, but rather showed all the kids how much of a mess you could make with olive oil. When she spoke to Jay about it, he apologized and seemed genuinely sorry. The next day, however, it happened again.

That day, after school, the counselor had a meeting with all of Jay's teachers. Apparently, Jay had been in a lot more trouble at home. He had broken into the neighbor's house while they were away and essentially trashed the kitchen (explaining where he found the olive oil). He was well known to the local police and social services, so his situation at school was not a surprise to them.

There had been considerable effort by the school and social workers to conduct testing to determine the exact nature of Jay's problem. Jay's father always blocked the testing. The counselor had known the family for many years and understood the situation well. He had shared very confidential information with the teachers and requested that all the teachers maintain that confidentiality as a personal favor to him.

Jay's mother had been an alcoholic and had gone to a clinic when Jay was 2 years old. Since that time, she had always been supportive of her family, a loving wife and mother and an avid community volunteer. The father felt there was too much "family baggage" to allow testing or an Individualized Education Plan (IEP) to be written on Jay. Instead, the father had asked the counselor to see if there was some other way to control Jay in school. The idea was that if he could be controlled in school the same technique might work at home too. This was the reason for the meeting.

At the meeting, the counselor suggested that a contract be set up between the teachers and Jay. All his teachers were to write up what they wanted from him in terms of their class (see Figure 2.2 on pages 57–58). The counselor would organize the contract and conditions. The alternative was suspension from school and further involvement with the police and social services.

Vicky now had to figure out what she wanted from Jay and how she was going to deal with him in her classroom. She knew that the last thing she needed was to make an enemy of Jay. So, even with the contract, it would be important to have additional ideas and techniques ready to use in class.

Apply

- Are there strategies that might help Jay to meet behavioral expectations in Vicky's class? For example, would a watch with an alarm help him to be on time for class?
- Would a checklist of books and materials help him to keep organized?
- Could Jay contribute to thinking about strategies?

son went riding by. No one told him he was too young to accomplish that task, so he just did it on his own.” By using the concept of a continuum, we can work with theories that define growth in terms of stages, at the same time realizing that life is a continuous progression.

**Early–Late Experience (Controversy 3)**

Burton White’s 1975 book, *The First Three Years of Life*, became extremely popular since it was the first written for the general population. The book introduced parents to the work of Jean Piaget and other current theorists on human development. White’s premise was that the most crucial time in the development of a child was the first 3 years. He stated that if a child did not receive appropriate nurturing during the first 3 years it was essentially too late for the child to catch up. This claim led to considerable upset among parents with older children, because they were just becoming aware of the importance of early experience for infants.

The book further added to the controversy about when in a child’s life the most essential experiences occur—in infancy and early childhood or later? Both sides of this controversy are fiercely debated. If a child has had limited experiences before the age of 5, is it really too late? (Photo 2.4). What about children from disadvantaged backgrounds who have been exposed to enriched environments when they enter school and excel beyond expectations?

**PHOTO 2.4**

Young children who are exposed to enriched environments have a better chance of success at school.
If we return to our previous discussion of nature–nurture, we could argue that a child born with musical skill and talent will need opportunities and a supportive environment for this potential to be expressed. But is there a time limit on genetics? For example, we do know that time is a necessary factor for physical development, so is it also reasonable to conclude that there are age limitations on the expression of musical talent and skill? An elderly person with arthritis provides an obvious example in which age is a limiting factor. But how old is too old? Does something happen at 5 years of age to limit the potential for the expression of a genetic talent? If we adhere to a strict interpretation of stage theory, then the answer is yes. But there are 12-year-olds who are beginning music lessons and have considerable talent. One author’s son began guitar in grade 10 and continues to play this instrument as an adult. Again, what this demonstrates is the need to work within the context of a continuum in dealing with controversial issues or theories.

Defining Development

As we have been discussing various controversies and themes about development, you have probably been thinking about your own understanding of this term. In this text we use a generic, more flexible definition that allows us to introduce you to numerous ideas without being constrained by personal viewpoints. It also allows us to introduce a range of ideas within a topic so that you may start to build your own understanding of what development means to you.

As used in this text, development is a pattern of change that continues throughout the life-span, encompassing cognitive, physical, moral, and social–emotional elements.

As explained earlier, few things in life can be approached from a single perspective. The complexity of an individual, with his or her unique genetic complement, singular personal experiences, and innermost thoughts and aspirations, makes it unreasonable to exclude developmental perspectives from our concepts of learning. Even identical twins are not really the same in anything other than genetic makeup.

Using a Developmental Perspective in the Classroom

By taking a developmental perspective as a teacher, you open yourself to an understanding of people from an individual, holistic viewpoint. Children and adolescents in a classroom exemplify this point. Each has progressed to a particular, and probably unique, point along the continuum of social, emotional, physical, and cognitive development in his or her life on any particular day. For a teacher, the challenge is to meet the needs of each student as an individual (Photo 2.5).

However, as you begin to understand students from an individual, holistic perspective, you begin to realize that education and learning also need the same kind of perspective. If you have ever purchased a sweater that is advertised as “One size fits all,” you will know that this just isn’t true. The garment never really fits right because it was made for someone who only exists in a statistical composite. If we approach learning and education with this same “one size fits all” philosophy, we will find very few students who will actually thrive; most will get by, but others will fail. This is another reason why we have introduced you to the idea of using a continuum to study development.
Adjusting Curricula to Developmental Needs

A developmental philosophy provides us with an understanding of learning and education that allows us to have some idea of where a student sits on that developmental continuum. As teachers, we then can adjust our curriculum to best suit the needs of that student, a process called curriculum matching. Using this process, a teacher starts with the curriculum he or she needs to present and then adapts it to the abilities and interests of a student. In this way, students have a chance to succeed and be challenged by education; it allows education to become a natural component of a student’s life, rather than an artificial social enterprise constructed without consideration of the recipients. This philosophy emphasizes and reflects the continuity of life by taking into account previous characteristics as well as future potential. More simply, it allows us to respect the student as an individual person.

Physical Development

Physical changes are one of the most obvious things we notice about people. Children tend to grow rapidly, so even after a short time away from a child we often see jumps in their growth. Although physical changes are generally predictable, the variations that occur are the result of biological processes that make growth a personal, individual event. The growth process is influenced by several variables that need to be taken into consideration, such as the genetic makeup of the person, his or her environment, and the cultural group into which the child is born. However, maturation is the regular, orderly sequence of growth determined by the child’s genetic makeup. Although other factors, such as malnutrition, can influence this orderly growth, maturation occurs on its own time line. As a result, teachers see an incredible variation in physical height and weight even within one classroom.

Problem-Based Scenario 2.2, on Dylan, gives you a chance to think about the practical implications of variations in physical development. It is also an opportunity to think about individual profiles of development. Students’
physical development often presents unexpected problems for teachers. Handling situations appropriately requires adept interpersonal skills, considerable diplomacy, and quick thinking to assess what is going on. Dylan, for example, is a big boy physically, yet he is still a grade 1 student on a cognitive, social, and emotional level. Because of his size, however, his peers see him differently.

If you will be teaching adolescents, Problem-Based Scenario 2.3, on Sean, gives you the opportunity to think about how profiles of development may affect career planning. This scenario also raises questions about the roles of teachers and parents in guiding adolescents toward certain professions. The prospect of small stature may have an influence on Sean’s future. At issue here is the effect this particular situation will have not only on Sean, but on his entire family. You may want to revisit this scenario when you encounter the topic of self-esteem.

**Periods of Physical Development**

Physical development can be organized into periods with characteristic growth patterns. As with any aspect of development, these periods should be considered only as points along a continuum. Here we describe the following stages of physical development:

- Infancy
- Early childhood
- Middle and late childhood
- Adolescence

**Infancy**

*Infancy* is the period from birth until about 18 months to 2 years. This period is characterized by vigorous growth. At birth, a human baby has a differentially large head that makes up about a quarter of its overall length. As a general principle, growth occurs from the top down (head to tail); that is, the head and trunk
develop first and then the arms and legs. This is called cephalocaudal growth. Then growth continues from the center parts outward, called proximodistal growth, with the limbs developing first and the fingers and toes last. This pattern of growth results in the differentially proportioned body of a newborn. Parents are always amazed at the diminutive size of a newborn baby's fingers and toes. Disproportionately large head size and the placement of small eyes somewhat lower down on the head are what characterize the “cuteness” of babies and
young animals. Konrad Lorenz (1971) found that it was this cuteness that triggered impulses in adults to nurture and take care of babies. In his study, both men and women responded in a nurturing way to figures with disproportionately large heads and low-set features that were described as cute.

Between 10 and 18 weeks of gestation, the majority of neurons are formed. With some rare exceptions, this means the brain of an infant contains all the neurons it will ever have, due to the inability of these very specialized types of cells to reproduce after birth (Todd, Swarzenski, Rossi, & Visconti, 1995). But the baby’s brain does continue to grow. Growth occurs as a result of the myelination of neurons (the coating of neurons with a fatty substance called myelin), the reproduction of glial cells that support and nourish the neurons, and the branching and pruning of synapses (connections between neurons) (Tanner, 1978).

Early Childhood

Early childhood spans from about 2 to 5 or 6 years of age. Physical growth during this period is slower than during infancy. Usually, this leads to a reduction in the amount of food children need (and much concern on the part of parents) as babies grow out of being toddlers. The most noticeable change, however, is in the body proportions and overall appearance of the child. Limbs grow longer than the torso, which in turn grows more than the head, so the child starts to lose the top-heavy look of an infant. As children continue to grow, they require less sleep, so by 5 years of age naps may no longer be necessary.

As children grow, they gain control over their bodies. They learn to control their bladder muscles, for example, allowing them to sleep throughout the night without needing to urinate. Motor skills improve due to increased body awareness. Activities such as running and jumping become automatic with increase in muscle development (Photo 2.6). At about 18 months of age,
approximately two-thirds of children have already started to show a preference for being either right-handed or left-handed (Archer, Campbell, & Segalowitz, 1988). This leads to an understanding of left and right by the time children enter school.

