Teaching The Adolescent BRAIN

MARCIA D'ARCANGELO

ASCD

Association for Supervision and Curriculum Development

Alexandria, Virginia USA

About the Developers

This guide was developed by Wayne Jennings, University of Minnesota, and Joan Caulfield, University of Missouri–Kansas City, cofacilitators of the Brain-Compatible Learning Network of ASCD and publishers of *The Networker,* a newsletter supported by ASCD Networks, along with Amy Reilly, teacher at Hutchinson Middle School in Hutchinson, Kansas, and Marcia D'Arcangelo, multimedia producer and program manager, ASCD.

The video program was produced by Marcia D'Arcangelo, ASCD, and directed by Dana Sheets, State of the Art, Inc.

We gratefully acknowledge the support and participation of River Middle School, Vintage High School, and Napa New Tech High School, Napa, California; J.E.B. Stuart High School, Falls Church, Virginia; Parkway High School for Peace and Social Justice, Philadelphia, Pennsylvania; and Sacramento New Tech High School, Sacramento, California.

ASCD Staff

Video Production

Marcia D'Arcangelo, *Producer and Program Manager*
Gail Clark Dickson, *Development Team Member*
Scott Willis, *Development Team Member*
Deborah Brown, *Development Team Member*
Deborah Perkins-Gough, *Development Team Member*
Katie Martin, *Development Team Member*
Katherine Checkley, *Development Team Member*
Rebecca Baker, *Development Team Member*
Theresa Lewallen, *Development Team Member*

Manual Production

Mary Beth Nielsen, *Manager, Editorial Services*
Judy Ochse, *Associate Editor*
Kim Pifer, *Copyeditor*
Gary Bloom, *Director, Design and Production Services*
Vivian Coss, *Production Specialist*
Reece Quiñones, *Senior Graphic Designer*
Barton Matheson Willse & Worthington, *Typesetter*

ASCD is a community of educators, advocating sound policies and sharing best practices to achieve the success of each learner. Founded in 1943, ASCD is a nonpartisan, international education association with headquarters in Alexandria, Virginia.

ASCD publications present a variety of viewpoints. The views expressed or implied in the video program and manual should not be interpreted as official positions of the Association.

Copyright © 2006 by the Association for Supervision and Curriculum Development, 1703 North Beauregard Street, Alexandria, VA 22311-1714 USA. All rights reserved. Materials in the Handouts and Overheads and Readings and Resources sections of this manual are intended for use in face-to-face workshops designed as part of this video staff development program. For this purpose, materials in these sections of the guide may be reproduced. Any other use of these materials is prohibited, unless ASCD grants written permission.

Association for Supervision and Curriculum Development
Telephone: 1-800-933-2723, or 1-703-578-9600
Fax: 1-703-575-5400
E-mail: member@ascd.org
Internet: www.ascd.org

ASCD Stock Nos.: Entire Set, 406050; Facilitator's Guide, 406050FG; Tape 1, 406051; Tape 2, 406052; Tape 3, 406053; Tape 4, 406054; DVD, 606050

ISBN Nos: Entire Set, 978-1-4166-0336-8 or 1-4166-0336-0; Facilitator's Guide, 978-1-4166-0341-2 or 1-4166-0341-7; Tape 1, 978-1-4166-0337-5 or 1-4166-0337-9; Tape 2, 978-1-4166-0338-2 or 1-4166-0338-7; Tape 3, 978-1-4166-0339-9 or 1-4166-0339-5; Tape 4, 978-1-4166-0340-5 or 1-4166-0340-9; DVD, 978-1-4166-0347-4 or 1-4166-0347-6

11 10 09 08 07 06 10 9 8 7 6 5 4 3 2 1

TEACHING THE ADOLESCENT BRAIN

Introduction

Teaching the Adolescent Brain 3
Assumptions 4
Purpose of the Series 5
About the Series 5
Use of the Facilitator's Guide 6
Role of the Facilitator 7

Workshops

Program 1: *Almost Adults*
Workshop 1A 15
Workshop 1B 19
Program 2: *The Engaged Teen*
Workshop 2A 27
Workshop 2B 30
Program 3: *The Reflective Teen*
Workshop 3A 37
Workshop 3B 40
Program 4: *Know Your Brain . . . Know Yourself*
Student Session 47

Handouts and Overheads

Handout 1 Viewpoints 53
Handout 2 Self-Assessment Radar 55
Handout 3 Lotus Blossom Organizer 57
Handout 4 Get the Gist 59
Handout 5 Key Points 61
Handout 6 Reflection 63
Handout 7 Strategies 65
Handout 8 Personalizing Education Web 67
Handout 9 Multiple Intelligences Review 69
Handout 10 Table Talk 71
Handout 11 Implications of Learning Research 73
Handout 12 Challenges and Interventions 75
Handout 13 What Is Metacognition? 77
Handout 14 Metacognitive Strategy Quick Find 79
Handout 15 True or False? 81
Handout 16 K-W-L 83
Handout 17 Did You Know? 85

Overhead 1 Objectives for Workshop 1 87
Overhead 2 Viewpoints 89
Overhead 3 Lotus Blossom Organizer 91
Overhead 4 Objectives for Workshop 2 93
Overhead 5 Objectives for Workshop 3 95
Overhead 6 Objectives for Program 4 97
Overhead 7 Desirable Behaviors 99
Overhead 8 Risky Teen Behaviors 101

Readings and Resources

Reading 1 "The Adolescent Brain: A Work in Progress," by P. Wolfe . . 105
Reading 2 "What Makes Teens Tick," by C. Wallis 111
Reading 3 "Moving Your School to Brain Compatibility," by W. Jennings and J. Caulfield 119
Reading 4 "Safe Schools for the Roller Coaster Years," by L. Inlay. . . 123
Reading 5 "A Case for School Connectedness," by R. W. Blum 127

References 131
Resources 132

Introduction

Any new theory is first attacked as absurd. Then it is admitted to be true, but obvious and insignificant. Finally, it seems to be important, so important that its adversaries claim they themselves discovered it.

—William James

Teaching the Adolescent Brain

Is teaching an art or a science? The long-standing debate over this question continues to rage among educators. Those who believe the former argue that teachers are born, not made, whereas proponents of the latter believe that a deliberate approach to students and curriculum built on enthusiasm and zest can, indeed, create great teachers. The truth is, of course, that teaching is both an art and a science, but science plays a particularly important role when it comes to secondary education.

Secondary teachers face the challenge of dealing with a unique type of science: the psychology and biology of adolescence. When confronted with "tweens" and teens' glaring indifference to well-planned lessons, teachers, unsurprisingly, begin to question whether the task at hand—namely, reaching their students—is possible. Many conclude that reaching all of their students simply isn't realistic and instead settle for the handful who do respond.

We believe, however, that the Holy Grail of reaching all students is attainable by understanding the adolescent brain and knowing how to energize and engage it. We offer no magic wand, no bag of tricks or set of procedures that will work under all conditions for all teachers. Rather, our goal is to give teachers new strategies to use in the classroom as well as new insights into the ever-changing adolescent brain, and to suggest what the implications may be for designing teaching and learning experiences.

Some critics believe that we do not yet know enough to bridge the gap between neuroscience and education, arguing that although the research is certainly promising, we are not ready to apply it to the classroom. Others discount neuroscience's relevance altogether, contending that it has little to say to desperate educators seeking solutions to complex problems. In sum, they posit that, guided by the best of intentions, educators may adopt ineffective or even counterproductive strategies based on unfounded claims that they are proven by brain research.

The critics are correct on at least one point—we still have much to learn about the way the brain works. Essentially, we are in the Model T era of brain research. What we do know, however, is that in terms of storage the

brain is more like a sieve than a closed container. Information without relevance simply passes through. Teachers have tremendous amounts of information to impart to students and making this information relevant is key.

Knowledge of adolescent brain functions can help teachers design better, more effective learning activities, but the conditions under which those activities are introduced places limitations on the outcomes. For example, teaching five or six classes of 30 students each day does a disservice to both teachers and students; under such constrained conditions, the necessary elements for optimal engagement and learning simply cannot exist. Thankfully, no matter the obstacles teachers may face, a number of exciting, research-based strategies exist that can broaden their teaching palette and help ensure learning for even the most reluctant adolescent.

Assumptions

In this guide, we offer strategies led by common sense assumptions about the brain based on what research and successful educational practice tell us. Yes, we still have much to learn about the mysterious world of neurons, synapses, and neural chemicals, but this does not have to stop us from proposing effective teaching and learning strategies that are congruent with adolescents' developing brains. The following assumptions guide us in this effort:

1. **Brain-compatible education is not a fad or another educational experiment.** Because neuroscience can provide useful insights about new ways to work with students, brain-compatible education holds the promise of genuine reform. Those who are critical consumers of brain research read, discuss, and search out or provide quality staff development and can combine knowledge gleaned from the available research with the experiential wisdom that teaching brings.

2. **The brain changes physiologically as a result of experience.** To a large extent, external environment determines how the brain will develop and function. This finding is based on research done by Marian Diamond et al. (1998) that established the concept of neural plasticity, the brain's ability to change its structure and function in response to external experiences.

3. **Intelligence is multiple.** Howard Gardner posits that human intelligence encompasses a far wider and more universal set of competencies than a single general intelligence reflected by an IQ score. Working with a carefully crafted set of criteria, Gardner has identified

eight different intelligences and allows for the strong possibility that even more exist. Understanding and utilizing multiple intelligences in the classroom opens the door for academic success for adolescents.

4. **The adolescent brain is not fully developed.** Educators once followed the widely accepted assumption that, in terms of brain development, students entering puberty are essentially adults. But scientists have discovered that adolescents do not gather and process information in the same way adults do. In fact, neuroscientists have discovered that adolescents' brains continue to change well into their 20s. What this means for teaching and learning depends on educators' keeping up with new discoveries in brain research and considering how to apply this knowledge in the classroom.

Purpose of the Series

The primary purpose of this professional development series is to focus on effective teaching practices that optimize the vitality and unique characteristics of the adolescent brain. The series will look at the structural and functional changes that occur in the developing brains of healthy teens and explore the implications these physical changes might have for changes in teens' cognition and behavior.

The secondary purpose of the series is to provide information that teachers can share with their students about teen brain development and how that development relates to learning to function as a self-regulating adult.

About the Series

This video-based staff development series consists of four video programs and a facilitator's guide. It is intended to support teachers, administrators, students, and other stakeholders interested in learning about the adolescent brain and to offer effective approaches to reaching adolescents in the classroom. This guide includes detailed agendas and activities for seven workshops—two workshops for each of the first three video programs and one workshop for the fourth video program—as well as handouts, overheads, and additional readings and resources.

Program 1, *Almost Adults*, sets the context for exploring the role of the brain in the teen years in terms of academic learning and behavioral choices. Through interviews with neuroscientists, cognitive psychologists, educators, and students, participants explore the intricacies of the adolescent brain and the implications for effective teen-specific teaching practices.

