

Adolescence: Cognitive Development

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Note: Worth Publishers provides online Instructor and Student Tool Kits, DVD Student Tool Kits, and Instructor and Student video resources in DevelopmentPortal for use with the text. See Part I: General Resources for information about these materials and the text Lecture Guides for a complete list by text chapter.

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Suggested Activities

Introducing Adolescence: Cognitive Development

“On Your Own” Activity: Developmental Fact or Myth?

Before students read about cognitive development during adolescence, have them respond to the true-false statements in the handout.

The correct answers are shown below. Class discussion can focus on the origins of any developmental misconceptions that are demonstrated in the students’ incorrect answers.

- | | |
|------|-------|
| 1. T | 6. T |
| 2. F | 7. F |
| 3. T | 8. F |
| 4. T | 9. T |
| 5. T | 10. T |

AV: The Journey Through the Life Span, Program 6: Adolescence

See Adolescence: Biosocial Development for a description of Program 6 and the accompanying observation modules, which cover the entire unit on adolescence.

AV: Transitions Throughout the Life Span, Program 15: What If?

Program 15 begins by describing the cognitive advances of adolescence, especially the emerging ability to think in an adult way, that is, to be logical, to think in terms of possibilities, and to reason scientifically and abstractly. Kathleen Berger provides expert commentary on the characteristics of formal operational thinking.

Not everyone attains this level of reasoning ability, however, and even those who do so spend much of their time thinking at less advanced levels. For instance, adolescents have difficulty thinking

rationally about themselves and their immediate experiences, often seeing themselves as psychologically unique and more socially significant than they really are. The first segment describes this adolescent egocentrism and its manifestation in the personal fable, invincibility fable, and sensitivity toward an imaginary audience.

The next segment asks the question, “What kind of school best fosters adolescent intellectual growth?” Many adolescents enter secondary school feeling less motivated and more vulnerable to self-doubt than they did in elementary school. The rigid behavioral demands and intensified competition of most secondary schools do not, unfortunately, provide a supportive learning environment for adolescents. Schools can avoid this “volatile mismatch” by becoming more effectively organized and setting clear, attainable educational goals that are supported by the entire staff.

The final segment focuses on adolescent thinking at work: decision making regarding sexual activity and other high-risk behaviors.

Classroom Activity: Case Study of an Adolescent

John McManus of Eastern Michigan University describes an effective classroom exercise in which the case-study method is used to help students understand the problems of adolescence.

McManus divides students into groups of four to seven. Each group picks an adolescent problem—delinquency, sexual dilemmas, peer relationships, or educational difficulties, for example—then composes a hypothetical case study that illustrates the topic in a manner that is both interesting and consistent with information presented in the text and class.

When the case study has been composed, the group must generate as many potential solutions as possible for the problem described. After discussing the various solutions, they rank them from most to least favorable (an activity almost guaranteed to gen-

erate heated discussion). Each group then selects one of its members to present the case study, and its “solutions,” to the class.

An optional extension of the class exercise is for each group to designate several target groups—for example, parents, friends, clergy, persons from various ethnic or socioeconomic groups—and then present the case study to a small sample from one of the targeted groups, asking them to suggest a solution. When the group reconvenes, members should discuss and integrate their findings, then present the case study to the class.

McManus reports that students responded enthusiastically to the case-study assignment. One group, for example, proposed a case in which a “14-year-old female, Cindy, lives at home with her divorced mother; her father lives in another state. She is pressured to pose nude by her mother’s photographer boyfriend. He tells Cindy she will be paid well and that her mother could really use some of the extra money. Cindy’s dilemma involves a serious values conflict.”

The group constructed a questionnaire and administered it to a cross section of people from 13 to 65 years of age. There were clear age-related differences in the responses. Respondents under the age of 20 thought Cindy should run away from home or seek help from her friends. Twenty- to 50-year-olds recommended that Cindy seek help from community agencies such as the school or mental-health counseling centers. The oldest respondents suggested that Cindy approach her own family—a parent or a close relative—for help.