**Middle and Late Childhood**

Middle and late childhood ranges from about 6 to 11 or 12 years of age. From 6 to 9 years of age, there is steady growth, producing on average an additional 2 to 3 inches in height and 4 to 6 pounds in weight per year. The larger trunk, with more room for internal organs, leads to a reduction of the bulging stomach characteristic of early childhood (Photo 2.7). With the exception of the onset of puberty, when physical differences become apparent, both boys and girls appear to be relatively equivalent in physical capabilities. *Puberty* is defined as the age range during which an adolescent undergoes sexual maturation.

From approximately 9 years of age, both girls and boys tend to add about 8 to 10 pounds per year until around age 12. At about 9 years old, girls start to show early signs of puberty, which is characterized by exuberant growth, most notably in height gains. Intermediate teachers find the girls towering over the boys and are often not really prepared for this change, since the students are still in elementary school. There is a tendency for teachers to mistakenly think that puberty is a characteristic of students in secondary school. For this reason it is important for elementary teachers to familiarize themselves with the characteristics of puberty and adolescence. One author worked in a middle school where a very upset male teacher had to deal with a young grade 7 girl who had not noticed she had blood on her white jeans until she stood up to do work on the chalkboard. Not only was the young girl embarrassed, but the teacher was not prepared for an event like this. He hadn’t thought about puberty because he had always dealt with elementary students. Luckily, one of the girl’s friends saw what had happened and stood up behind her quickly, and they both left the room. Most of the class was unaware of the incident.

**Puberty:** Age range during which an adolescent undergoes sexual maturation

*PHOTO 2.7*

In middle and late childhood, physical development and socialization become interrelated.
Likewise, it is important for secondary teachers to understand late-childhood development, since new teachers who are assigned an eighth-grade group of boys and girls are often unprepared for the characteristics of eighth-graders. The physical transition that characterizes early adolescence is one aspect of the rationale for separate middle schools in many communities.

**Adolescence**

Adolescence ranges from puberty until adulthood and is characterized by vigorous growth. In general, adolescence begins at about 12 years of age for girls and 14 years of age for boys and lasts until about 18 to 20 years of age. The timing of adolescence is a very individual affair and often becomes the source of stress for those adolescents who mature late. This is a time when teenagers attain most of their adult height, undergo sexual maturation, and develop secondary sex characteristics, such as underarm hair, as the result of the production of sex hormones. Secondary sex characteristics distinguish boys from girls, but are not directly involved in reproduction; for example, for boys, secondary sex characteristics are the growth of facial hair or a deepening voice and, for girls, changes in hips and thighs.

It comes as a bit of a surprise to a teacher to find a boy in ninth grade with the beginnings of a beard and mustache (see Info Byte 2.3). Although we understand what is happening, for some reason we assume it will occur in older students, not in our younger classes. When changes do occur in younger students, it is extremely important to remember that the student may be mature physically, but at a different point in his or her cognitive and social development.

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**Info Byte 2.3**

**Primary and Secondary Sex Characteristics**

**Primary Sex Characteristics:** development of the organs necessary for reproduction.

**Males**
- Maturation of the testes, penis, scrotum, seminal vesicles, and prostate gland
- First signs of puberty include the growth of the testes and scrotum.

**Females**
- Maturation of the ovaries, Fallopian tubes, uterus, and vagina
- Because female sex organs are mostly internal, the first signs of puberty are not as apparent as in males.

**Secondary Sex Characteristics:** physiological characteristics of maturation that are not directly associated with the sex organs.

- Growth of breasts and nipples (males may sometimes have temporarily enlarged breasts)
- Onset of pubic hair
- Voice deepening in males, due to larynx changes
- Underarm hair
- Broadening of shoulders in males
- Widening of hips in females
- Muscle development
- Facial hair usually in males (sometimes in females as well)
- Changes to skin and glands that often cause pimples and blackheads
Since by adolescence the brain and head are already at adult size, the biggest growth occurs in the body. As any parent of a teenager can tell you, the body parts that grow first are the hands and feet. Earlier we mentioned the growth pattern of a developing fetus, in which development occurred from the trunk outward (proximodistal). With adolescents, this pattern is reversed and occurs in a distal–proximal direction, from the ends inward.

**Changes during Adolescence** A distal–proximal pattern of growth often leads to a certain amount of clumsiness in young adolescents. Feet that appear to have grown a couple of sizes overnight often trip on stairs or fall over things. It takes a while for the legs and arms to catch up to the size of the hands and feet. The trunk is the last body part to gain adult size. Facial proportions change: the forehead becomes wider and higher, the nose longer, and the chin more prominent. An increase in the activity of sweat glands leads not only to pimples, but also to the production of sweat and resulting body odor.

During puberty, social, emotional, and cognitive complexities are associated with the biological process. In some instances, it refers specifically to the age when a male first produces live sperm, or spermarche, and when a girl has her first menstrual period, or menarche. At this point, an individual could reproduce (although there is often an actual lag in time from the first production of sperm and eggs and physically being able to conceive).

**Sexual Development in Girls** In North America, girls on average reach menarche at about 12 years of age. Over the past couple of centuries, the age of menarche has steadily declined due primarily to increased nutrition and better general health. Menarche is triggered by the percentage of body fat to height. Since the trigger is body fat and not muscle, it is not unusual for athletes to have delays in the onset of their first period.

After their first period, girls continue to add height for about 2 years and then generally stop growing. For early maturing girls, this means that they may attain their adult height earlier than their later developing peers, although there may be no differences in the final adult height in either group. Often the only physical difference that may occur with the age of menarche is in leg length, in which later developing girls have slightly longer legs due to a longer growth period. An increase in breast size and changes in hip shape are aided by the addition of increased body fat. This is a time when many girls are upset by the weight gains caused by body fat and often become devoted to dieting. Body image is a crucial issue at this point in development.

A level of stress is associated with the timing of maturational events. For girls, early maturation may mean not only shorter stature, but a heavier appearance that is seen as undesirable and may lead to excessive dieting (Biro et al., 2001; Peterson, 1988). As you will see later, the timing of puberty can have an influence on adolescents’ academic and social lives. A short list of research results is given in Info Byte 2.4.

**Sexual Development in Boys** Boys begin to show signs of puberty around 12 years of age, usually with an increase in the size of the testes and penis. The first viable ejaculation, spermarche, usually occurs at approximately 14 years of age. Some facial hair may begin to appear, but beard growth is a late developing characteristic. The sex hormones cause shifts in the pitch of the voice, an increase in the prominence of the Adam’s apple, and, for some boys, an embarrassing slight swelling of breast tissue. As with girls, the timing of puberty can lead to problems both socially and academically.
Early and Late Maturing Boys and Girls

Early Maturing Boys
- Considered more attractive and masculine
- Often more adept at athletics, thus tend to be more popular
- More confident, greater self-esteem (Graber et al., 1997)
- More likely to have behavior problems due to association with older boys
- Tend to become less curious and less active as they get older (Duncan et al., 1985; Peskin, 1973)

Late Maturing Boys
- Considered less attractive, childish
- Appear to peers as dependent, less leadership ability (Brooks-Gunn, 1988)
- Tend to become more assertive and flexible in later life (Alasker, 1995)

Early Maturing Girls
- More vulnerable to peer pressure
- More likely to get into trouble and take risks
- More independent
- Unhappy about body image
- Lower grades than late maturing girls (Ge et al., 1997)

Late Maturing Girls
- Few problems with parents and teachers
- More gregarious and self-confident (Graber et al., 1997)
- Tend to be taller and thinner (Simmons & Blyth, 1987)

Language Development

While physical development is certainly a focus of new parents, there is also the accompanying emphasis on communication with the baby. Infant-directed speech, or “motherese,” normally consists of low-spoken, variably pitched short words and sentences (Littlewood, 1984). Research done on the interaction that occurs between mothers and infants found that the general reason for communication is to provide a social–emotional connection (Trainor, Austin, & Desjardins, 2000), as well as to enhance language development (Kuhl & Meltzoff, 1997). While cultural variations occur in parent–child interaction (Rogoff, Mistry, Göncü, & Mosier, 1993), our human desire to connect with each other for social and emotional reasons makes communication a necessity (Photo 2.8).

Communication among Other Animals

It has often been said that language is the defining difference between humankind and the rest of the animal kingdom. However, we know that animals have language in the form of body language, vocalizations, or other forms
of communication. These forms of communication are used among animals to signal individual and group needs. Bees, for example, dance to indicate the direction in which food can be found, and chimpanzees hoot to signal the danger of a snake in the area. Thus the idea of language being the defining difference of humankind requires a more detailed look at the structure and function of language.

**Features of Human Language**

One unique aspect of human language in general is our ability to pass along thousands of years of collective experience to the next generation. This information extends beyond our own environment and range of experiences to that passed along to us by our ancestors and neighbors. Research on mazes and problem solving has demonstrated that the concept of planning for the future exists even in chimpanzees. Although this planning is limited, it does exist in rudimentary form (Gazzaniga, 1998). For humans, the concept of planning allows us to extend time and ideas into the future. For example, the space station has been a dream of humankind for generations.

The concept of planning over time exemplifies a totally unique human capability. It involves taking an abstract idea from one person, giving it form in the structure of verbal and written language, having other people add to it, and then passing it along to another generation to be carried out. As we look at this capability, the complexity of the structure of language requires branching off into a variety of topics and areas that need to be synthesized if we are to comprehend this uniquely human characteristic.

**Theories of Language Development**

To better understand the structure of human language and how humans acquire the ability to communicate, we introduce three important theories of language development:
Chapter 2  Development: A Holistic Preview

- **Piaget**: Language use depends on our ability to use symbols and map categories and relationships onto the brain
- **Vygotsky**: Thought and language are independent until 2 years of age
- **Chomsky**: An innate capability allows humans to learn language

**Piaget: Language and Cognition**
The Swiss psychologist Jean Piaget (1896–1980) stressed the aspect of thought, or cognition, over the verbal production of language. He felt that, for an object to become more than just a word or label, cognitive-structural information was necessary to map the categories and relationships pertinent to the object. Piaget believed that for the first 2 years of their lives children are engaged in developing the cognitive structure necessary to apply the symbolic function relayed by language. This is why for the first 2 years children usually use names of items rather than categories (e.g., “dog” rather than “animal”) and sometimes call other animals by the word they are most familiar with (Photo 2.9). Once the ability to symbolize (the *semiotic function*) emerges, the ability to use language begins.

