

Cognitive Development

Chapter Two

- I. Thematic Lessons from Cognitive Development
- II. Grade-Specific Lessons from Cognitive Development
 - A. Primary Grades
 - B. Upper Elementary Grades
 - C. Junior High School
 - D. High School

In the last chapter, we considered a handful of learning theories that have direct implications for teachers dealing with a classroom full of students. We examined a model for evaluating the rigor of lesson objectives according to their cognitive demands. We explored the variations among students' learning modalities and intelligences, and we discussed strategies for ensuring lasting memory of what we are teaching.

Another idea from the field of learning theory that helps teachers purposefully design instruction is the concept of cognitive development. Cognitive development theory segments and categorizes the characteristics of students at different stages in their growth. Some familiarity with cognitive development is important to you as a teacher making instructional and management decisions.

In this chapter, primarily through a series of tables, we will provide an overview of children's cognitive, physical and social development. We will then focus on the implications of those generalizations for teachers in planning lessons and managing a classroom at various grade levels.

I. Thematic Lessons from Cognitive Development

The core notion of cognitive development is that children develop skills and abilities in more or less predictable sequences. While not all children develop at the same rate, they do all pass through common phases of cognitive, physical, and social development. Although we will not explore here all of the many well-known theorists who have contributed to our understanding of this idea, we can boil down all of those theories to a series of thematic findings that are most relevant to teachers in the classroom. The following five themes (adapted from Jeanne Ormrod's *Educational Psychology: Developing Learners*) serve as founding tenets of cognitive development and provide important background for teachers:

Understanding cognitive development allows us to properly select curriculum and activities and to scaffold instruction so that students are challenged, but not frustrated.

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(1) At different ages, children think in different ways. Cognitive psychologists study students' perceptions and analyses of the world around them. Generally speaking, children become increasingly capable of handling more complex and abstract ideas. For example, younger children may have difficulty interpreting figurative language. And, over the course of adolescence, students generally can handle more and more sophisticated problem solving. As teachers, we should encourage students to think about and describe the strategies they are using to access knowledge.

Cognitive Development

(2) Children actively construct meaning. Cognitive development theorists generally agree that children are not passive receivers of knowledge, but instead are active meaning-makers. That is, information does not simply seep into a child's brain; children are immediately processing new ideas—putting them into categories, making connections to other pieces of information they already know, and asking questions to develop an interpretation of the world around them. This theory of “constructivism” further states that students need first-hand experience, rather than simply a teacher's explanation, to abandon preconceived notions they have. As a result, rather than always being a “sage on the stage,” an effective teacher should consider when it is appropriate to be a “guide on the side,” crafting activities and open-ended questions that allow students to explore their world first-hand. On a cold day, younger students might believe their sweaters and hats produce heat; for some students, only through testing this notion with thermometers will the misconception be debunked. The act of watching students explore their own approaches for solving a problem—rather than simply telling them “the” way to do it, or letting them “discover” without any supervision or guidance whatsoever—gives a teacher insights into how the child thinks and how then to clarify any misunderstandings.

(3) A child's cognitive development builds on prior knowledge. Another theme running through all cognitive development theories is that very little, if any, knowledge is actually written on a “blank slate.” New knowledge must be built on prior knowledge for students to achieve understanding. That is, no new idea can be explained for someone unless that person has some starting place for the explanation. As teachers, this concept reminds us to do all we can to build that prior knowledge. Again, we must expose our students to a vast array of experiences and ideas, as they will serve as foundations for more experiences and ideas.

Piaget's Framework for Cognitive Development

Swiss theorist Jean Piaget (1896-1980) is often credited with opening the door to studies of modern cognitive development. His multifaceted research in developmental psychology and genetic epistemology (the study of the formation and meaning of knowledge) was driven by his curiosity about how knowledge grows and develops in the human mind. His fundamental proposition that the growth of knowledge is a progressive pattern of increasingly sophisticated stages of mental faculty continues to serve as the backbone of cognitive development theory. To provide you with an overview of his highly influential theories, we have included two summary tables in the **Learning Theory Toolkit** (pp. 4-7: Piaget's Framework: Preoperational, Concrete Operational, and Formal Operational Thought); this Toolkit can be found online at the Resource Exchange on TFANet. ✖

(4) Challenging student thought promotes cognitive development. While there are disagreements among theorists as to the relative influences of natural, internal development and externally-driven cognitive “exercise,” cognitive development does tell us that pushing the rigor of students' cognitive experiences does affect students' general cognitive development. This idea encourages us as teachers to know our students' cognitive comfort zones and to teach just beyond those comfort zones. Easier said than done, since each child comes to the classroom with different prior knowledge and readiness levels. It becomes the educators' mission to structure lessons so that everyone is challenged. One way to do so is by scaffolding assignments so that all students receive the amount of assistance they need to complete a task.