Composing case studies of this type offers several pedagogical benefits, including stimulating students’ creativity and critical thinking, enhancing class discussion, and integrating and applying core concepts. And, of course, it increases student interest in the course.

McManus, J. L. (1986, April). Student-composed case study in adolescent psychology. *Teaching of Psychology, 13*, 92–93.

AV: Adolescence: A Case Study (20 min., CRM/McGraw-Hill)

This film shows Angie, a 17-year-old junior in a large California high school—in math and literature classes, primping in front of a mirror, and in a group of girls flirting with a group of boys. All these scenes are used to elucidate adolescent cognitive development, from the hypothetical to the most egocentric. Given adolescent self-consciousness, some of the scenes appear too staged. However, the moments when Angie is asked to explain herself (“Who am I? Well, I’m a Gemini, so I change a lot, and my moon is in Pisces so I fall in love easily”) authentically reflect the poignancy of adolescence. Angie is also idealistic and aware of her roots (her parents came from Mexico), characteristics typical of many adolescents.

John Flavell and Joseph Church comment on some of the cognitive developments highlighted by the film. Church makes the radical suggestion that adolescence is perhaps the worst time for formal education as high

schools and colleges now offer it. This view could be used to start a discussion of the function of school for adolescents.

AV: Teens: What Makes Them Tick? (41 min., ABC News)

(See description in Adolescence: Biosocial Development.)

AV: A Day in the Life of a Teen (25 min., Insight Media)

This interesting film is one of a series depicting the world through the eyes of a toddler, a preschooler, a child, and a teenager. Throughout the film expert commentary provides a conceptual framework for understanding cognitive development through adolescence.

AV: Pressure-Cooked Kids (28 min., Films for the Humanities and Sciences)

This highly recommended film explores the escalating pressures faced by contemporary teenagers and what can be done to teach them how to handle stress in their early years so that they can better cope when they are adults.

Teaching Tip: Revise and Resubmit

Andrew Johnson and his colleagues at Park University (2011) wondered whether certain types of student assessments more accurately predicted final grades than others. They explored this issue with two sections of students enrolled in introductory psychology, whose course assessments included a pre-post myth quiz (2% of final grade), four multiple-choice exams (48% of grade), a major position paper (23% of grade), and 16 chapter essay questions (25% of final grade). Interestingly, the answers to the chapter essay questions were scored using an artificially intelligent network-model application (SAGrader) that permitted the students to submit an unlimited number of revisions to their answers until they were satisfied with their grade on this component of the course.

The results demonstrated written essays are an important part of teaching and learning, even in large, lecture-based courses. More specifically, the written assignment that permitted students an unlimited number of revisions was the single best predictor of the final grade despite the fact that exams represented nearly twice as many points. The researchers suggest that while the opportunity for unlimited revisions creates a heavy burden for the instructor (the 56 students in the study submitted a total of 2,508 essay responses to the 16 questions!), it also introduced motivational and self-regulation components that powerfully influenced student performance. Most importantly, the opportunity to “revise and resubmit” improved students’ essay scores 39.7 percent!

Johnson, A., Smyers, J., & Cowley, B. J. (2011). *Final grade predictors*. National Institute on the Teaching of Psychology, St. Petersburg, FL.

Adolescent Thinking

Egocentrism

Classroom Activity: Adolescent Egocentrism

To broaden your students' understanding of adolescent egocentrism, you might introduce the "foundling fable," in which young people imagine that they are the offspring not of their actual parents but of much wiser and more beautiful people who were forced to give them up. This fable appeals to children and adults as well as to adolescents. Children's fairy tales and adult soap operas (as well as more serious works) often incorporate tales of people who discover their "real" parents.