**Vygotsky: Thought and Language**
The Russian theorist Lev Vygotsky (1896–1934) believed that social and cultural interaction affects both the language development and cognitive development of a child. According to his theory, before the age of 2 years a child uses both language and thought, but they are independent of each other. By the time a child reaches about 2 years of age, language and thought become interrelated. Children then use language to drive their reasoning. For example, we know children will invent words and sentence formations to grasp concepts. A friend’s child called a skunk a “stinky cat” because he was told a skunk looks like a cat, but has other qualities as well. As you will read later in this chapter, Piaget and Vygotsky provided insight into the development of language and thought. Rice (1989) suggested that perhaps the two domains of cognition and language are interconnected in such a way as to overlap at certain points of development. Despite the debate about language and thought, in education we depend on language to

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**PHOTO 2.9**
Natalie insists on calling the ceramic deer a doggie.
communicate not only thoughts, but also skills. As adults, we know that there is a major difference between thought and language, even though they are connected.

The difference between thought and language can be seen in a student who has the verbal learning associated with certain words, but does not really understand the idea behind these words. This concept is exemplified by Tom, a fourth-grade boy who had recently completed the Just Say No program at school. (The program is designed to show elementary students how to deal with sexual abuse and advances.) One of the older boys in the neighborhood thought it was funny to grab younger boys by the genitals. Even though all the boys knew it was wrong, they didn't know what to do. When it was suggested to Tom that he handle it exactly as he had been taught in school, his comment was, “Oh, so that’s what they meant.” Tom had learned all the words and had completed the program to the satisfaction of his teachers. What he hadn't learned was the idea or concept behind the words. This is known as a production deficiency (Flavell, Beach, & Chinsky, 1966).

**Chomsky: Language-Acquisition Device**

Originally, theorists believed children learned language and concepts through exposure to adults and continued repetition and reinforcement. According to this theory, language was strictly a process of mimicking adults. Noam Chomsky (1965) rejected this idea since it could not explain how children regularly generated new sentences not heard before. He postulated an innate capability that allows humans to learn language, a language-acquisition device.

The language-acquisition device that Chomsky proposed is not a specific structure or area in the brain, but rather an individual’s capacity to learn and understand language, as well as the need to acquire language (Photo 2.10). It programs children’s brains so that they have the ability to analyze spoken language and figure out the rules. This basic need to communicate with each other is exemplified by the development of visual languages, such as American Sign Language (ASL). Today, ASL is a recognized modern language. ASL and parallel forms of sign languages around the world are similar to the variety of spoken languages. Problem-Based Scenario 2.4 gives you an opportunity to learn about not only ASL, but also about issues surrounding the cultural aspect of language development. Problem-Based Scenario 2.5 allows you to think about how you would work with students who have developed their own form of communication.

**PHOTO 2.10**

Sign languages are recognized forms of modern language.
Problem-Based Scenario 2.4

Student: **Yetta**
Teacher: **Dianne**

Dianne Collie was stumped. In her 15 years of teaching she had worked with students with a variety of special needs—learning disabilities, cerebral palsy, visual impairment, Down syndrome. When she learned 2 months ago, at the end of August, that a profoundly deaf student, Yetta Clarke, was to transfer from the Provincial School for the Deaf into her homeroom, she thought she’d have no difficulty learning about and accommodating the unique challenges to this student’s learning. She had even been excited at the prospect of learning American Sign Language!

However, American Sign Language (ASL) had not proved so easy to learn, and with all the demands on her time during September, Dianne had been grateful for the easy access to communication with Yetta that Jasmine, the educational interpreter, provided. In fact, Dianne thought guiltily, she had relied on Jasmine too much, allowing her to have more contact than Dianne had with the Hearing Resource teacher and even agreeing for her to adapt the language level in the texts when necessary. Now, at the end of October, it was apparent that Yetta had settled well socially into the integrated experience, and so it was time, Dianne thought, to focus more directly on Yetta’s academic performance. It was here that Dianne was baffled.

When Dianne spoke with Yetta (through Jasmine) yesterday and suggested that she focus on improving her English grammar, Yetta had been resistant—even defiant. Her hands were clearly expressing anger when she signed that she could learn only through ASL and that English grammar was important only to hearing people. Yetta accused Dianne of neither appreciating nor understanding ASL and Deaf culture. Deaf culture? What on earth did that mean? And what was the difference between ASL and English? Dianne didn’t know the answers to these questions, but she realized that to be an effective teacher for Yetta she needed to find out . . .

*Figure 2.4 appears on pages 59–61.*

**Apply**

- How do theories of language development help you understand Yetta?
- Think about language and culture. Is there a relationship? If so, what is the nature of this relationship? What might be the educational implications?


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The inherent function of the language-acquisition device allows us to learn language without systematic instruction or reinforcement. Brown (1973), for example, studied the errors children made as they learned to speak and found that their mistakes followed the rules of language. When a 2-year-old says “they goed,” instead of “they went,” she is following the structural rule of putting an “ed” on the word to form the past tense (e.g., “open” to “opened”). Children rarely make grammatical mistakes with structure; the problems come from the variations in our language that result when we change the rules.

**Language and the Brain**

Although Chomsky opened our minds to the concept of a naturally occurring tendency toward language, the current findings in brain research complement this information by showing how language acquisition actually takes place. To
Problem-Based Scenario 2.5

Students: Hannah and Holly
Teachers: Patty and Lisa

During the first half-hour of the day in the grade 2 class, children planned their day, then chose an activity for the remaining time. It was a favorite time of day for children and teachers alike—a chance to settle in, get organized for the day, and exercise some personal choice. Team teachers Patty Inglis and Lisa Yamoto valued it because it gave them time to observe the children and to interact informally with them.

Today Lisa observed Hannah and Holly playing with puppets. The twins’ identical red ponytails bobbed as they worked their hand puppets in an animated way in the class drama center. They appeared to have a shared understanding of their dramatic play. To Lisa, though, observing this activity added to her concern about the twins’ development. Hannah and Holly’s language was immature. They had difficulty understanding prepositional phrases like “behind the door” and “on top of the shelf.” They used “on” for “in” and “over” for “in front of.” Their vocabulary was limited. Patty was first alerted to how limited the day Holly asked her if she could borrow “a write with.” Vocabulary limitations affected their day-to-day comprehension of class discussions, teacher directions, conversations with peers, and stories. They often interrupted stories to ask, “What’s that mean?” The puppet play indicated, once again, that something needed to be done to help with the twins’ language development. While Holly and Hannah communicated with each other easily, their ability to communicate with others needed a lot of support.

Patty and Lisa also talked regularly about Hannah and Holly’s reading and written language development. In the spring of grade 2, both girls were struggling with reading material geared for beginning grade 1 students and finding written language very difficult. Patty and Lisa wondered how to approach the upcoming parent conference. They wanted to offer some support to Sheila, Hannah and Holly’s mother, who tried hard to help out, but really had her hands full as a single parent with a toddler at home. But Patty and Lisa worried about how to reinforce the fact that the girls needed more exposure to language. When they had met with Sheila in the fall, she’d been so proud of the fact that the girls had each other to talk to and appeared to dismiss their concerns about language development.

In addition to offering the right kind of support to Sheila, Patty and Lisa were wondering where to turn next themselves. Hannah and Holly had learning assistance support, but what more could be done?

Apply

■ How could Vygotsky’s view of language development help Patty and Lisa support Hannah and Holly’s mother?
■ What is a strategy you could use to begin to address the twins’ language development?

ping usually takes the form of asking the patient questions that require verbal responses. As questions are asked and the patient responds, small areas of the brain become activated, identifying areas as speech or verbalization centers. In this way the surgeon can determine exactly where areas of language are located (Gazzaniga, 1998).

**Structure of the Brain**

The brain is divided into right and left hemispheres. This arrangement is called *lateralization*, with each side having specialized functions. In the left frontal region near the motor cortex is *Broca’s area*, which controls the ability to speak (Figure 2.11). People with an injury in this area have difficulty speaking fluently, or *expressive aphasia*, but they can still comprehend language.

Slightly behind this area is the temporal region responsible for auditory processing. Within this area is *Wernicke’s area*, where comprehension of spoken language takes place. People with injuries in this area find it difficult to understand spoken language and often speak with nonsense words. This is called *receptive aphasia* (Owens, 1996).

Annett (1973) found that children suffering injuries to Broca’s and Wernicke’s areas recovered language function. This demonstrates what neurologists call the *plasticity* or flexibility of the brain to compensate for injury. In some instances, other areas of the brain may take over some tasks when the usual areas become nonfunctional. For people who are deaf and use sign language, researchers have found that some areas regularly devoted to hearing become functional for visual stimuli (Bransford, Brown, & Cocking, 2000). This means that the brain has the capability to adapt to injury and changes in the environment.

**Variation in Brain Structure**

Everyone has slightly different areas for speech, thereby necessitating a personalized map for each patient. Some areas are devoted specifically to terminology, or the

![Broca's Area](image1)

![Wernicke's Area](image2)

**Figure 2.11**

The brain has areas dedicated to specific tasks such as Broca’s area, which controls the ability to speak, and Wernicke’s area for auditory processing.
identification of items. Others are devoted to concepts or to a second language (Bransford et al., 2000). As we accumulate information on language development, we find that Chomsky’s language-acquisition device is actually a complex interconnection of areas primarily in the left hemisphere of the brain. The interconnection among these areas and between the two hemispheres of the brain means that, in cases where the same type of brain injury occurs, the resulting disability can vary from patient to patient. Recently, research done on people with brain injuries has provided us with a more precise understanding of language development.