Program 2, *The Engaged Teen*, builds on the rationale presented in Program 1 to illustrate classroom practices that support academic learning in the teen years. The program shows how teachers can personalize education and emphasize its relevance in teens' lives by connecting content to the real world. The program also considers the influence of emotion and engagement in the learning process.

Program 3, *The Reflective Teen*, focuses on how educators can positively support teen behaviors that are likely to promote learning. It explores the role of school connectedness and relationship building. This program also highlights the importance of teaching kids metacognitive strategies to help them monitor and direct their own behavior.

Although many of the issues explored throughout the series are framed from a student's perspective, Programs 1–3 are nonetheless designed primarily with educators in mind. Program 4, *Know Your Brain . . . Know Yourself*, however, is tailored specifically to students. It explains why adolescence can be so challenging, at least in terms of how the brain is working during these years. The program can serve as a vehicle for discussing issues with students in the classroom. It can also serve parents interested in gaining greater insight into what's going on inside their teenager's head.

Two workshop formats are provided for each video program. The first workshop format is approximately 60–90 minutes long and gives participants an opportunity to view the video program in its entirety and to reflect on and share broad reactions and perspectives about the issues addressed. The second, longer workshop format is approximately three hours long. During the longer workshop, participants may wish to view the video program in segments. With both formats, the activities, supplemental readings, and discussions are designed to deepen participants' understanding of specific issues and give them an opportunity to consider how to apply certain strategies in the classroom.

Use of the Facilitator's Guide

As the facilitator of this workshop series, keep in mind that because people frequently have different perceptions about the same experience, participants will learn more if they are allowed to discuss their different insights than if they simply watch the video segments with no follow-up. Moreover, viewing a video can often be a passive activity, much like watching television, unless careful preparation has been made to turn viewing into an intellectually active experience by providing the

viewer with appropriate previewing discussion activities and follow-up activities. The follow-up activities can promote further reflection and can support the participants' efforts to plan for the effective application of the ideas presented in the program.

This guide is designed to help you get the best possible benefits from the video series. The workshop activities and discussion questions included here can serve as a starting point. However, your choice of activities and questions should certainly not be limited to those contained in the guide. Indeed, facilitators should encourage participants to raise their own questions based on the particular needs or concerns of their school, district, or community.

This guide contains four sections:

- The **Introduction** presents an overview of the philosophy, principles, and research pertaining to teaching the adolescent brain, as well as a description of the video program participants will review.
- The **Workshops** section provides agendas, materials, and information needed for the facilitator to plan and conduct two different workshops for each video program in the series (with the exception of Program 4, which has only one session). Because the workshops are designed as a cohesive whole, participants should be encouraged to attend as many as possible.
- The **Handouts and Overheads** section lists the materials to be duplicated and distributed to participants in each workshop. They include camera-ready masters for overhead transparencies that are incorporated within the various workshop sessions.
- The **Readings and Resources** section includes a select collection of readings. These articles may be duplicated and distributed to workshop participants for independent reading or incorporated within the workshop formats. In addition, this section includes a list of resources on the adolescent brain.

Role of the Facilitator

As facilitator of these workshops, you could be a staff developer, site-based or central office administrator, teacher, counselor, parent, or community member. Regardless of your background, as leader, your preparation and openness to discussion will help your group get the most benefit from this program. Remember, you may be showing this video to

a group of individuals with varying levels of knowledge and experience. Therefore, your background knowledge and outside reading will be beneficial.

As a facilitator, you have several major responsibilities:

Read and View the Materials.

Your initial preparation should include viewing the video program(s) you are going to use in your workshop, reading the Introduction, and studying the workshop format(s) you plan to use. A thorough reading of the articles in the Readings and Resources section prior to the workshop will be beneficial as you lead participants through the discussion and activities.

Prepare the Program Activities.

You'll want to review the workshop guides and handouts, duplicate materials, and provide needed equipment and supplies for the workshop.

Check the Room and the Seating Arrangements.

Reserve a room that is large enough, with ample seating for the number of participants you expect to attend, and ensure that it is conducive to small-group discussions.

Arrange for the Necessary Video and Audiovisual Equipment.

Arrange for a working VCR or DVD player and monitor (one 23–25-inch monitor will suffice for up to 25 participants), ensure proper electrical fitting, and make sure you have sufficient power cords with adapters for the VCR or DVD player. Plug in both machines to ensure their working condition and to make sure that the electrical outlets in the reserved room are in working order. If the room is large, you may need a microphone and speakers. If you plan to use overheads, make sure you have a working overhead projector, screen, and extra transparencies and markers, if you need them. Provide a flipchart and markers, or chalk and eraser for a chalkboard.

Prepare Materials.

Duplicate enough handouts for all participants, as well as supplementary readings you would like to distribute. Prepare overhead transparencies from the Overheads section of this guide and duplicate any overheads you wish to use as handouts.

Announce the Program.

In your announcements or invitations, give sufficient notice and clearly specify the day of the week, date, time, and location for the program. Remind participants to bring pencils and notepads. If parents, business leaders, or community members are invited, they may need more advance notice than school or district staff members.

Make Other Arrangements.

Prepare an agenda, including time for breaks. Arrange for refreshments, if desired.

Workshops

Program 1

Workshop 1A

This workshop accompanies Program 1, *Almost Adults,* and explores how brain development during the adolescent years can affect teens' cognitive and behavioral functions in the classroom.

The following agenda includes the time required for viewing the video and suggested times for completing the workshop activities. You may wish to adjust the time schedule, modify some activities, or delete an activity to meet the needs and interests of your group.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introductions	15
Introduction to the Video	20
View Program 1, *Almost Adults*	30
Reflection and Discussion	20
Conclusion	5
Total Approximate Workshop Time	90 minutes

Workshop 1A Objectives

- Understand the anatomical changes taking place in the adolescent brain.
- Consider how these changes might affect cognitive and behavioral functions.
- Consider the implications of these changes for classroom practice.

Materials List for Workshop 1A

- Handout 2, Self-Assessment Radar
- Handout 3, Lotus Blossom Organizer
- Handout 4, Get the Gist
- Overhead 1, Objectives for Workshop 1
- Overhead 3, Lotus Blossom Organizer
- Reading 1, "The Adolescent Brain: A Work in Progress"
- Reading 2, "What Makes Teens Tick"
- Overhead projector and screen

Facilitator's Note

You may wish to provide copies of some of the readings found in the Readings and Resources section of this guide. You can distribute these either before the workshop as an introduction to the topic or after the workshop as a review. Providing folders with all the materials inside is an efficient way to distribute handouts and other resources. You may also wish to provide name tags.

Welcome and Introductions (15 minutes)

1. Welcome all participants. Introduce yourself and explain your role as workshop facilitator. As the facilitator, you will guide the group through the workshop to help them meet the workshop objectives.

Facilitator's Note

If the group comprises individuals from several schools, you might suggest that participants from the same school sit together for group activities. This will encourage them to think of strategies and implications of the material for their own school or classrooms.

2. Depending on the size of the group and whether the participants know one another, you may want to set aside time for participants to introduce themselves individually.
3. Display Overhead 1, Objectives for Workshop 1, and explain the goals of the workshop.
4. Summarize key points from the Introduction section of this manual in your own words.

Introduction to the Video (20 minutes)

1. Explain to participants that this video is the first part of a three-part series that focuses on what research says about the adolescent brain. The series will explore new research in neuroscience and cognitive psychology and suggest possible implications for classroom practice. This video will establish a context for exploring the role of the brain in the teen years in terms of academic learning and behavioral choices.

Facilitator's Note

The self-assessment radar is a way of assessing previous knowledge on a given subject before a workshop is presented.

2. Distribute Handout 2, Self-Assessment Radar, and review it with participants.

   Participants rate their current level of understanding on a 0–5 numbered scale (located in the bottom-left corner) and add up their composite score. Because this is new knowledge for most participants, scores will be low. After Workshop 3 is presented, the radar will be used again as a post-workshop knowledge evaluation. As participants' knowledge increases, so, too, should their radar scores.

   Say the following to participants:

   - **You are about to rate your knowledge of the items listed on each spoke of the "radar" in front of you. Use the key in the lower left-hand corner to guide your responses. Once you've completed your rating, add up the numbers circled on each spoke and put your composite score at the top of the page. If**

you attend Workshop 3A or 3B, you will see this radar again. At the conclusion of those workshops, you will complete the same radar and compare your scores.

3. When participants are finished with the self-assessment radar, distribute Handout 3, Lotus Blossom Organizer, and tell participants they will be using this note-taking tool as they watch the video. Display Overhead 3, Lotus Blossom Organizer, and explain that the center square contains the main topic—in this case, "The Adolescent Brain." The circles within the center square represent possible subtopics that can then be represented in the organizer's adjacent squares, as illustrated by the expansion of the subtopic "Possible Strategies" in the lower right-hand corner of the overhead.

4. Ask participants to refer to their radar handout and select up to eight subtopics to watch for as they view the video.

Facilitator's Note

Participants may also choose subtopics of interest to them that don't appear on the radar screen. Suggest that participants keep their radars for future reference.

View Program 1, *Almost Adults* (30 minutes)

1. Suggest that participants use Handout 3, Lotus Blossom Organizer, for taking notes on the subtopics they've selected as they view the video.

2. Show Program 1, *Almost Adults*.

Reflection and Discussion (20 minutes)

1. Distribute Handout 4, Get the Gist. Have participants reflect on the notes they took using the Lotus Blossom Organizer and respond independently to the questions on Handout 4.

2. When participants have completed the handout, ask them to share their thoughts with a colleague and then share them with the larger group (this is called the Think/Pair/Share strategy).

3. If you are using the optional readings suggested for this workshop, distribute Reading 1, "The Adolescent Brain: A Work in Progress." Suggest that participants read the article after the workshop to further their understanding of the adolescent brain. However, if time permits, you may allow participants to read the article during the workshop, followed by discussion in small groups or with all participants. Allow a minimum of 30 minutes for this additional activity.

Conclusion (5 minutes)

1. Review the workshop objectives and address any questions or concerns participants still have.
2. Distribute copies of Reading 2, "What Makes Teens Tick," by Claudia Wallis. Tell participants this article provides a review of the information covered in the workshop and that if they plan on attending Workshop 2B, they should bring the article with them.
3. Thank the participants for attending the workshop, and invite them to attend the rest of the workshops in the series. Mention that if they are planning on attending Workshop 1B, they might want to review the handouts, readings, and notes from this workshop.

Workshop 1B

This workshop is designed for use with Program 1, *Almost Adults,* and is approximately three hours in length. During the workshop, participants explore their understanding of the teenage brain and consider how new information from the fields of neuroscience and cognitive psychology can inform classroom practice. The workshop is intended for those who want to take part in in-depth conversation and learning about the changes teens undergo in the cognitive and affective domains. It offers a relaxed pace with extra time for reflection, discussion, and shared note taking. Possible participants for this workshop format include school improvement teams, faculty or staffs, task forces, parent-teacher groups, leadership teams, central office administrators, and school board members.