You might discuss reasons behind the foundling fable's special appeal for adolescents, who (as we shall see) are wrestling with identity problems as well as with problems of physical appearance and body image (inherited physical characteristics). Why, for example, do adopted children, who have a legitimate need to discover their biological parents, become more interested in doing so upon reaching adolescence?

Formal Operational Thought

AV: Teenage Mind and Body (30 min., Insight Media)

(See description in Adolescence: Biosocial Development.)

AV: Adolescent Cognition: Thinking in a New Way (30 min., Insight Media)

Hosted by David Elkind, this video uses the theories of Piaget, Erikson, and Goffman to discuss the changes in cognition that occur during adolescence.

Classroom Activity: Adolescent Logic

To help students understand the logical thinking of adolescents, you might present the following tests for the presence of formal operational thought.

1. Construct a simple pendulum (a weight attached to a string that has been tied to a rod). Provide students with varying weights and lengths of string, and tell them that they can push the weight with varying degrees of force and begin the swing of the pendulum at varying heights. Then ask them which factors influence the number of swings the pendulum makes per minute. (Only the length of the string does, but individuals whose thinking has not yet progressed beyond the concrete operational level have a great deal of trouble figuring this out.)
2. Describe one of Piaget's reasoning tasks and ask students how they would figure it out. For example, suppose there are four bottles, each containing a colorless liquid, and a fifth bottle, also containing a liquid that is colorless. Mixing this fifth liquid with one or more of the liquids in the other bottles is supposed to produce a yellow liquid. How do they do it? (Individuals who use for-

mal operational thought begin with a system; they do not rely on trial and error. They first determine how many single bottles they will try [4], then all the combinations of two [6], and so forth.)

Classroom Activity: Logical Versus Practical Intelligence

During adolescence, formal operational thought—reflected in scientific reasoning, logical construction of arguments, and critical thinking—first becomes possible. Not all problems encountered by adolescents and adults require formal thinking, however. And while many adolescents and adults are capable of thinking logically, they do not always do so. Indeed, older adults and experts in a field often find that a formal approach to solving problems is unsatisfactory and oversimplified.

Yale psychologist Robert Sternberg believes that a new kind of "practical intelligence" begins to emerge during late adolescence. This type of thinking is more applicable to everyday situations than formal thought is because it recognizes that many problems have no single correct answer and that "logical" answers are often impractical. Some developmentalists believe that this new way of thinking reflects the greater cognitive maturity of older adolescents in reconciling formal thought with the reality of their lives.

The following problems are designed to stimulate your students' thinking about the difference between formal thought and practical intelligence. For each problem, ask your students to think of the "logically correct" answer and a more "practical" answer. Examples of "logical" and "practical" answers are given following each problem.

1. Imagine two environmental settings for five houses of equal size. In one, representing a town, the houses are clustered in one corner of a one-acre field. In another, representing the country, the houses are scattered about the one-acre field. Would the spatial arrangement of the houses affect the amount of grass that has to be mowed? Would there be more grass to cut in the "town" or in the "country"?

- (a) What is the *logically* correct answer to this question?

Answer: Because the spatial arrangement of the five houses does not alter the area of the field they cover, the amount of grass to mow would be the same in the town and the country.

- (b) Are there *practical* reasons that might lead one to think differently about this question? What are they?

Answer: Mowing would be harder and take more time if the arrangement of the houses left many small spaces between them. Thus,

it would require less time to mow the grass in the “country,” making it seem as though there were less grass to cut than in the “town.”

2. Consider the following domestic scene: “Downstairs, there are three rooms: the kitchen, the dining room, and the sitting room. The sitting room is in the front of the house, and the kitchen and dining room face onto the vegetable garden at the back of the house. The noise of the traffic is very disturbing in the front room. Mother is in the kitchen and Grandfather is reading the paper in the sitting room. The children are at school and won’t be home until teatime. Who is being disturbed by the traffic noise?” (Labouvie-Vief, 1991)

- (a) What is the logical answer to this question?