For some types of injuries, however, a precise understanding is not possible. For example, children with FAE generally have few to none of the overt characteristics of the brain damage that results from alcohol consumption during pregnancy. However, brain scans done on some of these children reveal actual holes—areas where there is no brain tissue (Conry & Fast, 2000) (Photo 2.11). If these holes occur in a language area or in a connection between areas, the student may exhibit difficulty in tasks ranging from identifying colors to putting together complete sentences with a subject, verb, and object. Due to the social implications of identifying a child with FAE, as was the case with Eve, these students are often subjected to years of frustrating remedial instruction in school, with few substantial results.

**Stages of Language Development**

Even though language development is a complicated process, we can artificially separate it into two parts: the structural aspect and the functional aspect. The
structural aspect includes all the elements of grammar, as well as social and cultural rules related to communication, such as gestures and facial expressions. The functional aspect is the actual use of language to communicate ideas, think, and problem solve (see Info Byte 2.5).

As teachers, we also need to take into consideration the child’s environment, or speech community. A speech community refers to the social and cultural language group within which the child lives. It influences word use, slang, intonations, sound variations, and so on. It once took one of the authors some time to understand a child when he talked about a “ruff.” What he was actually talking about was a “roof.” This child’s particular pronunciation resulted from his speech community at home. Teachers always need to consider the speech community of the child when assessing speech and language capabilities. Without this awareness, local variations in rule systems of language could make it appear as though the student had a communication problem.

**Info Byte 2.5**

**Structural and Functional Aspects of Language**

**Structural Aspect of Language**

From a structural point of view, it is somewhat arguable exactly when the rudiments of language begin to develop. Analyses of the interaction between new mothers and infants claim a vocal interaction within 72 hours after birth (De Casper & Fifer, 1980). While this may be contested by experts, most mothers would likely confirm this bond between themselves and their infants. The time between birth and 2 years of age is devoted to acquiring the actual formation of words. The sequence of sound production generally follows this pattern:

- **Birth to 2 months:** Infants make comforting, gurgling sounds.
- **2 to 4 months:** Sounds are produced, but they are different from those of an adult due to the physiology of the infant’s head.
- **4 to 7 months:** Repetitious babbling (e.g., dadada). Deaf babies don’t do this, suggesting experience with sound has an effect on language acquisition.
- **10 to 14 months:** The pacing and rhythm of sound are acquired.
- **Approximately 13.5 months:** First recognizable words are produced (e.g., Mama, Dada).

Usually, during this first year and a half babies communicate using sound (crying, cooing, etc.) and/or gestures, such as holding up their hands to indicate they want to be picked up. By the time the child has reached 24 months, she or he is capable of two-word combinations and has a vocabulary of over 200 words. At 3 years old, most children will have increased their vocabulary, expanded sentence structure, and learned to use questions and negatives. When the child has reached about 6 years of age, his mouth and palate will have developed so that the sounds produced will reflect the sounds of the adult language (Owens, 1988).

**Functional Aspect of Language**

From a functional viewpoint, children absorb information about their world from the time they are born. As they interact with people, they pick up general information and place it in observable categories. For example, a child understands the category dog but may find the terms collie or mammal make no sense. One of the authors relates the story about a neighbor’s child, Duncan, who, as a toddler, learned that his dog’s name was Daisy. When his mother tried to teach him the names of flowers, Duncan would be sent into hysterical laughing at the patch of daisies along the road. He would very carefully explain to his mother that Daisy was a dog, not a flower. Not only does this example show us that the understanding children bring to their world relies on language, but it also underscores the importance of language in cognitive development.
Cognitive Development

Our capacity to think and reflect on our thinking is the focus of the study of cognitive development. Two main questions drive this study (Flavell, Miller, & Miller, 1993, p. 3):

1. What does children’s thinking look like at various points throughout development? (the description question)
2. How does this development come about? (the explanation question)

Defining Cognition

A basic definition of cognition is a dictionary definition: cognition refers to the process of knowing or perceiving, according to the Concise Oxford Dictionary. This definition provides a general overview of cognition, but does not give us much detail. In addition to knowledge and perception, cognition also includes the following:

- Memory of what we know and have perceived in the world around us
- Representation of knowledge and perceptions (e.g., in written, symbolic, or graphic form)
- Problem solving (Sternberg, 1999a)
- Intelligence, thinking, imagining, creating, planning and strategizing, classifying, and relating (Flavell et al., 1993)

Defining Cognitive Psychology

Cognitive psychology concerns itself with the study of the preceding concepts. It investigates the following:

- How we acquire knowledge (e.g., in mathematics, social reasoning, scientific reasoning, or narrative)
- Nature of the knowledge acquired
- How knowledge is influenced by the culture in which we live
- Ways of transmitting knowledge in that culture

Cognitive Psychology and Education

Fundamentally, cognitive psychology is concerned with “the mind as an object of study” (Sternberg, 1999a, p. viii). Educational psychology takes this study into the classroom. It asks questions about the following:

- How students represent knowledge
- How they solve problems
- How they perceive verbal and visual information
- How memory affects their learning
- How aware they are of their thought processes

Thinking about knowledge and our own and others’ ways of thinking is at the heart of teaching.

Bruner’s Models of Mind

How we think about others’ minds and how they develop is incredibly important to how we teach. Jerome Bruner (1996, pp. 53–63), an esteemed educational theorist, presented four models of mind and their pedagogical consequences:

1. Children as imitative learners: If we view children as imitative learners who need to acquire know-how, we assume a modeling role in teaching. We teach children the skills they need to function in particular social-
cultural settings by showing them and having them practice the skills. This model of mind does not focus on teaching for understanding (or “knowing that”), but on skill sets only. For example, if a teacher models science experiments for children and shows them how to write up the modeled experiments using the scientific method framework, the children may never come to understand the critical role of experimentation in science or learn from their own attempts to solve scientific problems. There is a serendipity to scientific discoveries that is often constrained by the need to fit science into a preset structure. The scientific method is a cultural tool. It needs to be united with children’s own efforts to understand science, not the teacher’s modeling of it, to encourage conceptual understanding (see model 4) (Kuhn, 1970).

2. Learning through didactic exposure: If we believe that children learn from didactic exposure, or exposure to anything that instructs, we take the position that there are knowledge sources, including the teacher’s mind, that allow children to look up or hear what they need to know. In this model, “knowing how” is assumed to result from “knowing that.” Thus, if we teach that area is equal to length times width, it is assumed that students will be able to calculate the area for any given surface. This model of mind sees the learner’s mind as a tabula rasa (blank slate) waiting to be filled with facts dispensed by teachers, books, and the like.

3. Children as thinkers: If we see children as thinkers, we teach in a way that reflects our curiosity about children’s perspectives on learning, the curriculum, and school as a social-cultural milieu. This model of mind assumes that it is the child’s capacity to reason and engage in discussion with others that results in learning (Photo 2.12). Underlying this approach to education is the teacher’s effort to understand how children think, how they think about their own thinking, and how they remember and organize knowledge and learning.

In teaching young children about density, Bickerton (2000; Bickerton & Porath, 1997) engaged them in discussion about their experiences with boats. They then discussed what makes boats float before taking part in a boat contest. Their challenge was to design a boat that was seaworthy and

PHOTO 2.12
Students who are encouraged to discuss their ideas have rich insights about their learning.
could hold cargo. The children’s discussion of the challenge, both with the teacher and each other, led to rich insights into the nature of their understanding and how they set about solving problems. Each child was encouraged to take on the role of scientist, including the framing and testing of hypotheses and thinking about his or her approach to boat design and sea trials.

4. **Personal versus objective cultural knowledge:** If we see children as needing to distinguish their own knowledge from the objective knowledge in their culture, we teach in a way that unites the previous perspective, children as thinkers, with study of the past. We help children understand what distinguishes personal knowledge from knowledge that has a history—“what is taken to be known” in our culture. We also strive to use children’s ways of knowing in our instruction. We help them to build bridges between their own conceptions of knowledge and those of the culture.

Continuing with the previous example of density, this perspective unites the children’s understanding of how boats float with study of the design of boats throughout history, including well-known nautical disasters, such as the *Titanic*. Discussion should be linked to children’s observations in their own work, their experiences with boats, and their ways of solving problems involving buoyancy.

**Models of Mind and Problem-Based Learning**

Of the four models outlined by Bruner (1996), the fourth most closely parallels the philosophy of problem-based learning. Problem-based learning aims to help learners become aware of their own knowledge and to use this awareness to raise questions about what needs to be known in particular learning situations. It facilitates the *construction* of knowledge in terms that are meaningful to the learner.

Problem-based learning also aims to support self-directed learning by introducing learners to appropriate resources. Rather than defining teachers as dispensers of knowledge, problem-based learning incorporates tutors and resource people to help students make connections between their own understanding and the traditional knowledge of the culture.

The connection between personal knowledge and other sources of knowledge is critical. Personal knowledge based on our own experience and practice is important, but to be useful it “must be compared to knowledge from other sources, connected with knowledge based in research, and interwoven with knowledge derived from a theoretical perspective” (Snow, 2001, p. 8). As discussed in Chapter 1, the flow of knowledge is not unidirectional. The personal knowledge of excellent teachers, when made systematic, can enrich research-based and theoretical knowledge (Snow).

**Theoretical Perspectives on Cognitive Development**

In this section, overviews of the theories of two psychologists who played significant roles in describing cognition and learning, Jean Piaget and Lev Vygotsky, are presented. Key concepts related to each of these theories are introduced. In Chapter 3, we discuss how current work in educational psychology has built on the important work of Piaget and Vygotsky.

The principle underlying the presentation of theory in this and subsequent chapters is the degree of relevance to practice (the *theory–practice link*). Teachers need to have a rationale for the instructional, social, and behavioral support systems that they implement in their classrooms. Teachers are accountable to par-
ents, administrators, and school boards. Understanding why you base some instruction on one theoretical approach and some on another is essential in making informed professional decisions.

Piaget’s Theory of Cognition

Cognitive psychology attributes its tradition and direction as a field of study to the influence of Jean Piaget. Although his view of the nature and development of knowledge was not accepted universally, his theory and methods of investigation greatly influenced thinking and research into cognitive development. He was truly interested in why and how children think the way they do and in how thinking develops from infancy through adolescence.