This workshop format provides activities for a half-day session for 10–100 participants. If the workshop must be shorter than the suggested time, you can eliminate portions of the activities as appropriate. Depending on the length of your workshop, you might want to schedule an additional break. If you are able to allot additional time for the workshop, you might also want to show the video in segments rather than playing it in its entirety.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introductions	20
Introduction to the Video	20
View Program 1, *Almost Adults*	30
Break	20
Reflection and Discussion	20
Supporting Activities	55
Conclusion	15
Total Approximate Workshop Time	3 hours

Workshop 1B Objectives

- Understand the anatomical changes taking place in the adolescent brain.
- Consider how these changes might affect cognitive and behavioral functions.
- Consider the implications of these changes for classroom practice.

Materials List for Workshop 1B

Facilitator's Note

You may wish to provide copies of some of the readings suggested in the Readings and Resources section of this guide. Select information that is relevant to your participants' needs and concerns. You can distribute it to participants either before the workshop as an introduction to the topic or after the workshop as a review. Providing folders with all the materials inside is an efficient way to distribute handouts and other resources. You may also wish to provide name tags.

- Handout 1, Viewpoints
- Handout 2, Self-Assessment Radar
- Handout 3, Lotus Blossom Organizer
- Handout 4, Get the Gist
- Handout 5, Key Points
- Handout 6, Reflection
- Overhead 1, Objectives for Workshop 1
- Overhead 2, Viewpoints
- Overhead 3, Lotus Blossom Organizer
- Reading 1, "The Adolescent Brain: A Work in Progress"
- Reading 2, "What Makes Teens Tick"
- Overhead projector and screen
- Flip chart or blank overhead transparencies and markers

Welcome and Introductions (20 minutes)

1. Welcome all participants. Introduce yourself and explain your role as workshop facilitator. As the facilitator, you will guide the group through the workshop to help them meet the workshop objectives.

Facilitator's Note

If the group comprises individuals from several schools, you might suggest that participants from the same school sit together for group activities. This will encourage them to think of strategies and implications of the material for their own school or classrooms.

2. Depending on the size of the group and whether the participants know one another, you may want to set aside time for participants to introduce themselves individually.
3. Display Overhead 1, Objectives for Workshop 1, and explain the goals of the workshop.
4. Summarize key points from the Introduction section of this manual in your own words.
5. Distribute Handout 1, Viewpoints, and display Overhead 2, Viewpoints. Invite participants to choose one of the quotes and discuss its possible relevance to the workshop with a partner.

Introduction to the Video (20 minutes)

1. Explain to participants that this video is the first part of a three-part series that focuses on what research says about the adolescent brain. The series will explore new research in neuroscience and cognitive psychology and suggest possible implications for classroom practice. This video will establish the context for exploring the role of the brain in the teen years in terms of academic learning and behavioral choices.

2. Distribute Handout 2, Self-Assessment Radar, and review it with participants.

   Participants rate their current level of understanding on a 0–5 numbered scale (located in the bottom-left corner) and add up their composite score. Because this is new knowledge for most participants, scores will be low. After Workshop 3 is presented, the radar will be used again as a post-workshop knowledge evaluation. As participants' knowledge increases, so, too, should their radar scores.

   Say the following to participants:

   - **You are about to rate your knowledge of the items listed on each spoke of the "radar" in front of you. Use the key in the lower left-hand corner to guide your responses. Once you've completed your rating, add up the numbers circled on each spoke and put your composite score at the top of the page. If you attend Workshop 3A or 3B, you will see this radar again. At the conclusion of those workshops, you will complete the same radar and compare your scores.**

3. When participants are finished with the self-assessment radar, distribute Handout 3, Lotus Blossom Organizer, and tell participants they will be using this note-taking tool as they watch the video. Display Overhead 3, Lotus Blossom Organizer, and explain that the center square contains the main topic—in this case, "The Adolescent Brain." The circles within the center square represent possible subtopics that can then be represented in the organizer's adjacent squares, as illustrated by the expansion of the subtopic "Possible Strategies" in the lower right-hand corner of the overhead.

Facilitator's Note

The self-assessment radar is a way of assessing previous knowledge on a given subject before a workshop is presented.

Facilitator's Note

Participants may also choose subtopics of interest to them that don't appear on the radar screen. Suggest that participants keep their radars for future reference.

4. Ask participants to refer to their radar handout and select subtopics to watch for as they view the video.

View Program 1, *Almost Adults* (30 minutes)

1. Suggest that participants use Handout 3, Lotus Blossom Organizer, for taking notes on the subtopics they've selected as they view the video.
2. Show Program 1, *Almost Adults*.

Facilitator's Note

The placement of breaks is merely a suggestion. Use your own discretion in regard to placement and length of breaks.

Break (20 minutes)

Reflection and Discussion (20 minutes)

1. Distribute Handout 4, Get the Gist. Have participants complete the handout independently and then share their thoughts with a colleague.
2. Invite volunteers to share their thoughts about the video with the entire group.

Supporting Activities (55 minutes)

1. Distribute Reading 1, "The Adolescent Brain: A Work in Progress," and Handout 5, Key Points.
2. Set up a jigsaw strategy by dividing the participants into groups of four members each. These groups will become the "home groups." Have individuals in the home groups number off from one to four. Have all the ones get together in a certain part of the room, all the twos in a different part of the room, all the threes in another part of the room, and so on.
3. Ask the ones to read from the beginning of the article through "The Growth Spurt and Pruning" section. Have the twos start reading at the "Myelination During Adolescence" section and stop just before the "Substance Abuse and the Adolescent Brain" section. The threes will start reading at the "Substance Abuse and the Adolescent Brain" section and stop at the end of the "Nicotine" section. The fours will start with "Adolescent Sleep Patterns Are Different" and read through to the end of the article. Allow approximately 10–15 minutes for participants to complete the reading.

4. Ask each numbered group to discuss their section of the reading and come to consensus on the key points they want to share with their home groups when they reconvene. Direct them to use Handout 5, Key Points, to record these points. Allow approximately 10 minutes for this activity.

5. When the groups have had time to share and discuss the key points from their sections of the article, ask the participants to return to their home groups and share the information they gathered from their reading groups. Allow approximately 10 minutes for this activity.

6. When the groups have had time to share, take about 10–15 minutes to conduct a whole-group discussion about what participants learned from the workshop and how this new knowledge may influence their classroom practices.

Conclusion (15 minutes)

1. Distribute Handout 6, Reflection. Give participants a few minutes to complete this activity. Invite several volunteers to share their thoughts with the entire group.

2. Review the workshop objectives, address any questions or concerns participants still have, and distribute copies of Reading 2, "What Makes Teens Tick." Tell participants that this article elaborates on the information covered in the workshop and that if they plan to attend Workshop 2B, they should bring the article with them.

3. Thank the participants for attending the workshop, and invite them to attend the other workshops in the series.

Facilitator's Note

Consider helping participants focus on and retain the strategies and thoughts offered by others by writing their responses on a flip chart, chalkboard, or blank overhead transparency.

Program 2

Workshop 2A

This workshop is designed to accompany Program 2, *The Engaged Teen*. This program illustrates classroom practices that support cognitive processes in the teen years. It shows how teachers can personalize education and emphasize its relevance in teens' lives by connecting content to the real world, thereby helping teens see the purpose of education.

The following agenda includes the time required for viewing the video and suggested times for completing the workshop activities. You may wish to adjust the time schedule, modify some activities, or delete an activity to meet the needs and interests of your group.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introductions	10
Introduction to the Video	15
View Program 2, *The Engaged Teen*	40
Reflection and Discussion	15
Conclusion	10
Total Approximate Workshop Time	90 minutes

Workshop 2A Objectives

- Explore classroom practices that support academic learning.
- Consider strategies for personalizing education.
- Learn the importance of connecting the classroom and the real world.

Materials for Workshop 2A

- Handout 3, Lotus Blossom Organizer
- Handout 6, Reflection
- Handout 9, Multiple Intelligences Review
- Overhead 3, Lotus Blossom Organizer
- Overhead 4, Objectives for Workshop 2
- Reading 3, "Moving Your School to Brain Compatibility"
- Overhead projector and screen

Facilitator's Note

You may wish to provide copies of some of the readings suggested in the Readings and Resources section of this guide. Select information that is relevant to your participants' needs and concerns. You can distribute it to participants either before the workshop as an introduction to the topic or after the workshop as a review. Providing folders with all the materials inside is an efficient way to distribute handouts and other resources. You may also wish to provide name tags.

Welcome and Introductions (10 minutes)

1. Welcome all participants. Introduce yourself and explain your role as workshop facilitator. As the facilitator, you will guide the group through the workshop to help them meet the workshop objectives.

Facilitator's Note

If the group comprises individuals from several schools, you might suggest that participants from the same school sit together for group activities. This will encourage them to think of strategies and the implications of the material for their own school or classrooms.

2. Depending on the size of the group and whether the participants know one another, you might want to set aside time for participants to introduce themselves individually.

3. Summarize key points from the introduction section of this manual in your own words.

Introduction to the Video (15 minutes)

1. Explain to participants that this video is the second part of a four-part series that focuses on what research says about the adolescent brain. This video looks at classroom practices that encourage academic learning in the teen years.

2. Display Overhead 4, Objectives for Workshop 2. Discuss the objectives with the group.

3. Distribute Reading 3, "Moving Your School to Brain Compatibility," and give participants about 10 minutes to read it.

View Program 2, *The Engaged Teen* (40 minutes)

1. Distribute Handout 3, Lotus Blossom Organizer, and tell participants they will be using this note-taking tool as they watch the video. Display Overhead 3, Lotus Blossom Organizer, and explain that the center square contains the main topic—in this case, "The Adolescent Brain." The circles within the center square represent possible subtopics that can then be represented in the organizer's adjacent squares, as illustrated by the expansion of the subtopic "Possible Strategies" in the lower right-hand corner of the overhead. Ask participants to work with a partner and select several ideas from the reading that they want to watch for in the video. Tell them to write these topics in the boxes of the Lotus Blossom Organizer and take notes as they watch the video.

2. Show Program 2, *The Engaged Teen*.

Reflection and Discussion (15 minutes)

1. Ask participants to review their notes on the video and discuss their observations in groups of four.

2. Distribute Handout 9, Multiple Intelligences Review, and tell the participants that this handout is just a review of what they already know about multiple intelligences. Allow a few minutes for perusal of and brief discussion about the handout.

Conclusion (10 minutes)

1. Distribute Handout 6, Reflection. Give participants a few minutes to complete the handout activity. Invite several volunteers to share their thoughts with the entire group.
2. Review the workshop objectives and address any questions or concerns the participants may still have.
3. Thank the participants for attending the workshop and invite them to attend the other workshops in the series. Mention that if they are planning on attending Workshop 2B, they might want to review the handouts, reading, and notes from this workshop.

Workshop 2B

This workshop accompanies Program 2, *The Engaged Teen,* and is approximately three and a half hours in length. During the workshop, participants will explore classroom practices designed to appeal to teens' interests and help them see the relevance of education.