Answer: The logical relationships embedded in the passage—that the noise is most disturbing in the front room, that the sitting room is in the front, and that the grandfather is in the sitting room—suggest that the “correct” answer is the grandfather. Researchers have found that younger students almost always give this logically correct answer.

- (b) Are there practical considerations that might lead one to answer this question differently? If so, what are they?

Answer: Older adolescents often perceive logical relationships other than those of interest to the experimenter and so answer differently. For example, some might reason that the grandfather could not possibly have been disturbed by the noise, as he would not have chosen to continue reading in a noisy room. Others may reply that the grandfather might have been hard of hearing, or that the noise was not very disruptive at that particular moment.

Labouvie-Vief, G. (1991). Intelligence and cognition. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (3rd ed.). New York: Van Nostrand Reinhold.

Straub, R. O. (2004). *Seasons of life study guide* (5th ed.). New York: Worth.

AV: Formal Thought (32 min., Davidson Films)

Adolescents are seen demonstrating logical and systematic procedures as they grapple with various tests of formal operational thought. For many classes, watching this film will bring home the fact that not all adults can master these problems as well as some of the brighter adolescents can.

“On Your Own” Activity: Formal Operational Thought: Test Yourself

To help students understand the difference between concrete operational thought and the formal operational thought that becomes possible in adolescence,

you might suggest that students look closely at the kinds of intellectual tasks they are asked to perform in school. One way of doing this is to examine test questions: Some call for simple recall, others for synthesis, and others for scientific reasoning, logical conclusions, critical thinking, or the construction of an argument. Have students use Handout 2 to guide their responses.

Students who can easily distinguish between questions that require formal operational thought and those that cannot probably know how to answer the more demanding questions. The fact that not all students are comfortable with questions requiring formal operational thought supports the finding that not all adolescents (or adults) reach this level of cognitive maturity or are able to perform at this level consistently.

In responding to the last two items on the handout, some students will indicate problems with learning (remembering) details and large chunks of information; others will note problems with reasoning, criticizing, and drawing conclusions. Answers should help students to determine whether any difficulties they experience result from incomplete mastery of formal operational thought or from other problems such as poor study habits or low motivation.

If you wish to explore this subject in greater detail, you might examine graduate-level tests such as the MCAT for prospective medical students; these will provide good examples of questions requiring scientific reasoning and other thinking at the formal operational level.

AV: Adolescence: Cognitive and Moral Development (30 min., Child Development Media)

This video describes the changes in adolescent thinking and moral reasoning that accompany puberty. Among these are increasingly sophisticated logical and abstract reasoning abilities, limited by adolescent egocentrism. The video also touches on adolescents’ receptivity to their culture, including the models they see at home, in school, and in the media.

Intuitive, Emotional Thought

Classroom Activity: A Virtual Reality Without Adults

In every era, teenagers have created their own private worlds in which to explore their newfound freedom, thinking skills, and emerging identities. For successive generations, this world centered around the music of rock-and-roll, heavy metal, punk, and rap. Although this rite of passage is not inevitably the “storm and stress” struggle that G. Stanley Hall believed it inevitably to be, adolescence is still full of risk. If “old-fogyism” doesn’t bother you too much, a sure-fire technique for getting a good class discussion going is your personal version of the “When-I-was-a-teenager, my-parents-were-most-worried-that-I-would-fall-under-the-influence” story. Ask them whether the pop-culture

influences on teenagers' minds are potentially more hazardous today, or whether this common belief is yet another example of generational forgetting.

Some experts believe the entertainment and information threats to adolescents are much more dangerous today than ever before. The new entertainment technologies threaten to make teenagers more deeply isolated from adults than ever before. MTV, the Internet, ever-more graphic video games, and no-holds-barred music are combining to create what one researcher has called "almost a virtual reality without adults." The booming computer video game business has many psychologists concerned. One of the most popular genres, known as a "first person shooter" game, or FPS, is exemplified by such games as Team Fortress, Battlefield, Call of Duty, Counter-Strike, and Doom, which was reportedly the favorite of the Columbine High School shooters. The ad for one of the games proudly promises "multiplayer gang bang death match for up to 16 thugs! Target specific body parts and actually see the damage done, including exit wounds."