Epistemology

Piaget became interested in epistemology, the theory of knowledge, while working in the laboratory of Theodore Simon in Paris in the early part of the 20th century. Simon, following up on work begun with Alfred Binet, was developing a test of reasoning. Piaget’s task was to develop a French version of the test, which was in English (Ginsburg, 1997). This involved the administration of the test to many French children.

Piaget was fascinated by patterns in the children’s test performance. Noticing that virtually all children of a particular age got the same items wrong on the multiple-choice test, he wondered what could account for their reasoning. (If they had guessed at the answers, 25% would have got the answers right simply by chance.) Rather than dismissing errors as straightforward mistakes, he posed the question of why children answered as they did: “I engaged my subjects in conversations . . . with the aim of discovering something about the reasoning process underlying their right, but especially their wrong answers” (Piaget, 1952, p. 244).

Piaget’s Stages of Development

Following his work with Simon and his subsequent intense, detailed observations of his own three children from birth on (e.g., see Piaget, 1953), Piaget formulated a theory of intellectual development. The hallmark of Piaget’s theory is that we progress through definite stages in cognitive development. Each stage is distinguished by the thought associated with it. Each stage builds on the previous one, integrating familiar ways of thinking with new abilities. The ages at which each of these stages are achieved are rough guidelines; their sequence, however, is believed to be invariant. Piaget outlined four stages of development (Table 2.1):

1. Sensorimotor stage
2. Preoperational stage
3. Concrete operational stage
4. Formal operational stage

Sensorimotor Stage

During infancy, thinking is simple and is bound to actions on the infant’s environment. Piaget described the period from birth to approximately 2 years of age as the sensorimotor stage. In this stage, motor development becomes increasingly focused and purposeful, allowing infants to gain some control over their actions in their environment. Through these actions, infants come to learn about the world in which they live.

Between about 18 and 24 months of age, infants acquire a fully developed concept of object permanence. Before infants acquire this concept, a hidden object does not appear to exist for them. After developing object permanence,
## TABLE 2.1

<table>
<thead>
<tr>
<th>Stage</th>
<th>Approximate Age Range</th>
<th>Summary of Accomplishments (theoretical)</th>
<th>Summary of Accomplishments (practical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensorimotor</td>
<td>Birth to 24 months</td>
<td>Vision coordinated with motor actions</td>
<td>Baby touches mobile over crib</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflexes refined into purposeful action as a result of experience</td>
<td>Baby bats mobile to get it to spin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efforts to learn about the world</td>
<td></td>
</tr>
<tr>
<td>Preoperational</td>
<td>2 to 7 years of age</td>
<td>Symbolic–representational ability (pictures, models, words, and pretend play as standing for real objects or events)</td>
<td>Child builds a castle out of blocks; dresses up as mommy or daddy; draws stick figures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tendency to make judgments on the basis of appearance (e.g., big things are heavy)</td>
<td>The size of the box in which a birthday present is wrapped is the basis for judging the present’s worth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knowledge of event sequences</td>
<td>Child knows the sequence of events for a visit to a fast-food restaurant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recognition of others’ minds</td>
<td>Recognizes others’ feelings; by the end of this stage, recognizes a relationship between thoughts, feelings, and behavior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simple numerical reasoning</td>
<td>Adds and subtracts small numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Socially shared thinking</td>
<td>Preschoolers plan a game together</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Irreversibility of thought</td>
<td>Child watches as a clown shapes two equal-sized balloons into a snake for his brother and a pig for him; he cries loudly because his brother has the larger balloon</td>
</tr>
<tr>
<td>Concrete</td>
<td>7 to 11 years of age</td>
<td>Acquisition of operations that result in logical thinking (e.g., class inclusion)</td>
<td>Children now know that dogs are animals, tulips are flowers, and so on</td>
</tr>
<tr>
<td>operational</td>
<td></td>
<td>Operations applied to concrete objects or situations</td>
<td>Bundles of 10 popsicle sticks are used to teach the concept of place value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reversibility of thought</td>
<td>The child above knows that his “pig” is actually the same size as his brother's “snake.” He is able to “think back” to the original balloon.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ability to take perspective</td>
<td>Children understand that others may have opinions different from their own</td>
</tr>
<tr>
<td>Formal</td>
<td>11 to 15 years of age</td>
<td>Ability to form hypotheses and think deductively</td>
<td>A student examines a science problem, hypothesizes an explanation, deduces whether the explanation is logical, then tests her theory</td>
</tr>
<tr>
<td>operational</td>
<td></td>
<td>Ability to reason with possibilities</td>
<td>An adolescent girl thinks of all the possible reasons that her friend has rejected her, then reasons that only two of the reasons are viable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ability to think abstractly</td>
<td>An adolescent sees the political implications of Orwell’s <em>Animal Farm</em></td>
</tr>
</tbody>
</table>

*Source: Based on Flavell et al., 1993.*
they actively seek out toys and other objects when they are under a blanket or behind a couch. This concept is fundamental to our beliefs about ourselves and objects in the world; if we do not believe that objects and people continue to exist when they are out of our sight, life will be irrational (Flavell et al., 1993).

**Preoperational Stage**  During the *preoperational stage*, from approximately 2 to 7 years of age, children begin to use representations to think about their world. Language, drawings, movement or gestures, and mental images are understood to stand for (or represent) objects and events (Flavell et al., 1993). Thinking is highly influenced by perception (e.g., judgments about weight are made on the basis of size: big is heavy; small is light) (Case, 1985).

Piaget believed that thinking at this stage is egocentric. Although it is true that young children relate events to their own experience, they are capable of understanding others’ feelings or points of view (e.g., Astington, 1993; Case, 1992). However, children at this stage usually are not able to include understanding of others’ feelings or points of view in explanations for their actions and behavior (Case & Okamoto, 1996; Porath, 2001).

During the preoperational stage, children demonstrate thought that is irreversible (Flavell et al., 1993). That is, appearances are everything. If one preschooler receives a cup of juice in a shallow, wide cup while her friend gets the same amount of juice in a tall, thin glass, she thinks her friend has more juice. Seeing the juice poured back into the cup will not convince her otherwise.

**Concrete Operational Stage**  During the *concrete operational stage*, from approximately 7 to 11 years of age, children acquire operations—“systems of internal mental actions that underlie logical thinking” (Flavell et al., 1993, p. 133). These operations include class inclusion (dogs are part of the larger concept “animal”) and taking the perspective of others. They also include various types of conservation:

- **Number**: 10 beads are 10 beads whether they are placed close together or far apart.
- **Liquid quantity**: two equal amounts of water remain equal despite one being poured into a container of a different shape.
- **Length**: two strings of equal length remain equal when one is moved to the left of the other).

A classic Piagetian experiment on conservation of amount involves presenting a child with two balls of clay of the same size. One ball is rolled into a sausage shape in front of the child. The child is then asked which piece of clay is bigger. In the preoperational stage, because of their reliance on appearance, children tend to say that the sausage-shaped piece of clay is bigger, even though they agreed earlier that the pieces were the same size. In the concrete operational stage, in reaction to the same experiment, children look amazed that any adult would be so foolish as to ask the question of which piece is bigger.

During this stage, children also become capable of reversible thinking. They understand that actions can be reversed or undone. In the experiment just described, they understand that the clay can be returned to its original shape. Children also acquire the capacity to take another’s perspective. The logical thinking that children demonstrate in this stage is applied to concrete situations. Hypothetical thinking, however, is difficult for children in the concrete operational stage of development.
Formal Operational Stage  The final stage of development hypothesized by Piaget is the formal operational stage. In this stage, from approximately 11 to 15 years of age, adolescents acquire the ability to think abstractly. (See Chapter 3, however, in which we discuss the low percentage of adolescents who actually acquire formal operational thinking.) Children in this stage are capable of framing hypotheses, thinking deductively, reasoning in the absence of concrete objects (Flavell et al., 1993), and thinking interpretively (Case & Okamoto, 1996). They begin to think in terms of possibilities, rather than being bound by reality, as in the concrete operational stage.

Educational Implications of Piaget’s Theory

Student teachers often want to know how Piaget’s theory applies to their teaching. Although Piaget’s theory has been criticized for its lack of direct applicability to curriculum, in a general sense the theory informs teachers about the characteristics of thought at different age levels. Teachers’ observations tell them that there is something “first-grade-like” about 6-year-olds and “seventh-grade-like” about preadolescents. School staff room conversations contain references to how teachers understand and accommodate the different stages of development in early and middle childhood and adolescence. Piaget’s theory can help teachers build on this intuitive knowledge by offering specific examples of how children of different ages think.

Concrete Thinking  In the early and middle elementary years, children think concretely. They need direct experience with objects, such as counters in mathematics and meaningful materials in science. They need to have new concepts related to their own experience. This need is especially critical during the early years of formal schooling when children’s thinking is tied very closely to their own experiences. One of the authors explains:

“A kindergarten student informed me that she would soon be six years old. Since I work regularly with a small group of children in her class on a research project and would likely be there for her birthday, I asked her when her birthday was. She replied emphatically, ‘When I’m six is my birthday.’ She seemed to think I just didn’t get the idea of birthdays.”

Deductive and Hypothetical Reasoning  In preadolescence, children begin to acquire the ability to think in more formal, logical terms; to reason without reference to concrete objects or events, to think hypothetically; and to reason deductively. Instruction is critical in helping children acquire formal thought (Inhelder & Piaget, 1958).

Children and adolescents cannot acquire the formal knowledge of disciplines in a culture without teaching. However, the nature of the teaching is critical in building conceptual understanding of a discipline. Did you ever learn mathematical formulas or historical facts without acquiring a conceptual understanding of mathematics or history? Bruner’s (1996) four models of mind are critical to remember here. To help learners truly understand a discipline, they must be respected as thinkers who have relevant questions and experiences that can be used as building blocks for the construction of conceptual understanding.

Spiral Curriculum  In addition, the hierarchical and integrative nature of Piaget’s theory translates into the notion of a spiral curriculum (Bruner, 1996). A spiral curriculum acknowledges that concepts are revisited periodically during the period of formal schooling, with each new exposure incorporating and
building on the previous one, while moving to a more sophisticated level of understanding.