This workshop format provides activities for a half-day session for 10–100 participants. If the workshop must be shorter than the suggested time, you can eliminate portions of the activities as appropriate. Depending on the length of your workshop, you might want to schedule an additional break. If you are able to allot additional time for the workshop, you might also want to show the video in segments rather than playing it in its entirety.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introductions	15
Introduction to the Video	45
View Program 2, *The Engaged Teen*	30
Break	20
Reflection and Discussion	40
Supporting Activities	40
Conclusion	15
Total Approximate Workshop Time	3 hours, 25 minutes

Workshop 2B Objectives

- Explore classroom practices that support academic learning.
- Consider strategies for personalizing education.
- Learn the importance of connecting the classroom and the world.

Materials List for Workshop 2B

- Handout 3, Lotus Blossom Organizer
- Handout 6, Reflection
- Handout 7, Strategies
- Handout 8, Personalizing Education Web
- Handout 9, Multiple Intelligences Review

- Handout 10, Table Talk
- Handout 11, Implications of Learning Research
- Overhead 3, Lotus Blossom Organizer
- Overhead 4, Objectives for Workshop 2
- Reading 2, "What Makes Teens Tick"
- Reading 3, "Moving Your School to Brain Compatibility"
- Overhead projector and screen
- Blank overhead transparencies and markers
- Flip chart paper and markers

Facilitator's Note

You may wish to provide copies of some of the readings suggested in the Readings and Resources section of this guide. Select information that is relevant to your participants' needs and concerns. You can distribute it to participants either before the workshop as an introduction to the topic or after the workshop as a review. Providing folders with all the materials inside is an efficient way to distribute handouts and other resources. You may also wish to provide name tags.

Welcome and Introductions (15 minutes)

1. Welcome all participants. Introduce yourself and explain your role as workshop facilitator. As the facilitator, you will guide the group through the workshop to help them meet the workshop objectives.
2. Depending on the size of the group and whether the participants know one another, you may want to set aside time for participants to introduce themselves individually.
3. Display Overhead 4, Objectives for Workshop 2. Discuss the objectives with the group.
4. Distribute copies of Reading 2, "What Makes Teens Tick," and ask participants to look at the graphics. Then ask participants to review with a partner or in triads what they remember about the adolescent brain from the previous workshop. If participants have not attended Workshop 1A or 1B, ask them to review the graphics and discuss the brain anatomy illustrated.

Facilitator's Note

If the group comprises individuals from several schools, you might suggest that participants from the same school sit together for group activities. This will encourage them to think of strategies and the implications of the material for their own school or classrooms.

Introduction to the Video (45 minutes)

1. Explain that this workshop is suggested for those who want to more completely understand what types of strategies are most likely to engage adolescents in learning.
2. Distribute Reading 3, "Moving Your School to Brain Compatibility," and ask participants to read it. Allow about 15 minutes for participants to complete the reading.

3. Distribute Handout 7, Strategies, and ask participants to work in pairs to brainstorm strategies that would support the brain-compatible components reflected in Reading 3. Allow about 10 minutes for this activity.

4. Distribute Handout 8, Personalizing Education Web, and ask participants to fill in the web by considering the statement in the middle circle. Share results as a group or in triads. If results are shared by the whole group, consider recording participants' thoughts on a blank transparency.

View Program 2, *The Engaged Teen* (30 minutes)

1. Explain to participants that this program will show how teachers can personalize education and emphasize its relevance in teens' lives by connecting content to the real world, thereby helping teens see the purpose of education. These practices emphasize the importance of teaching strategies to promote intrinsic motivation. The program will also consider the influence of emotion and engagement in the learning process.

2. Distribute Handout 3, Lotus Blossom Organizer, and ask participants to note the various ways teachers engage students in the video and consider how they contribute to personalizing education. Display Overhead 3, Lotus Blossom Organizer, and explain that the center square contains the main topic—in this case, "The Adolescent Brain." The circles within the center square represent possible subtopics that can then be represented in the organizer's adjacent squares, as illustrated by the expansion of the subtopic "Possible Strategies" in the lower right-hand corner of the overhead.

3. Show Program 2, *The Engaged Teen*.

Facilitator's Note

The placement of breaks is merely a suggestion. Use your own discretion in regard to placement and length of breaks.

Break (20 minutes)

Reflection and Discussion (40 minutes)

1. Ask participants to review their notes on the video and discuss their observations in groups of four.

2. After approximately 10 minutes, distribute Handout 9, Multiple Intelligences Review, and tell the participants that this handout provides a review of what they may already know about multiple intelligences. Ask participants to briefly discuss within their small groups the value of using different strategies to address different intelligences.

3. Ask participants to write down the names of five students who currently struggle in their classrooms. Have the participants think about those particular students' "strong" intelligence and assess whether they currently are using any of the teaching strategies recommended for that intelligence listed in the right-hand column of Handout 9. Ask them to consider what their struggling students could achieve if they were taught using a variety of strategies. Allow approximately 15 minutes for this activity.

4. Have participants share their conclusions with the whole group.

5. Refer participants again to Handout 8, Personalizing Education Web, and ask them to list several additional ways they would like to try personalizing education in the future.

Facilitator's Note

Consider helping participants focus on and retain the comments offered by others by writing their responses on an overhead transparency.

Supporting Activities (40 minutes)

1. Ask participants to form groups of four to six. Give a sheet of chart paper to each group. Distribute Handout 10, Table Talk, and give participants a few minutes to review the rules of the game supplied on the handout. Invite each group to write the reflection question in the center of the chart paper. Ask participants to follow the rules of table talk and respond to the question, using knowledge they gained through watching the video and reading Reading 3, "Moving Your School to Brain Compatibility." Explain that as facilitator you will let the "discussion" unfold and will join in by circling ideas you think the group should expand upon, by writing questions about a particular comment, and/or by drawing a line connecting two interesting ideas or comments that you think the group should explore. Give participants approximately 10–15 minutes to do this activity, and then have the small groups share their conclusions with the larger group.

Facilitator's Note

Consider helping participants focus on and retain the comments offered by others by writing their responses on an overhead transparency.

2. Distribute Handout 11, Implications of Learning Research. Ask participants to read the handout and discuss the information it provides within their small groups. Allow approximately 10 minutes for this activity. Next, invite groups to pick their "top five" findings from the handout—that is, the findings they feel are most important. Allow approximately 5 minutes for this portion of the activity. Finally, ask the small groups to pick a representative to explain to the whole group their "top five" choices.

Conclusion (15 minutes)

1. Distribute Handout 6, Reflection, and ask participants to complete it. Invite several volunteers to share their thoughts with the entire group.
2. Review the workshop objectives and address any questions or concerns the participants may still have about strategies for personalizing education.
3. Thank the participants for attending the workshop, and invite them to attend the other workshops in the series.

Program 3

Workshop 3A

This workshop accompanies Program 3, *The Reflective Teen*. It builds on opportunities provided by the previous workshops in the series to explore how educators can facilitate the development of teens' ability to reflect on their learning and on their behavioral choices.

The following agenda includes the time required for viewing the video and suggested times for completing the workshop activities. You may wish to adjust the time schedule, modify some activities, or delete an activity to meet the needs and interests of your group.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introductions	10
Introduction to the Video	15
View Program 3, *The Reflective Teen*	30
Reflection and Discussion	25
Conclusion	10
Total Approximate Workshop Time	90 minutes

Workshop 3A Objectives

- Understand the influence of brain development on teen cognition and behavior.
- Understand how educators can positively influence teen behaviors.
- Understand the relationship between students' feelings of connectedness to school and student achievement.

Materials List for Workshop 3A

- Handout 2, Self-Assessment Radar
- Handout 3, Lotus Blossom Organizer
- Handout 12, Challenges and Interventions
- Overhead 3, Lotus Blossom Organizer
- Overhead 5, Objectives for Workshop 3
- Reading 4, "Safe Schools for the Roller Coaster Years"
- Blank transparencies and markers

Facilitator's Note

You may wish to provide copies of some of the readings suggested in the Readings and Resources section of this guide. Select information that is relevant to your participants' needs and concerns. You can distribute it to participants either before the workshop as an introduction to the topic or after the workshop as a review. Providing folders with all the materials inside is an efficient way to distribute handouts and other resources. You may also wish to provide name tags.

- Overhead projector and screen
- Flip chart or white board, markers or chalk

Welcome and Introductions (10 minutes)

1. Welcome all participants. Introduce yourself and explain your role as workshop facilitator. As the facilitator, you will guide the group through the workshop to help them meet the workshop objectives.
2. Depending on the size of the group and whether the participants know one another, you may want to set aside time for participants to introduce themselves individually.
3. Summarize key points from the Introduction section of this manual in your own words.

Facilitator's Note

If the group comprises individuals from several schools, you might suggest that participants from the same school sit together for group activities. This will encourage them to think of strategies and the implications of the material for their own school or classrooms.

Introduction to the Video (15 minutes)

1. Explain to participants that this is the third of a four-part series that focuses on what research says about the adolescent brain. The video used for this workshop explores teen brain development in terms of teens' ability to reflect on and modify their behavior.
2. Display Overhead 5, Objectives for Workshop 3. Discuss the objectives with the group.
3. Distribute Handout 12, Challenges and Interventions. Ask participants to consider specific challenges that students in their classroom, school, or district face with regard to managing their emotions and their thinking. Allow approximately 10 minutes for participants to reflect and to record their thoughts on the handout. Tell them that they will be filling out the Intervention column once they've watched the video.

View Program 3, *The Reflective Teen* (30 minutes)

1. Distribute Handout 3, Lotus Blossom Organizer, and tell participants they will be using this note-taking tool as they watch the video. Display Overhead 3, Lotus Blossom Organizer, and explain that the center square contains the main topic—in this case, "The Adolescent Brain." The circles within the center square represent possible subtopics that can then be represented in the organizer's adjacent

squares, as illustrated by the expansion of the subtopic "Possible Strategies" in the lower right-hand corner of the overhead. Ask participants to use the organizer as they watch the video to note the various ways teachers provide opportunities for students to develop and practice self-regulatory skills.

2. Show Program 3, *The Reflective Teen*.

Reflection and Discussion (25 minutes)

1. After viewing the video, ask participants to refer to their notes on Handout 12, Challenges and Interventions. Suggest that they now take a few minutes to write down possible interventions, based on what they saw in the video. Allow approximately 5–10 minutes for this activity.

2. Ask participants to discuss their comments with a partner. Allow approximately 5–10 minutes for this activity. Then, ask for volunteers to share their best ideas with the entire group. Facilitate discussion as time allows.

Facilitator's Note

Consider helping participants focus on and retain the comments offered by others by writing their responses on an overhead transparency.

Conclusion (10 minutes)

1. Distribute Handout 2, Self-Assessment Radar, and ask participants to rate their current level of understanding on a 0–5 numbered scale (located in the bottom-left corner) and add up their composite score. Direct participants who also attended Workshop 1A or 1B to compare their score now to the score they got when they completed the radar assessment during those workshops.

2. Distribute Reading 4, "Safe Schools for the Roller Coaster Years," and tell participants that this article explores ways that educators can help teens develop the life skills they'll need to become successful adults.