(5) Social interactions enable cognitive growth. There is an entire branch of cognitive theory devoted to social learning. These scholars focus on the ways in which people learn through observation. By seeing someone model a task, succeed or fail during an attempt, and get rewarded or punished for a behavior, learners make decisions about what they will do—and how to do it. Teachers should then provide modeling in both academic and social situations. One effective strategy is “thinking aloud,” where the teacher talks about his or her thought-processes when demonstrating a skill requiring decision-making. This allows students a window into the types of questions they should ask themselves when pursuing the same task. From the constructivist perspective, students should also have many opportunities to share

their ideas, perspectives, beliefs and thought-processes with peers and adults. Students who share and debate ideas will gain skills in seeing multiple perspectives and different ways of thinking, as well as help them discover flaws and gaps in their understanding.

II. Grade-Specific Lessons from Cognitive Development

Having outlined the most general lessons of cognitive development for teachers, we will now turn to specific insights that cognitive development has for teachers. We must begin with the obvious disclaimer that these lists of characteristics are merely generalizations. It is impossible to say with any certainty that *all* ten-year olds have any particular characteristic, other than being ten years old. A whole range of factors including developmental differences, environmental differences, and children's personalities can have a significant effect on whether a student meets the generic list of characteristics describing children of that age. A teacher should expect exceptions to the generalizations posed in this chapter:

No matter how children are grouped chronologically or by grade, there will also always be a wide spread in normal developmental differences. A two-year span in development is normal in any area of a child's development—physical, social, language or cognitive growth. Thus, a child who is ten years old chronologically may still be exhibiting social behaviors more typical of a nine-year old. A five-year old may display the physical prowess of a six-year old. A seven-year old child may be reading at a fifth-grade level, but have trouble making friends like other seven-year olds.⁷

Thus, it is difficult if not impossible to say that there is some "average" or "normal" eight-year old. And yet, knowing what is "typical" is helpful to a teacher who is designing a classroom for academic achievement.

A. Primary Grades (Pre-K-3)

Children in the first several years of school are experiencing rapid conceptual and language development as they learn to read and write. In terms of their cognitive development, they tend to be literalists, still developing the ability to think abstractly. As a result, concrete ideas and objects are most appreciated and understood.

In terms of physical development, students in this age range show a wide variation in physical development, even within the same grade. They are rapidly refining gross motor skills and more slowly refining their fine motor skills. (In younger grades, girls are often ahead of boys in fine motor skills and language.) Children between the ages of 4-9 may have high amounts of energy (relative to most of the rest of us) and have difficulty concentrating on things that do not interest or make sense to them (again, even more than us, because they haven't developed self-regulation), which may translate into a short attention span.

⁷ Wood, Chip. *Yardsticks: Children in the Classroom Ages 4-14*. Northeast Foundation for Children: 1997, p. 6.

Cognitive Development

Socially, these children are developing independence. They are also developing gender identity. Play, in its many forms, is highly significant for these younger children—a key to both socialization and cognitive exploration of new ideas and experiences. Generally speaking, much of children’s social energy is focused on pleasing adults.

Of course, there are important changes going on in the minds of children from kindergarten to third grade. At some point, students develop the ability to see situations from others’ perspectives, a task that is often difficult for kindergarten and first graders. Children also develop the ability to look beyond the “static” reasoning that they had when they were first entering school and reason about change and its effects. “Logic,” in the sense that we all think of it, becomes more and more attainable during these primary school years.

So what are the implications of these patterns for teachers in those grades?

As an early childhood educator, I focus heavily on the social and emotional development of my students. It is my responsibility to explicitly teach my students proper school behavior and school readiness skills, such as how school works, how they should sit, walk, act, make friends, and so on. My classroom is my student’s first experience with school and it is the basis on which all other years are built. It is a crucial year! My students are learning how to be friends, how to share, how express their feelings, and even how to dress themselves. It is my job to make sure that all of my students are ready for kindergarten, which encompasses much more than simply developing cognitive skills.