Piaget’s Theory of Constructivism
The core of Piaget’s theory of intellectual development was that we construct knowledge through our actions on and in our environments. Children have certain ways of thinking about the world:

- When engaged in play or schooling, children assimilate new experiences to their existing knowledge.
- Children also accommodate, or modify, existing ways of thinking to incorporate new knowledge.
- Both assimilation and accommodation allow us to adapt to our environment; adaptation is a state of equilibrium between assimilation and accommodation (Piaget, 1953).

To Piaget (1981), intelligence was equilibrium. In other words, when we act intelligently, our thinking is organized so that we both assimilate and accommodate new information. Piaget saw children and adolescents as scientists engaged in thought experiments that allow successive adaptations to their intellectual worlds.

The educational analogy of this type of intellectual activity is known as constructivism. The constructivist philosophy of education takes into account the child’s ways of thinking and learning when planning instruction. The child’s ways of knowing are used as starting points for education. At its most basic level, constructivism is the common sense that says we don’t teach abstract concepts like government to first-graders. However, we can present more concrete notions like community and jobs within the community, things relevant to 6-year-olds, that serve as building blocks for their eventual construction of the more abstract notions of community systems and government.

Teaching from a Constructivist Perspective
Teaching in a constructivist way involves the active engagement of learners. Because learners are seen as bringing knowledge and experience to school, their points of view are taken into account. Learners are not vessels into which knowledge is to be poured and then absorbed; instead, they are involved in a knowledge-building enterprise with educators. Learning and teaching, from the constructivist perspective, are highly active processes.

As teachers, you will need to design rather than plan lessons (Arlin, 1993). A design allows you to be flexible in responding to the learners in your classroom. It is just as well articulated as a plan, but is notable for its capacity to change as the lesson evolves. Rather than being linear in nature, a design allows for doubling back, fast forwarding, and using feedback loops. It results in a dynamic, rather than passive, learning experience.

Combining Different Philosophies of Teaching You might ask, “But, as a teacher, don’t I have a responsibility to tell my students what they need to know? Doesn’t constructivist teaching take up a lot of time and energy that I could use to teach children the answers they need?” The answer is yes to both questions, if you teach from a model of mind that sees children as learning from imitation or didactic exposure.

A more qualified positive answer is that, of course, some information simply needs to be given to children and adolescents. Models of mind aren’t mutually exclusive. However, if children are to acquire true understanding, they need educational experiences that build in opportunities not only to acquire,
or receive, knowledge, but also to understand, apply, analyze, synthesize, and evaluate knowledge (Bloom, 1956a) (see Info Byte 2.6). Students need to know that their own points of view are respected and that these points of view constitute valid starting places for learning (Paley, 1986). The time and energy devoted to constructivist teaching is well worth the outcome—engaged learners and teachers.

**Tailoring Theories to Individual Students**  One of a teacher’s greatest challenges occurs with students who do not seem to develop cognitively in the manner outlined by theorists. The school curriculum is based on the work of the theorists just discussed. This means that, for a number of students, there is a mismatch between curriculum and cognitive capabilities. For Eve, the mismatch is exacerbated by the damage resulting from a birth mother with a drug and alcohol habit (see Problem-Based Scenario 2.6). Teachers need to be aware of some of the learning challenges students encounter in these circumstances. Also, they need to be prepared to make curricular modifications that consider the specific needs of an individual student. The following narrative gives you a chance to revisit some of the issues you discussed about Jay, but with an emphasis on cognitive development and school achievement.

Earlier in the chapter you met Dylan, a physically mature first-grader. The following glimpse of Dylan gives you the opportunity to think about his cognitive development (see Problem-Based Scenario 2.7). In this case, the curriculum cannot quite keep up with Dylan. Modifications for students like Dylan require a teacher as dedicated as Eve’s teacher, Marilyn. Often teachers overlook students

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**Info Byte 2.6**

**Bloom’s Taxonomy of Educational Objectives**

In 1956, Benjamin Bloom and a number of other researchers published a Taxonomy of Educational Objectives, an organization of objectives that is still used today. The intent of the publication was to facilitate communication about educational goals. The book presented six educational objectives in a hierarchy from simple (knowledge) to complex (evaluation). The taxonomy is useful in helping teachers understand and balance the demands of different educational tasks.

- **Level 1**: Knowledge. Recall of specific, isolated bits of information, terminology, facts, conventions, trends, categories, criteria, methods of inquiry, and principles.

**Levels 2 to 6: Intellectual Abilities and Skills**

- **Level 2**: Comprehension. Lowest level of understanding. Knowledge and use of what is being communicated without relating it to other material or recognizing implications. Translation, interpretation, inference.
- **Level 3**: Application. Use of abstract concepts (e.g., general ideas or principles, theories) in specific, concrete situations.
- **Level 4**: Analysis. Recognition of assumptions; ability to distinguish fact from opinion; ability to determine whether an argument is logical; recognition of propaganda and advertising strategies.
- **Level 5**: Synthesis. Putting together elements in a coherent way; organization of ideas; planning; ability to generate hypotheses and revise them in light of new information.
- **Level 6**: Evaluation. Judgments based on internal evidence (accuracy of facts, logic of argument); judgments based on external criteria (comparison of theories or cultures; comparison to standards of excellence in a particular field).

Source: Based on Bloom, 1956, pp. 201–267.
Problem-Based Scenario 2.6

**Student:** Eve  
**Teacher:** Marilyn

Marilyn enjoyed her chats with Mr. and Mrs. Dominic. Their daughter, Eve, was one of the most pleasant young ladies in the ninth-grade class, at least up until now. During eighth grade Eve was an enthusiastic student, even when she was having troubles grasping some of the more abstract ideas in class. But now, in ninth grade, things had changed. The parent interview this time included the counselor, Jeff Grimes, at the request of Eve’s parents. During the discussion it became evident that Eve was having considerable trouble with abstract concepts in all her classes. In the previous grades this hadn’t been a problem, since most of the curriculum was concrete and she could get by without having to manipulate the more abstract ideas.

Lately, however, problems were arising. Mr. Dominic spoke in strictest confidence to Marilyn. As Mr. Dominic put it, “This wasn’t anyone’s business—it stayed within the family.” Eve was adopted, and at the time of the adoption knowing that Eve’s birth mother was an alcoholic with a crack cocaine addiction seemed irrelevant. Eve was a beautiful baby and seemed to have none of the characteristics of fetal alcohol or drug abuse. Now, however, some learning problems were surfacing. Not only was Eve having problems in school, but she had started to talk about dropping out of high school when she turned 16. Her best friend, Maria, was talking about dropping out as well, since she was having so many difficulties at school. The problem was building, and since both Eve and Maria were inseparable partners in the same English class, everyone was hoping that Marilyn could help.

**Apply**

- How do Piaget’s stages of development help you understand Eve?
- Is the spiral curriculum a useful concept in thinking about how to help Eve?
- Are there strategies in the research on fetal alcohol abuse that would be helpful?

such as Dylan, thinking that the student will eventually work things out on his or her own. But this is not true; students such as Dylan need as much attention from their teacher as does Eve.

**Vygotsky’s Theory of Social Interaction and Learning**

In addition to his contribution to understanding language development, Lev Vygotsky’s work has been influential in our consideration of sociocultural influences on learning. Vygotsky studied the role of adults and more capable older children and adolescents in communicating the intellectual tools of the culture to younger children. Whereas Piaget focused on the individual in interaction with his or her environment, Vygotsky believed that society was an important and essential factor in shaping knowledge. For Vygotsky, social interaction played a central role in learning.

Rather than concentrating on a static description of children’s thinking, as Piaget did, Vygotsky was interested in how far a child could progress with the help of an adult or older child. His approach is described as dynamic because it is concerned not simply with what children know, but with how their knowledge can be extended and elaborated with guidance. While Piaget encouraged children to elaborate on their answers to problems, his method concentrated on eliciting as full a picture as possible of children’s ways of understanding without actually teaching them.
Dylan and his classmates were very excited about the guest speaker who was due to arrive at their first-grade classroom any minute. They were gathered on the rug in front of an armchair, all set to welcome the visitor from the zoo. The big attraction was that he was bringing a boa constrictor and a lizard. The children had just completed a science unit on reptiles. This visit was the culminating activity. Shelley told her pupils that the visitor would give them a chance to ask questions. She drilled the class on what “good questions” were and on how questions differed from “telling.” As a class, they had practiced asking questions several times before the guest speaker’s visit. Now all that seemed forgotten as hands waved and excited voices told of experiences with snakes and lizards.

Shelley had counted on Dylan, at least, to ask good questions or show off his knowledge a little bit, but he was far more interested in telling the guest speaker about his cousin’s lizard and the time he got to feed it. Dylan was a walking encyclopedia of knowledge about reptiles. He knew facts and figures that challenged Shelley, his teacher. She was amazed to hear him join the chorus of little voices that had to tell their guest about family members and friends that had snakes and lizards or about the reptiles they had seen in zoos.

**Apply**

- What would Vygotsky say about Dylan’s interaction with the guest speaker?
- What model of mind did Shelley demonstrate in teaching the class about “good questions”? How might this have affected the way the children interacted with the visitor?
- How does this practice-based narrative consider special educational needs?
The Construction Zone  Piaget used prompts and questions to draw out children’s reasons for responding as they did. Their justifications for their answers were considered significant indicators of their way of thinking. Piaget was interested in the nature of children’s thought, but not in terms of education. Vygotsky, in contrast, used children’s knowledge as the basis for teaching. He was interested in how far children could progress from the understanding they expressed initially. In a Vygotskian approach to education, children’s knowledge is taken as a starting point for instruction that continues until no further learning takes place. Vygotsky called this the zone of proximal development: “It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86).

Teachers sometimes refer to the zone of proximal development as the construction zone, the zone in which children can move forward in constructing knowledge.