Although most teenagers may not be overly influenced by the mindless violence of such games, a vulnerable minority are. And, if a teen is predisposed to violence and aggression, violent games and Internet chatrooms give them the opportunity to meet like-minded people who will validate their experience. Over time, the at-risk teen may become increasingly isolated from family and friends, as group polarization and other social dynamics work their effects on group members. Some experts argue that violent computer games and Web sites are much more harmful than movies because the viewer takes an active role. This is especially true in FPS games, in which the player becomes the aggressor. In New York, mounting concern over this issue led the state senate to approve a 2008 bill that would take steps to crack down on video game violence. These steps include establishing an Advisory Council on Interactive Media and Youth Violence, requiring that every video game sold have a clearly displayed violence rating indication, and requiring that all game consoles be equipped with parental controls.

This issue of parental perspective on content worries many experts as much as or more than the content of the information to which teens are exposed. As noted in the text, the typical teen's skills for evaluating information and thinking critically about potentially hazardous activities are still emerging, if not downright faulty. To counteract these forces, many psychologists recommend strategies that go beyond setting limits on which Web sites can be visited and which games can be played. One is to put the computer in a family room, where teens and adults have more opportunities to interact in the flow of information into the home. Another is for parents to play the video games along with their children, even if they are distasteful. Finally, parents should simply talk more to their teens about what they are watching and listening to. For example, they might say, "I don't under-

stand this game. What is the objective?" Or "Who is this rapper Nas? What is he saying?"

Senate passes legislation to crack down on video game violence.(2008, July 7). *United States Federal News Service*. Washington, DC. Retrieved from <http://0-proquest.umi.com.wizard.umd.umich.edu/pqdlink?Ver=1&Exp=10-26-2013&FMT=7&DID=1513147711&RQT=309>.

Leland, J. (1999, May 10). The secret life of teens. *Newsweek*, pp. 45–50.

Teaching and Learning

AV: Education in America (three videos, 16–30 min., Insight Media)

This series of three videos discusses the evolution of education in America. Focusing on the seventeenth and eighteenth centuries, Part 1 (16 min.) takes the viewer to actual locations of dame schools, Latin grammar schools, church schools, and pauper schools. Focusing on the nineteenth century, Part 2 (16 min.) discusses the development of free public school systems. It also highlights the change to secular education, the rise of teacher education schools, and the influence of American textbooks. Focusing on developments during the first half of the twentieth century, Part 3 (30 min.) discusses the effects of the industrial revolution on education, the appearance of the junior high school, and the modern testing movement.

AV: The Middle School (30 min., Insight Media)

Using classroom visits and interviews with leading educators, this video explores why middle schools were created and the key features of successful middle school programs.

AV: American Schools: Catching Up to the Future (30 min., Insight Media)

This video probes the perennial question of what's wrong with American education. Willard Daggett discusses his belief that American schools need to be more skill-based in order to prepare students for success in today's information-based, high-tech society.

AV: Restoring Respect and Responsibility in Our Schools (44 min., Magna Films)

Profiling the work of Thomas Lickona, a leader in the Character Education Movement, this video provides a compelling argument for the role of schools in the development of student respect and responsibility. The program outlines specific classroom strategies and schoolwide curricula for creating a healthier climate in today's schools.

AV: Social-Cultural Diversity (30 min., Insight Media)

(See description in Theories of Development.)

AV: Dealing with Diversity in the Classroom (23 min., Insight Media)

This short program analyzes the diverse population of students in today's classroom. It examines how educa-

tional goals have shifted from “melting pot” assimilation to cultural pluralism and explains how teachers organize culturally diverse classrooms in order to make all students feel welcome.