3. Review the workshop objectives and address any questions or concerns the participants may still have.

4. Thank the participants for attending the workshop.

Workshop 3B

This workshop is designed to accompany Program 3, *The Reflective Teen*, and is approximately three hours in length. During the workshop, participants will explore the developmental aspects of the adolescent brain and consider the importance of reflection and students' feelings of connectedness to school to academic success.

This workshop format provides activities for a half-day session for 10–100 participants. If the workshop must be shorter than the suggested time, you can eliminate portions of the activities as appropriate. Depending on the length of your workshop, you might want to schedule an additional break. If you are able to allot additional time for the workshop, you might also want to show the video in segments rather than playing it in its entirety.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introductions	10
Introduction to the Video	20
View Program 3, *The Reflective Teen*	30
Reflection and Discussion	30
Break	15
Supporting Activities	60
Conclusion	15
Total Approximate Workshop Time	3 hours

Workshop 3B Objectives

- Understand the influence of brain development on teen cognition and behavior.
- Understand how educators can positively influence teen behaviors.
- Understand the relationship of students' feeling of connectedness to school and student achievement.

Materials for Workshop 3B

- Handout 2, Self-Assessment Radar
- Handout 6, Reflection

- Handout 12, Challenges and Interventions
- Handout 13, What Is Metacognition?
- Handout 14, Metacognitive Strategy Quick Find
- Overhead 5, Objectives for Workshop 3
- Reading 4, "Safe Schools for the Roller Coaster Years"
- Reading 5, "A Case for School Connectedness"
- Overhead projector and screen
- Blank transparencies and markers

Welcome and Introductions (10 minutes)

1. Welcome all participants. Introduce yourself and explain your role as workshop facilitator. As the facilitator, you will guide the group through the workshop to help them meet the workshop objectives.
2. Depending on the size of the group and whether the participants know one another, you may want to set aside time for participants to introduce themselves individually.
3. Display Overhead 5, Objectives for Workshop 3. Discuss the objectives with the group.

Facilitator's Note

If the group comprises individuals from several schools, you might suggest that participants from the same school sit together for group activities. This will encourage them to think of strategies and the implications of the material for their own school or classrooms.

Introduction to the Video (20 minutes)

1. Explain that this workshop explores the developmental aspects of the adolescent brain and considers the importance of reflection and students' feelings of connectedness to school to teens' academic success.
2. Distribute Handout 12, Challenges and Interventions. Ask participants to work in groups of three or four to brainstorm specific challenges that students in their classroom, school, or district face in terms of managing their emotions and their thinking. Allow approximately 10 minutes for participants to reflect and to record their thoughts on the handout. Tell them that they will be filling out the Intervention column once they've watched the video. Then ask the groups to select a representative to share their thoughts with the entire group.

Facilitator's Note

Consider helping participants focus on and retain the comments offered by others by writing their responses on an overhead transparency.

View Program 3, *The Reflective Teen* (30 minutes)

1. Suggest that participants keep the ideas they generated while working on Handout 12 in mind as they view the video program. Tell them that they should use the handout to note relevant points they notice in the video.
2. Show Program 3, *The Reflective Teen*.

Reflection and Discussion (30 minutes)

1. After viewing the video, ask participants to reflect on the notes they made on Handout 12, Challenges and Interventions, and suggest that they write down possible interventions, based on what they saw in the video. Allow approximately 10 minutes for this activity.
2. Ask participants to discuss their ideas for interventions with a partner. Allow another 5–10 minutes for this activity.
3. Ask for volunteers to share their intervention suggestions with the entire group. Facilitate discussion as time allows.

Facilitator's Note

Consider helping participants focus on and retain the comments offered by others by writing their responses on an overhead transparency.

Break (15 minutes)

Facilitator's Note

The placement of breaks is merely a suggestion. Use your own discretion in regard to placement and length of breaks.

Supporting Activities (60 minutes)

1. Explain to participants that an essential aspect of maturation is acquiring the ability to reflect on one's own thinking. This is true for both academic and behavioral goals.
2. Distribute Handout 13, What Is Metacognition? Ask participants to brainstorm examples of what each item on the handout looks like and sounds like in the classroom. Allow approximately 5–10 minutes for this activity.
3. Ask participants to consider the value of teaching students about their thinking. Conduct a brief discussion to explore their ideas.
4. Distribute Handout 14, Metacognitive Strategy Quick Find, and ask participants to brainstorm additional strategies to add to the list. Allow 5–10 minutes for this activity.
5. Tell participants
   - **As adolescents progress from middle school through high school, they develop a greater ability to control their emotions and to think ahead. During this time, they need**

Facilitator's Note

Consider helping participants focus on and retain the comments offered by others by writing their responses on an overhead transparency.

guidance and support to move from behaving emotionally, or reflexively, to behaving thoughtfully, or reflectively. It is during this time that students' connectedness to school takes on a primary role.

6. Distribute Reading 4, "Safe Schools for the Roller Coaster Years," and Reading 5, "A Case for School Connectedness." Tell participants that this part of the workshop will explore ways that educators can help teens develop the life skills they'll need to become successful adults.

7. Ask participants to form groups of four. Have two members of each group read one of the articles, and have the other two members read the second article. Allow approximately 15 minutes for participants to read the articles.

8. When participants have finished reading, ask the two individuals from each group who read the same article to discuss it and agree on three points that they will then share with their fellow small-group members. Allow approximately 5–10 minutes for this activity.

9. When participants have shared the points from their readings, suggest that they review the notes they made on Handout 12, Challenges and Interventions, and discuss how the information in the readings might inform their future actions. Ask participants to select one new intervention they would like to try in their classroom, school, or district. Allow approximately 10 minutes for this activity.

Conclusion (15 minutes)

1. Distribute Handout 2, Self-Assessment Radar, and ask participants to rate their current level of understanding on a 0–5 numbered scale (located in the bottom-left corner) and add up their composite score. Direct participants who also attended Workshop 1A or 1B to compare their score now to the score they got when they completed the assessment radar during those workshops.

2. Distribute Handout 6, Reflection, and ask participants to refer to their radars to complete the reflection.

3. Close the workshop by reviewing the objectives and addressing any questions and concerns participants may still have.

4. Thank participants for attending the workshop.

Program 4

Student Session

This session accompanies Program 4, *Know Your Brain . . . Know Yourself*, and is intended for a student audience. The purpose of this session is to acquaint teens with the unique changes taking place in their brains and to help them see how these changes influence their decisions and behavior. The video program describes how the brain works and why the adolescent years can be so challenging.

Make the students comfortable by asking them to introduce themselves (if they don't already know one another) and encouraging comments and participation.

The following agenda assumes that teachers will use the video program and facilitate the activities within an approximately 60-minute time period. Follow-up activities running approximately 75 minutes are provided after the main workshop activities. Teachers can modify the activities and adjust the time schedule for both the main workshop and the extension activities to meet the interests and needs of their students.

Agenda and Time Guide

Activity	Time (minutes)
Welcome and Introduction	10
Introduction to the Video	20
View Program 4, *Know Your Brain . . . Know Yourself*	15
Reflection and Discussion	15
Conclusion	10
Total Approximate Workshop Time	70 minutes

Session Objectives

- Explore how the brain changes during the teen years.
- Consider what those brain changes mean for learning and behavior.

Materials for Program 4

- Handout 15, True or False?
- Handout16, K-W-L
- Handout 17, Did You Know?
- Overhead 6, Objectives for Program 4

- Overhead 7, Desirable Behaviors
- Overhead 8, Risky Teen Behaviors
- Reading 1, "The Adolescent Brain: A Work in Progress"
- Reading 2, "What Makes Teens Tick"
- Overhead projector and screen
- Blank transparencies and markers
- Flip chart paper and markers

Welcome and Introduction (10 minutes)

1. As students arrive, greet them at the door and distribute Handout 15, True or False? Invite them to work with others to complete the handout. Tell students that you will review the handout at the end of the session.
2. Introduce yourself and present Overhead 6, Objectives for Program 4. Explain to the students that this session is designed to help them explore how their brains operate and the implications of those operations for their decision-making abilities and behavior.

Introduction to the Video (20 minutes)

1. Distribute Handout 16, K-W-L, and give students a minute to look over it.
2. Ask students to work in groups of three to brainstorm what they *know* about the brain in regard to each of the categories listed on the handout. Allow 5 minutes for this activity.
3. Next, ask them to list what they *want* to know about the brain. Allow another 5 minutes for this activity.
4. Ask for volunteers to share what they know and want to know.

Facilitator's Note

Consider helping students focus on and retain the comments offered by others by writing their responses on an overhead transparency.

View Program 4, *Know Your Brain . . . Know Yourself* (15 minutes)

1. Suggest that students make notes in the "L" (Learned) column of Handout 16 as they watch the video.
2. Show Program 4, *Know Your Brain . . . Know Yourself*.

Reflection and Discussion (15 minutes)

1. After viewing the video, give students a few minutes to review what they learned, and to write what they still want to know on the back of Handout 16.

2. Ask students to review Handout 15, True or False? and reconsider their answers in light of what they've learned. Then, tell students that all the statements on the handout are true.

Facilitator's Note

If time allows, have students discuss in small groups what they still want to know. Then, ask them to share their answers with the whole group. Record their comments on an overhead transparency.

Conclusion (10 minutes)

1. Distribute Reading 2, "What Makes Teens Tick," and call students' attention to the graphics. Point out that the structures detailed represent major areas of change in the teen brain. Suggest that they review these brain structures and read the article at their leisure to find answers to any remaining questions they might have.

2. Close the session by referring students to the Dana Foundation Web site (www.dana.org) for additional information about the teen brain.

3. Thank the students for attending the session and, if you plan to conduct any follow-up sessions, tell students about them and answer any questions they have about those sessions.

Optional Activities (75 minutes)

The following activities are optional, depending on the time available and interest you have in conducting follow-up sessions.

1. Discuss with students the idea that simply understanding their brains and learning styles isn't enough. They must take care of their brains by developing certain positive behaviors and avoiding risky behaviors.

2. Present Overhead 7, Desirable Behaviors. Discuss the information provided with students. Ask students if they feel any of the behaviors listed should not be included. Similarly, ask them if they have any behaviors to add to the list. As an extension activity, break students up into groups of two or three, depending on the number of participants. Assign each group 2–3 behaviors and ask them to write their own definition of each behavior. Also ask them to draw a picture illustrating each behavior. Provide students with flip chart paper and markers for this activity. When the groups have finished the exercise, ask them to share their definitions and pictures with the larger group.

Facilitator's Note

You may want to distribute copies of Reading 1, "The Adolescent Brain: A Work in Progress," as an additional source of information for students.

3. Using the Think/Pair/Share method within their small groups, ask students to generate a list of characteristics of successful students and adults. Ask for volunteers to share their answers with the entire group.

4. Present Overhead 8, Risky Teen Behaviors, and discuss. Invite students to add to the list.

5. Distribute Handout 17, Did You Know? Ask the small groups to read the statistics together and discuss them. Circulate during this activity to help answer questions.