Scaffolding  Also using the building metaphor, another kind of help offered to children by adults or capable older learners is known as scaffolding (Photo 2.14). Scaffolding involves providing active support during instruction, while continually taking account of the child’s responses. For example, one author showed children a pattern of letters (e.g., A X B X C . . .) and then asked them to predict what letters came next:

First, I asked the children if they had ever seen a problem like that before. If they had, they were asked how they had solved that problem
and if that solution might help them solve the current problem. If children had not seen a similar problem or if their recall of a previous problem did not yield a specific strategy, they were asked to read the letters out loud to see if patterns could be heard. If that strategy didn’t help, they were asked if there were any alphabetical or repeating patterns. Finally, specific clues such as the insertion of the first missing letter were given. (Ferrara, Brown, & Campione, as cited in Porath, 1988)

Vygotsky drew our attention to the important role of social interaction in learning. Research done within a Vygotskian perspective asks the following kinds of questions:

- How do mothers’ interactions with their children facilitate or impede effective problem solving?
- How do different societies approach education?
- How do different approaches to education influence what is achieved and how it is achieved?
- How do children function as a community of learners under their teacher’s guidance?

Piaget’s approach to understanding children’s intellectual development has been characterized, perhaps unfairly, as individualistic (DeVries, 1997; Youniss & Damon, 1992). Vygotsky’s approach, on the other hand, recognizes the importance of the social context of learning. Vygotsky made the link between the nature of cognition and society.

**Social and Emotional Development**

How we develop as social and emotional beings has consequences for how we learn. Children’s temperaments, family structure, social support, early socialization experiences, and emotional well-being all contribute to their adjustment and achievement in school. Social development and academic development are intertwined. Children who begin school able to interact effectively with their peers and teachers and to adjust and adhere to school routines and procedures for conduct tend to do better academically. These children have a better chance of acquiring the prosocial behaviors necessary for effective adjustment in our complex world (Eisenberg, 1992). Their social responsibility also contributes to successful academic achievement (Wentzel, 1993).

Emotional and social development also are closely related, as our social experience contributes to our emotional experience (Saarni, 1999).

**Emotional Intelligence** Emotional intelligence (also referred to as emotional competence) is critical to healthy development. Emotional intelligence is an awareness of one’s own emotional self, that is, the ability to manage one’s own emotions, read the emotions of others, and navigate the complexities of interpersonal relationships (Photo 2.15). Emotional intelligence is believed to be as important, if not more important, than IQ in determining success in school, career, and relationships (Goleman, 1995).

Emotional intelligence contributes to self-efficacy, self-awareness, self-esteem, empathy and sympathy for others, and adaptive coping (Saarni, 1999), all of which have implications for school adjustment and achievement. Teachers often question how children can learn effectively when they repeatedly arrive at
school emotionally upset. The curriculum doesn’t hold much relevance for a child whose family is unstable or who has witnessed violence. Researchers have increasingly recognized the importance of emotional well-being for effective learning and overall success, leading to an increased emphasis on emotional learning in schools (e.g., Goleman, 1995; Salovey & Sluyter, 1997).

In addition to children’s own social and emotional characteristics, the social and emotional contexts of schooling are themselves powerful influences on learning. Teachers’ understanding of their students’ social and emotional development and their design of supportive, caring classroom environments have important educational consequences. Classroom environments that emphasize autonomy, cooperation, and caring encourage children to be motivated to learn (e.g., Lickona, 1991). In addition, knowing students’ perspectives on what happens in their classrooms is critical. Students’ perceptions of classroom practices predict achievement and motivation far better than do teachers’ perspectives (Paris & Ayres, 1994). For example, if students perceive that their teacher is interested in learning and respects their approaches to learning, they are motivated to achieve. On the other hand, if a teacher “shoots down” students’ ideas, it is a signal to the student to conform to the teacher’s viewpoint.

Subsequent chapters provide more detail on the various aspects of development presented here. In these later chapters, related concepts, such as intelligence, creativity, gender, exceptional learning needs, motivation, and assessment, are presented. The importance of social and cultural influences on teaching and learning also are considered. For now, Problem-Based Scenario 2.8 gives you a chance to think about social–emotional development and its effect on learning.

As you meet Mike in his ninth-grade science class, think about the social–emotional consequences of his misunderstanding the lesson being taught. Consider in Mike’s case how cognition and social development can interact. During planning sessions, teachers take into consideration the curriculum and the cognitive stages of their students, as we discussed earlier. But students often throw curves at teachers in some other area of development. The social–emotional aspect of students’ lives needs to be considered, especially during adolescence, when peers are so prominent in their lives.
Problem-Based Scenario 2.8

Student: Mike
Teacher: Marilyn

The teacher’s staff room was always noisy at lunchtime. Marilyn was sitting beside Barry, the ninth-grade science teacher. Several teachers were laughing as Barry talked about his second-period class. It seems that Mike Dawson really “blew it” in front of his friends today. At 6’1”, Mike was not only tall for his age, but also sought after by the ninth-grade girls due to what Marilyn’s grandmother would have called “rugged good looks.” Being on the basketball team only added to the leading social position he held in the high school.

Barry had been covering asexual reproduction in molds during the class. He explained that he had not only given out diagrams, but had also put quite a bit of information on the board. Everything was going well, so Barry thought, when Mike raised his hand. Barry called on him to ask his question. Apparently, Barry had to ask him several times to repeat or rephrase the question. It just didn’t make sense. Unfortunately, at the same moment that it dawned on Barry what was being asked, it also dawned on the class. The question referred to human sexual reproduction, not molds. That’s when the laughing began.

Barry had tried to calm the class down. Even though he asked to see Mike after class, it was too late. The other students told Mike that human reproduction was different from molds and “how couldn’t he know that!” Mike didn’t stick around after class. The question, which Marilyn missed, elicited a lot of laughing around the lunch table as well. Barry was going to try to track Mike down after he ate so that things could get cleared up. Barry also wondered out loud how many other students really didn’t understand what was being done in the class.

Marilyn thought about how she was struggling with metaphors in English, a classic abstract concept, and wondered if this could be the same thing. And what about her afternoon class with Mike? Was she assuming her students understood, just like Barry had in his science class? How could she find out without causing the social-emotional chaos that occurred by accident in the science class? There had to be some way to find out before she continued with her planned lesson. There certainly was no use having them write their own metaphors if they really didn’t understand what one was to start with. And how about Mike? This had to have been devastating to him.

Apply

- What would Piaget say about Mike’s experience?
- As a teacher, Marilyn needs to consider making some alterations to her plans because of an incident earlier in the school day. Teachers often need to take the entire day’s events into their planning, particularly in secondary schools where there might be a tendency to consider only the subjects being taught, not the students who come into these classes. If you were Marilyn, how would you approach Mike to talk about what had happened in science class?

Problem-Based Scenarios 2.9 and 2.10 allow you to apply your knowledge of development to the context of the whole classroom. In the first of these scenarios, Dylan’s first-grade classmates complain about his behavior. In Problem-Based Scenario 2.10, Sean, Eve, and Maria are part of a ninth-grade English class in which students present a variety of learning needs. Both scenarios present the challenge of balancing students’ individual needs with the group needs of the classroom.
**Problem-Based Scenario 2.9**

**Student:** Dylan  
**Teacher:** Shelley

Shelley Lim worked hard the 2 weeks before spring break to get new learning centers organized for after the holiday. Her students now were very comfortable with this way of learning, and she was proud of the way they had grown in independence. However, Dylan was always in the back of Shelley's mind as she did her planning. She felt that, despite all her thinking and trying of various strategies, she still hadn't really reached Dylan in a way that made a difference to his adjustment to school.

Shelley could hear the all too familiar comments in her head. They were most evident as the children worked in partners at centers or in groups during science activities. “Ms. Lim, Dylan's bossing me around. He won't listen.” “Does Dylan have to work with us? He's mean.” “Dylan says we're dumb. He's going to do his own science.” Dylan had no friends in the class. Was it his size? His aggression? What was going on anyway?

**Apply**
- Are there other questions Shelley could ask to help her focus her thinking about Dylan?
- What might Dylan's perspective be? How could you find out?

**Problem-Based Scenario 2.10**

**Students:** Sean, Eve, and Others  
**Teacher:** Marilyn

Marilyn had been teaching ninth-grade English for 6 years. Each year had become easier in certain respects. The curriculum was so familiar that she could anticipate problems, and in most instances she had a small bag of tricks to tackle these moments. What had started to take time lately was trying to reach more students who needed the extra help and attention. For the first couple of years, many of them just coasted through her class. While Marilyn was aware of these students, she was so busy trying to keep up with the curriculum, the rest of the students in the class, and all the ongoing paperwork that these students had taken a bit of a back seat.

Over the summer Marilyn had taken a course on students with special needs and had started to compile a resource file for students with various types of needs. Although her file was starting to look pretty complete, it quickly became apparent that putting all these ideas into a lesson plan for the entire classroom wasn’t as easy as the books implied. However, Marilyn was determined to write lessons that provided opportunities for every student in her class. As she opened the curriculum materials for the unit on short stories, she immediately thought of the range of abilities and talents in her Block B class. This was the class that always seemed to drain all her energy.

Marilyn thought back to the parent interviews she had had the week before. The Block B English class had included Sean Murphy, Eve Dominic, and her friend, Maria Gonzaga, as well as 27 other students. How could she design a unit to accommodate not only these students, but also the three exceptionally bright (and often bored) boys, the five girls who sat at the back of the room and did as little as possible, and the three ESL students?

All these students did the assigned work, but Marilyn wasn’t sure how interested they were in her course. How could she convey some of the passion she had for literature? What could she design for this unit that would span the variety of talents and interests of these students? After the unit on metaphors, Marilyn (continued)
realized there was about a quarter of the class who had little difficulty with abstract thinking. But others in the class struggled gamely by memorizing and just doing the best they could with the unit text. And, finally, what about all the information she had obtained during the parent interviews? Could she use any of it?

**Apply**

- Marilyn has quite a few questions about how to teach her class and a lot of different learning needs in the class. What might be a realistic start?
- How can Marilyn evaluate the teaching strategies she tries? When should she do this?