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I assumed “work quietly with your partner,” was enough direction for 2nd grade students, after all they had already been in school for a few years. After weeks of frustration I connected their need for concrete instruction in academics to their need for concrete directions in my behavioral expectations. Once we broke it down to what “work quietly with your partner” looked and sounded like, we were able to get down to the real work of 2nd grade.

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Implications for Teachers of Primary Grades

Cognitive Development	Physical Development	Socio-emotional Development
<i>The teacher should. . .</i>	<i>The teacher should. . .</i>	<i>The teacher should. . .</i>
<ul style="list-style-type: none"> • Use concrete examples • Make directions explicit and precise • Provide ample practice with language • Use lots of modeling • Attach language symbols to concrete experience • Plan lessons that are sensitive to activity levels and attention spans • Always have concrete referents for abstract concepts, including rules (abstract rules may have little meaning when Tommy discovers that Sharon has his toy) • Implant lots of language use in all activities • Provide opportunity for student interactions • Encourage student initiatives • Make use of songs, puppets, and art work 	<ul style="list-style-type: none"> • Limit activities in which students compete on the basis of size and physical strength • Provide play areas and equipment for running, climbing, and jumping • Involve students in activities like coloring and cutting • Provide “cool down” time after playground activities • Be aware of helping students grip pencil correctly; focus on handwriting instruction 	<ul style="list-style-type: none"> • Encourage and reinforce independence and initiative • Avoid sex role stereotyping • Provide opportunities for cooperative activities • Arrange lessons to ensure high degree of student success

B. Upper Elementary (Grades 3–6)

The transition to upper elementary school (which some might say occurs at third grade) is marked by the enhanced ability to perform logical operations with concrete materials, like math manipulatives. In the later elementary grades, children begin using abstract concepts more often and adeptly but still do so rarely (through rudimentary algebra, for example). Meanwhile, children’s communication skills, both verbal and written, are rapidly improving. During the third, fourth, and fifth grade, teachers report that differences in cognitive styles (including learning disabilities) become more pronounced and recognizable.

Upper elementary students experience slow and steady physical growth and become increasingly concerned with physical looks, coinciding with their social inclinations to start looking to peers as the key locus of influence instead of adults. Sometime toward the end of intermediate grades, some students (more often girls at this age) experience “growth spurts” with the onset of puberty. Female students may begin to menstruate, a concept that some may not understand (or have heard of) until they actually experience it. Physical fitness is also a key issue at this age.

The social lives of upper elementary students are increasingly dominated by issues of status within groups (both socially and academically). And research tells us that students are developing a sense of academic self-worth that will usually stick with the child through later schooling.

Implications for Teachers of Upper Elementary Graders

Cognitive Development <i>The teacher should. . .</i>	Physical Development <i>The teacher should. . .</i>	Socio-emotional Development <i>The teacher should. . .</i>
<ul style="list-style-type: none"> • Provide a wide variety of concrete experiences for initial learning (for example—graphing, using objects to learn adjectives, etc.) • Involve students in activities that allow conversations about abstract concepts and operations • Continue to use concrete manipulatives where appropriate • Use technology to engage students in practicing classroom skills 	<ul style="list-style-type: none"> • Promote appropriate eating habits and model and encourage fitness • Encourage and model physical activity and team athletics • Be aware of the social implications of appearance, offering reassurance to students feeling uncomfortable • Be sensitive to female students who need to use the bathroom during their menstrual period; male teachers may want to partner with a female teacher, who might keep feminine products in supply for unprepared students 	<ul style="list-style-type: none"> • Create learning experiences that lead to success through work and effort • Allow students to demonstrate competence by assigning them classroom jobs • Send strong messages about the importance of drug-free living

C. Junior High School (Grades 7–9)

During the junior high years, students’ cognitive skills are experiencing qualitative changes as they become fully able to think abstractly, systematically, hypothetically, and deductively. They are experiencing significant growth spurts and showing dramatic differences in physical maturation during puberty. Both female and male students will begin to smell differently and may not realize they need to start wearing deodorant, and you may need to relax your “no bathroom” policy for female students who are menstruating.

Cognitive Development

Seventh, eighth, and ninth graders are also experiencing deepening social relationships as they form, and experiment with, personal identity and preferences in dress and appearance. This new interest in appearance, fueled by physical changes, can lead students at this egocentric phase to think that all eyes in a room are on them—what psychologists call “the imaginary audience.” Adolescents continue to look to peers as the key influence in their lives, and mutuality and loyalty of friendships increase. Students group themselves in same-sex friend groups, and some more intimate one-on-one relationships begin to form. Above all, students are concerned with “fitting in.”