Handouts and Overheads

HANDOUT 1

Viewpoints

We underrate our brain and our intelligence. . . . Reluctance to learn cannot be attributed to the brain. Learning is the brain's primary function, its constant concern, and we become restless and frustrated if there is no learning to be done. We are all capable of huge and unsuspected learning accomplishments without effort.

—Frank Smith
Insult to Intelligence

I love to learn; I just hate to be taught.

—Winston Churchill

If a teen is doing music, sports, or academics, those are the connections that will be hard-wired. If they are lying on the couch or playing video games or MTV, those are the cells and connections that are going to survive.

—Dr. Jay Giedd
National Institute of Mental Health

HANDOUT 2

Self-Assessment Radar

My Score _____

0:	No clue
1:	Heard of it
2:	Understand it
3:	Can apply it
4:	Can explain it
5:	Can teach it
6:	Can evaluate it

HANDOUT 3

Lotus Blossom Organizer

HANDOUT 4

Get the Gist

1. What is the most important information that you learned from the video?

2. How does this new information affect your understanding of your students?

3. Write a "gist" statement of how you might apply what you learned in your school or classroom.

HANDOUT 5

Key Points

Within your small group, discuss key points of the assigned portion of the reading that you want to share with other groups. Record these key ideas below.

•

•

•

•

•

HANDOUT 6

Reflection

3 Things I learned . . .

2 Ways I can use this information . . .

1 Question I still have . . .

HANDOUT 7

Strategies

Brain-Compatible Components	Strategies
Students need a safe, respectful setting.	
Students need varied input for learning.	
Students need to learn experientially.	
Students need timely feedback.	

HANDOUT 8

Personalizing Education Web

HANDOUT 9

Multiple Intelligences Review

Children who are strongly	Learn	Enjoy	Should be taught with a combination of
Verbal/ Linguistic	in words	reading, writing, telling stories, playing word games	books, tapes, writing tools, journals, dialogues, discussion, debate, stories, plays
Logical-Mathematical	by reasoning	experimenting, questioning, figuring out puzzles, calculating	things to explore and think about, science materials, manipulatives, trips to museums
Spatial	in images and pictures	designing, drawing, visualizing, doodling	art, video, movies, slides, imagination games, puzzles, illustrated books, art museum visits
Bodily-Kinesthetic	through somatic sensations	dancing, running, jumping, building, touching, gesturing	role-play, drama, movement, things to build, sports and physical games, tactile experiences, hands-on learning
Musical	with rhythms and melodies	singing, whistling, humming, tapping feet and hands, listening	sing-along time, trips to concerts, playing music at home and school, musical instruments
Interpersonal	in cooperative groups/with others	leading, organizing, relating, manipulating, mediating	friends, group games, social gatherings, community events, clubs, mentors/apprenticeships, class meetings
Intrapersonal	best when able to focus within themselves	setting goals, meditating, dreaming, quiet time	secret places, time alone, self-paced projects, choices
Naturalist	with nature	cataloging, classifying, identifying patterns	hands-on activities, outdoor classrooms, selecting objects in nature
Existential	by being philosophical	discussing life, death, and ultimate realities	debates, Socratic seminars, cooperative groups

HANDOUT 10

Table Talk

Table talk is a silent way to reflect, generate ideas, check on learning, develop projects, and solve problems.

Rules of the Game

- No one may talk and anyone may add to the "conversation" as they please.
- You can comment on others' ideas by drawing a connecting line to a comment.
- Everyone must have something with which to write.
- Everyone should write as they feel moved, commenting on the question.

Reflection Question: How can you connect content to the real world?

HANDOUT 11

Implications of Learning Research

- Active learning is more powerful than passive learning.

- Focused attention is necessary but not sufficient for learning.

- No learning is emotion free; emotions can help or hinder learning.

- Anxiety—in moderation—can enhance learning.

- To be remembered, new information must be connected to prior knowledge, and information must be remembered in order to be learned.

- To be most effective, teachers must balance levels of intellectual challenge and instructional support.

- Interaction between teachers and learners is one of the most powerful factors in promoting learning.

- Prior knowledge and experience generally make more difference than intellectual ability in the learning process.

- New information structured in personally meaningful ways is more likely to be retained, learned, and used.

- Learning can take place through several channels; the more channels engaged in learning, the better.

HANDOUT 12

Challenges and Interventions

Consider challenges that students might face regarding managing their emotions and their thinking. Suggest interventions that might be effective.

Challenges	Interventions

Notes from video:

HANDOUT 13

What Is Metacognition?

Being conscious of one's mental processes:

Looks Like	Sounds Like

Ability to self-monitor and self-regulate during learning:

Looks Like	Sounds Like

Ability to plan a strategy to aid in retrieval of information:

Looks Like	Sounds Like

HANDOUT 14

Metacognitive Strategy Quick Find

Below is a list of metacognitive strategies that support students and their learning. Items that might be new to you have been defined.

- Looking Back—Rereading material if students are unclear after self-questions.
- Planning Strategies—Strategies for solving problems and completing projects.
- Mind-Mapping.
- Journal Keeping.
- Mnemonic Devices.
- Brainstorming—In a group, all ideas should be accepted. Working alone, all ideas should be considered. No censoring of ideas should take place at the beginning of a process.
- Think-Alouds.
- Drawing a picture to explain thinking.
- Monitoring students to share their progress during a learning activity.
- Self-Questioning—Students must be able to answer their own questions.
- Generating Questions—Helps students focus on thinking strategies.
- Teach students Bloom's Taxonomy and have them write questions at each level of Bloom to hone thinking skills.
- Reflection.
- Rephrase a statement to help extend thinking.

HANDOUT 15

True or False?

Test yourself! Read each statement and decide whether it is true or false. You may work with a partner or a small group, if you wish to discuss the statements before making your decisions.

1. Emotions affect learning. They deepen learning if appropriate in intensity.

   True False

2. The brain is meaning-driven and learns through relevance, interdisciplinary relationships, and themes.

   True False

3. The brain learns best if material is meaningful and linked to prior learning rather than factoids and isolated bits of information.

   True False

4. Each person's brain is unique and learns on its own timetable, with its own learning style and particular intelligence.

   True False

5. Active learning, hands-on learning, and project-based/problem-based learning are ways of expressing the brain's preference for real, context-based learning experiences.

   True False

HANDOUT 16

K-W-L

Key:
K = Know
W = Want to Know
L = Learned

	K	W	L
Anatomy			
Learning			
Behavior			
Risk			

What do I still want to know?

Where can I find information?

ASCD®
Association for Supervision
and Curriculum Development

HANDOUT 17

Did You Know?

Effects of Alcohol on the Teenage Brain

- Alcohol disrupts the activity of an area of the brain essential for memory and learning—the hippocampus.
- Hippocampal volumes tend to be smaller in those who abuse alcohol.
- The longer a teen abuses alcohol, the smaller the hippocampus becomes.
- Adolescents who abuse alcohol score lower on verbal and nonverbal retention-of-information tests.
- Drinking may be more dangerous in the teens than early 20s because the "finishing touches" on brain development (myelination and pruning) have not been completed.

The Teenage Brain and Sleep

- Teens need at least 9 hours and 15 minutes of sleep a night.
- Hormones critical to growth and sexual maturation are released during sleep.
- Sleep is a time when brain cell connections made during the day are strengthened.
- Sleep deprivation can have major, negative effects on learning and memory.
- Teens' biological clocks are set later than those of children or adults.
- The brain needs sleep to dispose of unimportant information and to practice new information.
- Sleep appears necessary to help teens regulate emotions.
- Depression is strongly tied to inadequate sleep.
- Insufficient rest can produce a 20 percent decrease in brain serotonin.

Source: From "The Adolescent Brain: A Work in Progress" [online article], by P. Wolfe, 2003. Copyright 2003 by Pat Wolfe. Adapted with permission.

OVERHEAD 1

Objectives for Workshop 1

- **Understand the anatomical changes taking place in the adolescent brain.**

- **Consider how these changes might affect cognitive and behavioral functions.**

- **Consider the implications of these changes for classroom practice.**

OVERHEAD 2

Viewpoints

We underrate our brain and our intelligence. . . . Reluctance to learn cannot be attributed to the brain. Learning is the brain's primary function, its constant concern, and we become restless and frustrated if there is no learning to be done. We are all capable of huge and unsuspected learning accomplishments without effort.

—Frank Smith
Insult to Intelligence

I love to learn; I just hate to be taught.

—Winston Churchill

If a teen is doing music, sports, or academics, those are the connections that will be hard-wired. If they are lying on the couch or playing video games or MTV, those are the cells and connections that are going to survive.

—Dr. Jay Giedd
National Institute of Mental Health

OVERHEAD 3

Lotus Blossom Organizer

OVERHEAD 4

Objectives for Workshop 2

- **Explore classroom practices that support academic learning.**
- **Consider strategies for personalizing education.**
- **Learn the importance of connecting the classroom and the real world.**

OVERHEAD 5

Objectives for Workshop 3

- **Understand the influence of brain development on teen cognition and behavior.**

- **Understand how educators can positively influence teen behaviors.**

- **Understand the relationship of students' feeling of connectedness to school and student achievement.**

OVERHEAD 6

Objectives for Program 4

- **Explore how the brain changes during the teen years.**

- **Consider what those brain changes mean for learning and behavior.**

OVERHEAD 7

Desirable Behaviors

- **Self-respect**
- **Curiosity**
- **Organization**
- **Effort**
- **Resilience**
- **Integrity**
- **Courage**
- **Patience**
- **Problem Solving**
- **Perseverance**
- **Initiative**
- **Common Sense**

OVERHEAD 8

Risky Teen Behaviors

- **Not getting enough sleep**
- **Abusing drugs**
- **Eating poorly**
- **Using alcohol**
- **Smoking**

Readings and Resources

READING 1

The Adolescent Brain: A Work in Progress

Pat Wolfe

One day your child is cheerful, loving and obedient, comes to you for advice, dresses in clothing you picked out together, and gives you a kiss on the cheek before turning in for the night at 10:00 p.m. Homework is done without nagging and you walk out of the parent/teacher conference beaming with pride.

Then somewhere between ages 10 and 12, a strange thing happens. Almost overnight it appears someone has unzipped your child and put someone else inside; you are living with a stranger. No longer could this child be called sweet and loving; surly and antagonistic would be better descriptors. Gone are the days when you are asked for advice and when you chance to offer it, you can be certain it will be ignored. This kid comes to breakfast in the morning dressed in an outfit to which you would like to pin a note stating, "What this person is wearing to school today is not my idea of good taste!" Your teen spends hours on the computer, but homework doesn't get done and you now dread school conferences.

It doesn't take a brain scientist to tell you that living with an adolescent can be a frustrating experience. However, brain scientists are beginning to shed light on why these teens are the way they are. Interestingly, the new information focuses not only on the oft-blamed raging hormones, but on what's going on above the neck as well. Many of the new insights into the adolescent brain have been gained using recently developed brain-imaging techniques that allow scientists to obtain a look at what is going on inside the brain. What they are seeing is that the teen years are a time of significant change in the activity, anatomy, and neurochemistry of the brain.