AV: Going to School in Japan (24 min., Insight Media)

(See description in Middle Childhood: Cognitive Development.)

AV: Inside Britain: Education (20 min., Insight Media)

This brief film explores the history and evolution of the British educational system and provides another interesting cross-cultural contrast to education in the United States.

Classroom Activity: Problem-Based Learning: Design a Better High School

The Introduction’s Classroom Activity: Introducing Problem-Based Learning describes this relatively new pedagogical tool. Following is a sample problem that you might want to give to your students as part of your coverage of cognitive development during adolescence.

In middle school, grades usually fall because teachers mark more harshly and students become less conscientious.

A good, problem-based exercise for the unit on adolescence is to have your students use the text, along with research literature and your classroom discussions, to design the ideal high school. This “perfect” high school should be one that is optimized to meet the cognitive, social, physical, and emotional needs of adolescents between the ages of 15 and 18. To promote cooperative learning, you might require that students research the topic individually, and then follow-up by dividing the class into groups of three to five students for discussion and the preparation of a final oral or collectively written report.

Before sending the students off on their assignment, you might take some class time to generate critical questions the school design must address in each area of need. For example, under the category of cognitive needs questions such as these might be addressed: “How long are class periods? Is schooling year-round? Will there be high-stakes testing? Under the categories of social and emotional needs, encourage the students to add questions to this list: “Should there be a dress code? Is sex education required? Are any classes segregated by gender?”

Based on the decisions your group makes today, you should devise a plan for researching the various issues. Two weeks from today’s class, your group will present an answer for Seth based on the issues you think are relevant.

Classroom Activity: High-Stakes Testing: Are the SAT Reasoning Test and ACT Useful?

As an extension of the text discussion of the rigid behavioral demands and inappropriate academic standards, you might lead a discussion of high-stakes testing: the SAT Reasoning Test or ACT that students must take to gain admittance to college. College

admissions officers downplay the significance of these standardized tests in the application process, teachers complain that the tests are irrelevant to the high school curriculum, and students and their parents say the entire process is too stressful. But each group continues the tradition: teachers devote class time to drills on SAT-type questions, admissions officers proudly point to their schools’ increasing average scores, and parents shell out large sums of money on preparation courses. More than half of all test-takers take the SAT or ACT twice (38 percent take it three times or more), and Kaplan, Inc.—the oldest test-preparation company—estimates the business as a \$250-million industry. More high school students in the class of 2010 (about 1.6 million) took the SAT than in any other graduating class in history (College Board, 2011). Another 1.57 million took the ACT (ACT News, 2011). Critics of such high-stakes tests point to the original claims that the tests measured innate intelligence. Although the College Board, which was founded in 1900 and administers both tests, no longer makes such claims, the perception that the tests are IQ tests persists. In response, the Board has changed the name of the SAT several times, from its original Scholastic Aptitude Test to Scholastic Assessment Test to the SAT to the SAT Reasoning Test, as it is called today.

Critics also charge that the tests have consistently favored affluent white students, especially males. Among the groups of students hurt the most by high-stakes testing have been African American and Latino students, who historically have been among the lowest-scoring groups and are underrepresented in colleges. Low socioeconomic status also predicts lower scores on such tests, which may be doubly discriminatory since the ACT and SAT are often used to award scholarships.

Perhaps most damaging to the tests’ reputations is the fact that countless studies have questioned the tests’ ability to predict freshman grade-point averages.

SAT Press Room (2011). *Course-taking patterns and academic intensity influence SAT performance*. Retrieved February 20, 2011, from <http://press.collegeboard.org/sat>.

ACT News (2011). *Facts about the ACT*. Retrieved February 20, 2011, from www.act.org/news/aapfacts.html.