**Summary**

Throughout this chapter you saw how complex it is to discuss only one aspect of an individual’s development. You also found that the definitions used for various forms of development can vary depending on the viewpoint of the author or researcher. As a result, a teacher must work along a continuum of competing theories, finding from among the extremes a balance that most closely resembles the student. The student, and not the theory, thus becomes the focus of the teacher’s thinking.

**A Metacognitive Challenge**

You should now be able to reflect on the following questions:

- How do I define development?
- What do I know about physical development? How does it influence the social and academic lives of students?
- What do I know about language development? Could I explain the connection between language acquisition and thought development?
- What do I know about cognitive development?
- How do social and emotional development affect learning?
To: Ralph Tsoritis, Counselor  
From: Vicky McElvy  
Re: Jay Thomas  
Date: Oct. 14, 1998

Enclosed is the list of behaviors I expect from Jay in English 9.

- Must be on time to class.
- Must have books and materials.
- Must complete all in-class and homework assignments.
- Must not interfere or interrupt other students working.
- Must work cooperatively with others during group work.
- Must not leave the room without permission and must come back in a specified time.

In the past I have found Jay responds well to the following “rewards” for appropriate behavior. But these rewards lose their appeal quickly.

- Getting to do his work differently from other students; e.g., using colored paper or writing in point form.
- Getting to go to the library or deliver a message for me.
- Being allowed to give or to read a report first.
Jay does not seem to respond to praise or to an appeal for personal satisfaction. While he can be very charming, he does not appear to have a desire to please anyone unless it seems to serve his own needs.

P.S. Despite all that has happened, I still like Jay. Please let me know how I can help. He is an intelligent young man with a lot of potential, which makes it so hard to see him headed in such a self-destructive direction.
FIGURE 2.4  Yetta’s Individualized Education Plan (IEP)

North Ashland School Board

INDIVIDUALIZED EDUCATION PLAN

Date: October 1999

Name (last /first):
Clarke, Yetta

Birthdate: Age: Sex:
03/04/74 15 F

Home Address:
237 Parkhurst Drive
North Ashland

School: Ashland Secondary
Grade or Program: 10

Parent / Guardian:
Carol & Mark Clarke
Hearing Res. Teacher: Joanne Embleton

Parent / Guardian Phone #:
635-2114
639-8212 (Dad’s work)

Parent Signature: Carol Clarke
Parent / Guardian Phone #: 

First Language: English / ASL

School History: For Preschool Yetta attended the Mt. Seymour Deaf Children’s Development Centre. She has attended the Provincial School for the Deaf since kindergarten.

Emergency Phone #: 

Siblings / Ages: Social Factors: Group/Foster Home & Phone #: 
Catrin 13yr.

Social Worker & Phone #: 

Medical Alert/Conditions:
Yetta has a profound bilateral sensorineural hearing loss which she acquired at the age of 3½ due to meningitis.

Support Services & Specialized Equipment:
Yetta receives full-time support services from the educational interpreter, as well as direct services from the Hearing Resource Teacher and the Skills Development Teacher.
FIGURE 2.4  Yetta’s Individualized Education Plan (IEP) (continued)

Ashland Secondary School

INDIVIDUAL EDUCATION PLAN

CONFIDENTIAL

This Individual Education Plan (IEP) is designed as a working document to give teachers an overview of the student’s strengths and weaknesses. It also includes a checklist of recommended adaptations and strategies to use when working with this particular student.

Student: Yetta Clarke  Date: October 1999

Strengths:
- pleasant, cooperative, good sense of humour
- works well with her interpreter
- wants to do well
- very social, well adjusted
- good student
- loves sports and other extra-curricular activities

Weaknesses:
- has a profound hearing loss
- sometimes is a bit too social
- has difficulty with Math
- could work harder on her studies

Additional Comments:
Yetta has had a good start to this school year. She has developed good friendships, which is especially important because this is her first term integrated into a regular public school. We are now working on having her realize when she can visit and when she must work.

It’s very important for Sarah Fox, Yetta’s interpreter, to be informed as soon as possible as to what topics, concepts, and vocabulary will be covered next in Yetta’s classes, so that Sarah can be prepared (for example, learn the exact spelling of new vocabulary words).

Yetta receives additional assistance from Joanne Embleton, the Hearing Resource Teacher, three times a week.

Please let me know if you have any concerns about Yetta.

David Anson, Skill Development Teacher
FIGURE 2.4 ■ Yetta’s Individualized Education Plan (IEP) (continued)

RECOMMENDED ADAPTATIONS AND STRATEGIES

Adaptations Required:

- Reduced Assignments
- Taped Novels/Textbooks
- Summaries (from the Resource Room)
- Calculator
- Peer Note-taking
- Photocopy of Overheads
- Highlighted Texts (from the Resource Room)
- Alternative Texts
- Other

Assessment (circle those applicable)

- Adapted Tests/Exams
- Allowing extra time
- Testing done or finished in the Resource Room
- Exams done or finished in the Resource Room
- Reader (a trained Special Ed. Dept. staff person)
- Scribe (a trained Special Ed. Dept. staff person)
- Dictaphone/Tape recorder
- Other

Additional Strategies (circle those applicable)

- Provide written back-up for oral directions.
- See that homework is in a written form and copied down by the student.
- Ask the student to repeat directions to you.
- Pair the student with a “good” student (the “buddy” system) to check on homework assignments being copied down, notes correctly copied.
- Seat the student close to the teacher.

N/A

- Avoid student oral reading.
- Give course outline and lists of vocabulary to the Skill Development (SKD) teacher.
- Give a copy of test or assignment to the SKD teacher so that the student can be “primed.”
- Allow students to use vocabulary cards or note cards.
- Allow reasonable time extension for assignments, if appropriate.
- Do not penalize for spelling errors.
- Send assignments to the SKD teacher if they need editing or re-copying.
- Break long-term tasks into small units—with corresponding due dates.

Recommended Reporting Procedure (circle appropriate choice)

- Adaptations only
- Significant modifications
  - Provincially approved letter grade
  - Modified letter grade (as needed)
FIGURE 2.5  ■  Student Background Form: Hannah

**Student Background**

Name: Hannah Page
Age:
Address: 62 Ryder Lane #201
Phone: 555-0011
Mother's Name: Sheila Lundquist

Address (if different from above)

Work: 
Father's Name: Ted Page
Address (if different from above)

Work: 
Legal Guardian

Work: 
Home:

Family Information: Younger brother, age 2

<table>
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<tr>
<th>School</th>
<th>Year</th>
<th>Grade</th>
<th>Placement</th>
</tr>
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<tbody>
<tr>
<td>Rivercrest Elementary</td>
<td>1996-97</td>
<td>K</td>
<td>Full day</td>
</tr>
<tr>
<td>Rivercrest Elementary</td>
<td>1997-98</td>
<td>1</td>
<td>Multi-age K2</td>
</tr>
<tr>
<td>Pearson Elementary</td>
<td>1998</td>
<td>1</td>
<td>1/LAC 1x/wk</td>
</tr>
<tr>
<td>Pearson Elementary</td>
<td>1998-99</td>
<td>2</td>
<td>2/LAC 3x/wk</td>
</tr>
</tbody>
</table>
FIGURE 2.6  ■  Student Background Form: Holly

Student Background

Name: Holly Page
Age: 7
Address: 62 Ryder Lane #201
Phone: 555-0011
Mother’s Name: Sheila Lundquist

Address (if different from above)

Work: Home: 555-0011

Father’s Name: Ted Page
Address (if different from above)

Work: Home:

Legal Guardian: 

Work: Home:

Family Information: Younger brother, age 2

<table>
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<tr>
<th>School</th>
<th>Year</th>
<th>Grade</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Full day</td>
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<td>Multi-age K-2</td>
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<td>Pearson Elementary</td>
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<tr>
<td>Pearson Elementary</td>
<td>1999</td>
<td>2</td>
<td>2/LAC 3x/wk.</td>
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</table>
FIGURE 2.6 ■ Student Background Form: Holly (continued)

Medical History: Normal development reported by mother.

Healthy.

Medications: None.
FIGURE 2.7  ■  Formal Assessment Record: Hannah

<table>
<thead>
<tr>
<th>Type</th>
<th>Evaluator</th>
<th>Date</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>PPVT-R</td>
<td>Lane Van Dyke (R)</td>
<td>May 12, 1998</td>
<td>79&lt;sup&gt;nd&lt;/sup&gt; percentile</td>
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<tr>
<td>Woodcock-Johnson</td>
<td>Lane Van Dyke (R)</td>
<td>May 19, 1998</td>
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<td></td>
<td></td>
<td>Letter-word identification 81 (10&lt;sup&gt;th&lt;/sup&gt; percentile)</td>
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<tr>
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<td></td>
<td></td>
<td>Vowel attack 76 (5&lt;sup&gt;th&lt;/sup&gt; percentile)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Passage comprehension 80 (12&lt;sup&gt;th&lt;/sup&gt; percentile)</td>
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</tbody>
</table>
### Formal Assessment Record: Holly

<table>
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<tr>
<th>Type</th>
<th>Evaluator</th>
<th>Date</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>PPVT-R</td>
<td>Lana Van Ryzek</td>
<td>May 12, 1998</td>
<td>79th percentile</td>
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<tr>
<td></td>
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<tr>
<td>Woodcock-Johnson</td>
<td>Lana Van Ryzek</td>
<td>May 12, 1998</td>
<td>Letter-word identification 77 (60th percentile)</td>
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<td>Sight words: 20 (20th percentile)</td>
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<td>Passage comprehension: 85 (75th percentile)</td>
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</table>
FIGURE 2.9 Portfolio Reflections: Hannah

Portfolio Reflections

Student Name: Hannah Date: Dec 14, 98

I was pleased that my child

Writes

Draws

Knows numbers

Questions I have about my child’s progress:

Parent/Guardian Signature: [Signature]
FIGURE 2.10 ■ Portfolio Reflections: Holly

Portfolio Reflections

Student Name: Holly
Date: Dec. 4, 98

I was pleased that my child

writes

knows numbers

Questions I have about my child’s progress:

Where is her drawing?

Parent/Guardian Signature: [signature]