What Changes Are Going On in There?

Scientists have known for some time that the brain grows by expanding and pruning the connections between cells, keeping the connections that are used the most and getting rid of the unused ones. They have also known that one of the most active periods of reorganization occurs early in life. Around two years of age, a huge buildup of neural connections occurs in the child's brain. This is followed by a massive pruning which allows the strongest and most efficient connections to function more effectively. The often erratic behavior of the child during this period reflects the changes taking place in the brain. The phrase "the terrible twos" sums up the challenges parents face in dealing with the young child.

Until quite recently, scientists assumed that this period of growth and winnowing away occurs only in early childhood and that most, if not all, of the major changes in brain organization and development occurred before adolescence. This view seemed reasonable in the light of the fact that the brain reaches its full size by puberty. The conventional wisdom has been that the adolescent brain is fully developed and functions similarly to an adult brain. This turns out—as many middle school teachers and parents already suspected—not to be the case. Instead, it appears that very complex changes take place in the brain during adolescence and that the brain is not fully "installed" until perhaps age 20. The brain is still developing during the teen years!

The Growth Spurt and Pruning

In what parts of the adolescent brain are the greatest changes occurring? A central area of focus has been the part of the brain located behind the forehead, called the frontal lobes. A long-range study by Jay Giedd and his colleagues at the National Institutes of Mental Health (NIMH) has involved using functional Magnetic Resonance Imaging (fMRI) to scan the brains of nearly 1,000 healthy

Source: From "The Adolescent Brain: A Work in Progress" [online article], by P. Wolfe, 2003. Copyright 2003 by Pat Wolfe. Reprinted with permission. Available: www.patwolfe.com/index.php?pid=100

children and adolescents ages 3 to 18. Giedd discovered that just prior to puberty, between ages 9 and 10, the frontal lobes undergo a second wave of reorganization and growth. This growth appears to represent millions of new synapses (connections between the brain cells) that process information. Then, around age 11, a massive pruning of these connections takes place, which isn't complete until early adulthood. Although it may seem like the more synapses the better, the brain actually consolidates learning by pruning away connections. The brain is getting rid of the least-used pathways, a method for ensuring that the most useful synapses are maintained, which, in turn, allows the brain to operate more efficiently.

Myelination During Adolescence

In addition to the winnowing of connections in the frontal lobes of the adolescent brain, another developmental factor is also at play. One of the final steps in developing an adult brain is the coating of nerves with a fatty material called myelin. This myelin sheath wraps around the axons of brain cells (neurons) and allows electrical impulses to travel faster and more efficiently. Before neurons receive their myelin sheath, they are considered immature and don't function well, but after myelination, the neurons are mature and ready to fulfill their designated functions more efficiently. This is one reason why a toddler is less coordinated than a 9-year-old. Myelin develops in the more primitive areas of the brain first, then gradually moves to the higher-level functioning areas. It is not surprising, then, to find that the frontal lobes mature last. Researchers at the University of California at Los Angeles compared scans of young adults, ages 23–30, with those of teens, ages 12–16, looking for signs of myelin, which would imply more mature, efficient connections. As expected, the frontal lobes in teens showed less myelination than those of the young adults. This is the last part of the brain to mature: full myelination is probably not reached until around age 20.

The CEO of the Brain

Why are these changes in the frontal lobes significant? The frontal lobes—specifically the area right behind the forehead, called the prefrontal or orbitofrontal cortex—have been called the CEO of the brain. It is in this part of the brain that executive decisions are made and ethical/moral behavior seems to be mediated. In fact, this part of the brain has been dubbed "the area of sober second thought." Persons with damage to this part of the brain often know what they are supposed to do but are unable to do it. The prefrontal cortex is responsible for many functions, such as the ability to make sound judgments, goal and priority setting, planning and organization of multiple tasks, impulse inhibition, self-control, and emotional control. These functions are practically a laundry list of characteristics that adolescents often lack. Researchers suspect that an unfinished prefrontal cortex with its excess of synapses and unfinished myelination contributes to adolescents' deficits in these areas. Their brains simply aren't ready to take on the role of the CEO, resulting in a lack of reasoned thinking and performance.

Emotion Holds Sway

There is yet another part of the brain that is going through change during the adolescent years. Deep in the center of the brain is a group of structures—sometimes called the limbic area—that mediate emotion. One of the major structures of this area is the amygdala, a small almond-shaped structure that plays a major role in instinctive emotional reactions, including the "fight or flight" response. This is the structure that engages and allows us to react quickly when we are faced with a dangerous situation. It takes precedence over thoughtful reflection—which you don't want when faced with a car speeding toward you or a snarling dog leaping at you!

A team led by Dr. Deborah Yurgelun-Todd at Harvard's McLean Hospital has used functional Magnetic Resonance Imaging (fMRI) to compare the activity of adolescent brains to those of adults. They found that when processing emotion, adolescents have lower activity in their frontal lobes and more activity in the amygdala than adults. Yurgelun-Todd asked teenagers and adults to view photographs of people's faces contorted with fear and to identify the emotion being expressed.

Adults had no difficulty correctly identifying the emotion; many teens, however, were unsuccessful. The images produced by the fMRI during this task showed activity in both the prefrontal cortex and the amygdala of the adult brains. The adolescent brains, on the other hand, showed almost no activity in the prefrontal cortex and a great deal of activity in the amygdala and surrounding emotional centers.

The results of this study suggest two things. One is that adolescents may not be nearly as good as we think they are at reading social signals such as facial expressions—even though they seem to do almost nothing but socialize. This may explain why adolescents often pay little attention to adults' warnings about inappropriate or risk-taking behavior. They may be misunderstanding the emotions of adults, which can lead to miscommunication in terms of what the teen thinks the adult is feeling.

The second thing the research suggests is that in the teen brain, the emotional center often holds sway over the rational prefrontal cortex. Realizing that the prefrontal cortex allows reflection while the amygdala is designed for reaction, we can begin to understand the often irrational and overly emotional reactions of teens. Our oft-asked question when teens engage in irrational behavior—"What were you thinking?"—is difficult for teens to answer because in many cases they weren't thinking reflectively, they were impulsively reacting. The good news is that as they grow older, their brain activity tends to shift to the frontal lobes and theoretically this results in more reasoned judgment and performance.

Substance Abuse and the Adolescent Brain

Now that it has become clear that, in contrast to previously held assumptions, there is a tremendous amount of change taking place in the teen brain, we need to look at the probability that alcohol and perhaps other drugs impact both brains and behavior differently in adolescents and adults. The shaping and fine-tuning of the frontal lobes is, at least in part, mediated by experience. This raises the possibility that drug abuse could alter normal development of the brain. This is an area of critical importance. Current estimates suggest that roughly 50 percent of high school seniors consume alcohol at least once a month while 17 percent regularly smoke cigarettes and nearly 50 percent have smoked some marijuana (Kann et al., 2000; Johnston et al., 2001).

Alcohol's Effects on the Brain

Much of the research on the effects of alcohol has been conducted using animal studies. In studies of rats, Markwiese et al. (1998) found that alcohol disrupts the activity of an area of the brain essential for memory and learning, the hippocampus, and that this area is much more vulnerable to alcohol-induced learning impairments in adolescent rats than adult rats. Rats are not humans; however, there is some evidence that the human hippocampus reacts in a similar manner. A recent study by De Bellis et al. (2000) found that hippocampal volumes were smaller in those who abused alcohol during adolescence and that the longer one abused alcohol, the smaller the hippocampus became.

Research by Sandra Brown and colleagues at the University of California, San Diego has produced the first concrete evidence that heavy, ongoing alcohol use by adolescents can impair brain functioning. They found several differences in memory function between alcohol-dependent and nondrinking adolescents, none of whom used any other drugs. In the study, the 15- and 16-year-olds who had drunk heavily (more than 100 lifetime alcohol use episodes) scored lower on verbal and nonverbal retention of information.

Additional research by Brown and Tappert (2000) is trying to answer whether or not heavy drinking at age 15 is more dangerous for the brain than at age 20. Their preliminary hypothesis is that drinking may be more dangerous because the finishing touches on brain development (myelination and pruning) haven't been completed and alcohol may interrupt or disturb these refining processes. Brown and Tappert point out that more studies will be needed to produce a definitive answer, but at least their work is an important step toward confirming what many scientists have suspected for some time: teenagers who drink may be exposing their brains to the toxic effects of alcohol during a critical time in brain development.

Nicotine

Not only are the frontal lobes of adolescents going through major changes, the molecular and chemical systems are being reshifted as well. Many substances appear to have a heightened effect on teens. Researchers at Duke University found that adolescent brains respond more intensely to nicotine than do adult brains. In rat brains, the levels of dopamine receptors in the pleasure center (the nucleus accumbens) of the brain increase dramatically between 25 and 40 days—the rat's adolescent phase (Spears, 2000). These receptors play a huge role in the pleasure-producing properties of drugs. It is not yet clear if the adolescent brain evidences this same increase, but many researchers think it is highly probable.

Adolescent Sleep Patterns Are Different

A common complaint of parents of teenagers is that their kids insist they can't fall asleep until midnight, but every morning means yelling at them to get out of bed in time to get to school on time. And parents aren't the only ones with complaints about adolescents' sleep habits. Teachers of early morning classes complain that their students seem to be in class in body only, frequently nodding off or, at the least, drowsy and difficult to teach. It may not be the teens' fault; biology may be behind their sleep problems. Recent research has shown that here is yet another area where adolescents' brains move to the beat of a different drummer.

Our sleep cycles are determined by what are called circadian rhythms, a sort of internal biological clock that determines not only how much sleep we need but also when we become sleepy at night and when we awaken in the morning. Sleep researcher Mary Carskadon, in her sleep laboratory at Brown University's Bradley Hospital, has discovered that teenagers need more sleep than they did as children and that their circadian rhythms appear to be set later than those of children or adults.

The conventional wisdom has been that young children need 10 hours of sleep and that as we become adults, the need decreases to 8 hours. Teenagers have been included in the adult group. Carskadon has shown that teens, far from needing less sleep than they did as children, need more. In order to function well and remain alert during the day, they need 9 hours and 15 minutes, possibly because the hormones that are critical to growth and sexual maturation are released mostly during sleep. One survey of the sleep patterns of 3,000 teenagers showed that the majority slept only about 7 hours a night, with more than a quarter averaging 6 hours or fewer on school nights. Given that sleep is a time when brain cells replenish themselves and when connections made during the day are strengthened, sleep deprivation can have a major negative effect on learning and memory.

A second finding from Carskadon's research is that these teens' biological clocks appear to be set later than those of children or adults. They do not get sleepy as early as they did when they were preadolescents and, therefore, tend to stay up later at night and sleep later in the morning. Most teenagers' brains aren't ready to wake up until 8 or 9 in the morning, well past the time when the first bell has sounded at most high schools. Teens who have to get up before their internal clock buzzes miss out on an important phase of REM sleep that is important for memory and learning.