AV: Shortchanging Girls, Shortchanging America (19 min., Insight Media)

Through interviews with educators, business executives, and developmentalists, this program explores the devastating effects of gender bias in American education. The program focuses specifically on the loss of self-esteem among girls and illustrates how they often are steered away from science and math curricular tracks.

Critical Thinking Activity: Is Tracking Effective?

Each unit of these resources contains at least one critical thinking exercise designed specifically to test

students' critical thinking about a topic covered in the text. Handout 3 asks students to design an experiment to determine whether tracking is effective.

The answers to this unit's critical thinking activity follow:

1. A viable hypothesis for this experiment would be that the separation of students into tracks based on achievement scores leads to gains in academic performance.
2. The independent variable in an experiment is the factor that is manipulated by the researcher to test the hypothesis. In this case, it would be assigning students to tracks.
3. You would likely use standardized tests to track about half the volunteers and leave the other half untracked. Alternatively, you could randomly assign half of them to the proper track and the other half to a track higher or lower (again randomly) than their scores indicate.
4. The dependent variable in an experiment is always the one that, according to your hypothesis, might be affected by the independent variable. In this case, academic performance after a year or so of your special assignments seems a good choice.
5. You would test the students, assign them to classes, and then retest them.
6. Ideally, the two groups should differ only in the one independent variable—tracking, no tracking, or incorrect tracking. Any other variables that might affect the dependent variable you are measuring—here, academic performance—would need to be controlled. These include student motivation, ability (both the tracked and untracked groups should include a full range of abilities), initial achievement levels, study skills, age, and sex. The results should show whether or not one group (tracked, mistracked high, mistracked low, or not tracked) achieved more than the other.

HANDOUT 1**Developmental Fact or Myth?**

- T F 1. Teenagers tend to overestimate their significance to others.
- T F 2. Unlike younger children, adolescents typically are *not* egocentric in their thought patterns.
- T F 3. Adolescents often create an imaginary audience as they mentally picture how others will react to their behavior and physical appearance.
- T F 4. Egocentrism may be a sign of cognitive maturity rather than irrational thought.
- T F 5. Adolescents are able to reason about propositions that may or may not reflect reality, while younger children are still tied to concrete operational thinking.
- T F 6. The brain has multiple pathways, not all used at once, for processing analytical thinking and intuitive thought.
- T F 7. The organizational structure of most middle schools reflects current developmental research on the best educational system for teens.
- T F 8. Engagement in school typically falls in each consecutive year of high school.
- T F 9. While more U.S. schools are instituting high-stakes tests, East Asian nations are moving in the opposite direction.
- T F 10. Strict punishments and installing metal detectors in high schools are likely to increase violence.

HANDOUT 2 (*continued*)

3. Describe, if you can, the kind of question that typically gives you the most trouble. Note whether or not this type of question requires thinking at the formal operational level.

4. What academic subject areas seem most difficult to you? Can you identify the main sources of difficulty?

HANDOUT 3**Critical Thinking Activity: Is Tracking Effective?**

Now that you have read and reviewed the material on cognitive development during adolescence, take your learning a step further by testing your critical thinking skills on this scientific reasoning exercise.

In an effort to boost achievement, many schools employ tracking, in which students are separated into distinct groups based on standardized tests of ability and achievement. In theory, each class then contains students of about the same ability level, and teachers can direct their presentation to that level to maximize learning. Critics argue that tracking is divisive and damaging, particularly for lower-track students who often face a “dumbed-down” curriculum taught by burned-out teachers.

Your task in this exercise is to design an experiment to determine whether or not tracking is effective in boosting academic achievement in high school students of varying abilities. The principal has rounded up 100 students who have volunteered to serve as subjects. To make sure your study will be valid, she wants answers to the following questions.

1. What might be your hypothesis for this experiment?
2. What would be the independent variable?
3. How would you implement the independent variable, using the 100 volunteers?
4. What would be the dependent variable?
5. How would you perform the actual experiment?
6. What variables would you need to control in order to ensure a valid test of your hypothesis?