As a middle school science teacher, I found out quickly that my 7th grade students were just beginning to develop as social beings, and they definitely went through their “growing pains” in my classroom. I first chose to combat the talking through more rigidly structured lessons, but I soon realized that my daily instruction needed to contain just as much social instruction and practice as it contained science instruction and practice. I shifted my lessons to account for nearly 100% group work, I created a highly structured group environment with well-established roles, expectations, and procedures, and I allowed my students’ energy for social development to be the engine of investment and achievement in my classroom.

Aaron Pomis, North Carolina ’02
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Not coincidentally, this is also the stage in which students develop a generalized “self-concept.” Adolescents begin to see themselves as having certain characteristics (“popular,” “sporty,” “different”), based on their previous performance and behavior, their position relative to others around them, and the ways in which they are treated by adults and peers. These definitions tend to fuel future behavior, so be conscious of how you are reinforcing a student’s negative self-image. Communicate how much you like your students as human beings, even when you express disapproval of their choices. Deem poor behavior as “not like you,” and seize opportunities to help children see themselves as capable and successful in school.

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Males and females experience challenges during adolescence. National studies have indicated that the academic performance of female students begins to slip as these students enter adolescence, particularly in math and science; they may begin to internalize societal stereotypes about women and suppress their ability to express their point of view or assert themselves.⁸ Male students are likely to have more self-confidence and higher career aspirations, but they are also less likely to graduate from high school.

Implications for Teachers of Junior High Students

Cognitive Development <i>The teacher should. . .</i>	Physical Development <i>The teacher should. . .</i>	Socio-emotional Development <i>The teacher should. . .</i>
<ul style="list-style-type: none"> • Provide extensive opportunities for abstract thinking, including consideration of moral dilemmas • Recognize that not all junior high students have fully developed abstract reasoning skills. • Recognize students may be inclined to challenge authority with their newfound skepticism of the world • Be aware and capitalize on students’ fascination with the “gray areas” of life (for example—that American history is littered with morally questionable episodes) 	<ul style="list-style-type: none"> • Minimize activities that draw attention to different levels of maturity • Promote appropriate eating habits and model and encourage fitness • Be sensitive to female menstruation (male teachers may want to partner with a female teacher, who might keep emergency feminine products in supply) and the potential for pregnancy 	<ul style="list-style-type: none"> • Listen to and help students clarify their thinking as they go through the potential turmoil of identity formation • Create classroom systems to provide the security of structure while providing the freedom for personal expression • Create classroom activities that do not necessarily require students to “stick out” • Be particularly careful not to humiliate students or draw unwanted attention to them

⁸ Rothenberg, Dianne. “Supporting Girls in Early Adolescence.” ERIC Digest: ED386331. September 1995.

<ul style="list-style-type: none"> • Use technology as a way to engage students, stimulate self-expression, and formulate complex ideas 		<ul style="list-style-type: none"> • Ensure that both female and male students have the opportunity to be heard during classroom discussions • Emphasize the risks of drug use and succumbing to peer pressure • Arrange for pen-pals or journal writing to foster expression
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D. High School (Grades 10–12)

During the last few years of high school, students are generally demonstrating full, adult, abstract reasoning. Most students have reached full physical maturity as well (although some males may continue to grow taller). Students continue to focus on the importance of peer relationships, with male and female cliques interacting with each other, and students show an increasing interest in individual, intimate relationships. Adolescent peer groups during these years tend to be highly correlated with socio-economic status and plans for the future. Sadly, adolescence can be an emotional and psychological roller coaster for some, and psychiatric disorders, while rare, become more prominent (i.e., eating disorders, schizophrenia, depression).

Implications for Teachers of High School Students

Cognitive Development <i>The teacher should. . .</i>	Physical Development <i>The teacher should. . .</i>	Socio-emotional Development <i>The teacher should. . .</i>
<ul style="list-style-type: none"> • Without giving up more concrete instructional tools such as charts, illustrations, graphs, and diagrams, move students toward higher-order thinking whenever possible by encouraging them to explain how they solve problems • Create projects that enable students to experience the tasks and dilemmas of professionals in the disciplines your subject area represents 	<ul style="list-style-type: none"> • Send messages about healthy body images • Learn to recognize and how to seek help for common adolescent health concerns • Be sensitive to female menstruation and the potential for pregnancy 	<ul style="list-style-type: none"> • Be acutely aware of social pressures and anxieties among students • Actively encourage non-violent conflict resolution • Attempt to ease anxiety about the future by offering assistance about career choices and options for higher education • Recognize that students may be reluctant to risk their self-esteem and egos when asked to try a new skill in front of peers • Develop, support and enforce policies against gender-related harassment

[The website "Inside the Teenage Brain" provides a good overview of brain development in adolescents.⁹]

Positivity Knows No Bounds

While thinking about cognitive, physical and socio-emotional development can keep you attuned to the interests and needs of your specific students, it is possible to blind yourself to strategies that may be ageless and timeless, particularly when attempting to create a positive environment in your classroom. Sara Cotner taught third grade as a 2000 corps member in South Louisiana, and she now teaches sixth grade at the KIPP Academy in Houston. In her experience, developmental levels account for certain differences in approach, but certain rules are universal:

Of course there are noticeable differences between teaching third grade and sixth grade. Most of my 8 year-olds were thinking about Pokemon and riding their bikes, while most

⁹ <http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/>, accessed 7/10/2010.

Cognitive Development

of my 11 year-olds are thinking about the opposite sex and fighting with their parents. I have had to modify the themes of my units to tap into my students' interests and tailor my instruction to tap into my students' raised cognitive abilities. However, much of my approach has stayed the same.

First, I continue to use cooperative learning because people at all ages are fundamentally social. They need to learn (and they enjoy practicing) the skills of cooperation, collaboration, and conflict resolution. Further, they learn just as much (and sometimes more) from each other than they learn from me. We still have teams and team jobs (Leader, Parliamentarian, Liaison, Recorder, and Materials Manager).

Second, I continue to incorporate the element of competition into my classroom management and instruction. Students earn points for their class, for example, when they move about the classroom quickly and quietly (during unpacking/packing, transitions, etc.) Also, they compete in teams each day during our review of the "Do Now." The element of being part of a team increases their level of personal accountability, and it makes some of the more tedious tasks more fun.

Third, I still use positive reinforcement like there's no tomorrow. Students earn stickers on a sticker chart every time they score 100% on a vocabulary quiz. The stickers mean absolutely nothing, and yet the students still remind me expectantly when I forget to pass them out. Further, I still try to inundate my students with messages of achievement. When I stop teaching in order to apply a consequence, I always say, "Class, I am so sorry that we are wasting your learning time."

I still read aloud to them and always stop in the most suspenseful part so that they moan and groan and beg me to read more.

I still shake their hands as they enter my classroom each day and give them high-fives as they leave.

I still have call-and-responses to get their attention:

*Teacher: If you read
Students: You'll succeed*

*Teacher: I like big
Students: Words and I cannot lie.*

*Teacher: Andele, Andele
Students: Mama, we like to read, oh, oh!*

I still pass out raffle tickets when I want to reinforce positive behavior. I still have a word wall. The list goes on!

I think people are fundamentally the same at all ages: they like to be rewarded for what they do well; they like to be appreciated as an individual; they like to talk to their friends; they like to play games; they like to laugh; they like to learn new things. How to accomplish each of these things changes slightly depending on the age of students, but surprisingly not that much.

Conclusion and Key Concepts

Imagine for a moment that your regional placement changes at the last minute. All summer you thought you would be teaching first grade and now you will be teaching fifth. Or, imagine that you are trying to figure out how best to teach about “government” to second graders, or to seventh graders, or to eleventh graders. Your understanding of the developmental stages that children go through as their minds mature is very helpful in steering you toward an effective adjustment of your instructional methods to meet the minds of your students.

As discussed in the *Instructional Planning & Delivery* text, successful teachers do not choose instructional methods or grouping strategies in a vacuum. Instead, they carefully consider which choices will most help to reach our objectives with their particular students. Cognitive development’s insights give us one more set of factors to consider as we are planning instruction and developing classroom management systems. Having read this chapter, you should have a basic background in the general themes of cognitive development.

- At different ages, children think in different ways.
- Children actively construct meaning.
- Cognitive development builds on prior knowledge.
- Challenging student thought promotes cognitive development.
- Healthy social interactions enable cognitive growth.

You also should have a basic understanding of the patterns we see in cognitive, physical, and social development in children of various ages. As we have discussed, those patterns will have implications for you as you purposefully plan lessons, develop rules, and lead your classroom to significant academic gains.