Armed with this research, some school districts are experimenting with later school starts at the secondary level, and the initial results are positive. (The results of a school start time study involving 17 districts in the Minneapolis-St. Paul area can be found on the Internet at http://education.umn.edu/CAREI/Programs/start_time/2001exec_sum.html. Changing the start time is difficult in many communities for various reasons, so what can teenagers do to cope? The National Sleep Foundation offers the following advice:

1. Stay away from caffeine and nicotine after noon. Also avoid alcohol, which can disrupt sleep.
2. Heavy studying or playing computer games before bed is arousing, as is trying to sleep with a computer or TV flickering in the room.
3. Avoid bright light in the evening, but open blinds or turn on lights as soon as the morning alarm sounds, to start the body's awakening cycle.
4. Sleeping more than two or three hours later on weekends than weekdays can disrupt the body clock even more, making getting up on Monday morning harder.

Some Cautions and Implications

Not all scientists agree with the research on the adolescent brain. Giedd's theory that brain changes are responsible for the often erratic behavior we see in teens is speculative. The theory is controversial because the roots of behavior are complex and cannot be easily explained by relatively superficial changes in the brain. However, if the theory turns out to be true, it would underscore the importance of providing careful guidance through adolescence, which isn't a bad idea in any case. Giedd states ". . . unlike infants, whose brain activity is completely determined by their parents and environment, the teens may actually be able to control how their own brains are wired and sculpted."

Adolescents are laying down neural foundations for the rest of their lives. As parents and teachers, we have an opportunity and an obligation to educate adolescents about what is going on in their brains and the role they play in determining the structure and functioning of their brains for the rest of their lives.

References

Brownlee, S. (August 9, 1999). Inside the teen brain. *U.S. News and World Report*.

Brown, S. A.; Tappert, S. F.; Granholm, E.; & Delis, D. (February 2000). Neurocognitive functioning of adolescents: Effects of protracted alcohol use. *Clinical and Experimental Research, 24*(2), 164–171.

Carskadon, M. (1999). When worlds collide: Adolescent need for sleep versus societal demands. In K. Wahlstom (Ed.), *Adolescent sleep needs in and school starting times*. Phi Delta Kappa Educational Foundation.

De Bellis, M. D., Clark, D. B., Beers, S. R., Soloff, P. H., Boring, A. M., Hall, J., Kersh, A., & Keshavan, M. S. (2000). Hippocampal volume in adolescent-onset alcohol use disorders. *American Journal of Psychiatry 157,* 737–744.

Dement, W. C. (1999). *The promise of sleep*. New York: Delacourt Publishers.

Giedd, J., Blumenthal, J., Jeffries, N., Castellanos, F., Liu, H., Ijdenbos, A., Paus, T., Evans, A., & Rapoport, J. (1999). Brain development during childhood and adolescence: A longitudinal MRI study. *Nature Neuroscience, 2*(10), 861–863.

Gudrais, E. H. (2001). Modern myelination: The brain at midlife. *Harvard Magazine, 103(*5), 9.

Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2001). *The monitoring of the future national survey results on adolescent drug use: Overview of key findings, 2000*. Bethesda, MD: National Institute on Drug Abuse, 1–56.

Kann, L., Kinchen, S. A., Williams, B. I., Ross, J. G., Lowry, R., Grunbaum, J. A., & Kolbe, L. J. (2000). Youth risk behavior surveillance—United States, 1999. Centers for Disease Control MMWR Surveillance Summaries, 49(SS-5), 1–96.

Kelly, J. A. (1997). Substance abuse and mental health care: Managed care, access, and clinical outcomes. *American Association of Occupational Health Nurses Journal*.

Markwiese B. J., Acheson S. K., Levin E. D., Wilson W. A., & Swartzwelder, H. S. (1998). Differential effects of ethanol on memory in adolescent and adult rats. *Alcoholism: Clinical and Experimental Research, 22,* 416–421.

Restak, R. (2002). *The secret life of the brain*. Dana Press and Joseph Henry Press.

Spear, L. P. (2000). The adolescent brain and age-related behavioral manifestations. *Neuroscience and Behavioral Review, 24*, 417–463.

Wahlstrom, K. L., & Freeman, C. M. (1997). *School start time study: Preliminary report of findings*. inneapolis, MN: Center for Applied Research and Educational Improvement.

Wolfson, A. R., & Carskadon, M. A. (1996). Early school start times affect sleep and daytime functioning in adolescents. *Sleep Research, 25*, 117.

Yurgelun-Todd, D. (2002). Frontline interview "Inside the Teen Brain" on PBS.org. Full interview available online at www.pbs.org/wgbh/pages/frontline/shows/teenbrain/interviews/todd.

READING 2

What Makes Teens Tick

Claudia Wallis

A flood of hormones, sure. But also a host of structural changes in the brain. Can those explain the behaviors that make adolescence so exciting—and so exasperating?

Five young men in sneakers and jeans troop into a waiting room at the National Institutes of Health Clinical Center in Bethesda, Md., and drape themselves all over the chairs in classic collapsed-teenager mode, trailing backpacks, a CD player and a laptop loaded with computer games. It's midafternoon, and they are, of course, tired, but even so their presence adds a jangly, hormonal buzz to the bland, institutional setting. Fair-haired twins Corey and Skyler Mann, 16, and their burlier big brothers Anthony and Brandon, 18, who are also twins, plus eldest brother Christopher, 22, are here to have their heads examined. Literally. The five brothers from Orem, Utah, are the latest recruits to a giant study that's been going on in this building since 1991. Its goal: to determine how the brain develops from childhood into adolescence and on into early adulthood.

It is the project of Dr. Jay Giedd (pronounced *Geed*), chief of brain imaging in the child psychiatry branch at the National Institute of Mental Health. Giedd, 43, has devoted the past 13 years to peering inside the heads of 1,800 kids and teenagers using high-powered magnetic resonance imaging (MRI). For each volunteer, he creates a unique photo album, taking MRI snapshots every two years and building a record as the brain morphs and grows. Giedd started out investigating the developmental origins of attention-deficit/hyperactivity disorder (ADHD) and autism ("I was going alphabetically," he jokes) but soon discovered that so little was known about how the brain is supposed to develop that it was impossible to figure out where things might be going wrong. In a way, the vast project that has become his life's work is nothing more than an attempt to establish a gigantic control group. "It turned out that normal brains were so interesting in themselves," he marvels. "And the adolescent studies have been the most surprising of all."

Before the imaging studies by Giedd and his collaborators at UCLA, Harvard, the Montreal Neurological Institute and a dozen other institutions, most scientists believed the brain was largely a finished product by the time a child reached the age of 12. Not only is it full-grown in size, Giedd explains, but "in a lot of psychological literature, traced back to [Swiss psychologist Jean] Piaget, the highest rung in the ladder of cognitive development was about age 12—formal operations." In the past, children entered initiation rites and started learning trades at about the onset of puberty. Some theorists concluded from this that the idea of adolescence was an artificial construct, a phenomenon invented in the post–Industrial Revolution years. Giedd's scanning studies proved what every parent of a teenager knows: not only is the brain of the adolescent far from mature, but both gray and white matter undergo extensive structural changes well past puberty. "When we started," says Giedd, "we thought we'd follow kids until about 18 or 20. If we had to pick a number now, we'd probably go to age 25."

Now that MRI studies have cracked open a window on the developing brain, researchers are looking at how the newly detected physiological changes might account for the adolescent behaviors so familiar to parents: emotional outbursts, reckless risk taking and rule breaking, and the impassioned pursuit of sex, drugs and rock 'n' roll. Some experts believe the structural changes seen at adolescence may explain the timing of such major

Source: "What Makes Teens Tick," by C. Wallis, May 10, 2004, *Time, 163*(19), 57–65. Copyright 2004 by Time, Inc. Reprinted with permission.

mental illnesses as schizophrenia and bipolar disorder. These diseases typically begin in adolescence and contribute to the high rate of teen suicide. Increasingly, the wild conduct once blamed on "raging hormones" is being seen as the by-product of two factors: a surfeit of hormones, yes, but also a paucity of the cognitive controls needed for mature behavior.

In recent years, Giedd has shifted his focus to twins, which is why the Manns are such exciting recruits. Although most brain development seems to follow a set plan, with changes following cues that are preprogrammed into genes, other, subtler changes in gray matter reflect experience and environment. By following twins, who start out with identical—or, in fraternal twins, similar—programming but then diverge as life takes them on different paths, he hopes to tease apart the influences of nature and nurture. Ultimately, he hopes to find, for instance, that Anthony Mann's plan to become a pilot and Brandon's to study law will lead to brain differences that are detectable on future MRIs. The brain, more than any other organ, is where experience becomes flesh.

Throughout the afternoon, the Mann brothers take turns completing tests of intelligence and cognitive function. Between sessions they occasionally needle one another in the waiting room. "If the other person is in a bad mood, you've got to provoke it," Anthony asserts slyly. Their mother Nancy Mann, a sunny paragon of patience who has three daughters in addition to the five boys, smiles and rolls her eyes.

Shortly before 5 p.m., the Manns head downstairs to the imaging floor to meet the magnet. Giedd, a trim, energetic man with a reddish beard, twinkly blue eyes and an impish sense of humor, greets Anthony and tells him what to expect. He asks Anthony to remove his watch, his necklace and a high school ring, labeled KEEPER. Does Anthony have any metal in his body? Any piercings? Not this clean-cut, soccer-playing Mormon. Giedd tapes a vitamin E capsule onto Anthony's left cheek and one in each ear. He explains that the oil-filled capsules are opaque to the scanner and will define a plane on the images, as well as help researchers tell left from right. The scanning will take about 15 minutes, during which Anthony must lie completely still. Dressed in a red sweat shirt, jeans and white K-Swiss sneakers, he stretches out on the examining table and slides his head into the machine's giant magnetic ring.

MRI, Giedd points out, "made studying healthy kids possible" because there's no radiation involved. (Before MRI, brain development was studied mostly by using cadavers.) Each of the Mann boys will be scanned three times. The first scan is a quick survey that lasts one minute. The second lasts two minutes and looks for any damage or abnormality. The third is 10 minutes long and taken at maximum resolution. It's the money shot. Giedd watches as Anthony's brain appears in cross section on a computer screen. The machine scans 124 slices, each as thin as a dime. It will take 20 hours of computer time to process the images, but the analysis is done by humans, says Giedd. "The human brain is still the best at pattern recognition," he marvels.

Some people get nervous as the MRI machine clangs noisily. Claustrophobes panic. Anthony, lying still in the soul of the machine, simply falls asleep.

Construction Ahead

One reason scientists have been surprised by the ferment in the teenage brain is that the brain grows very little over the course of childhood. By the time a child is 6, it is 90% to 95% of its adult size. As a matter of fact, we are born equipped with most of the neurons our brain will ever have—and that's fewer than we have in utero. Humans achieve their maximum brain-cell density between the third and sixth month of gestation—the culmination of an explosive period of prenatal neural growth. During the final months before birth, our brains undergo a dramatic pruning in which unnecessary brain cells are eliminated. Many neuroscientists now believe that autism is the result of insufficient or abnormal prenatal pruning.

What Giedd's long-term studies have documented is that there is a second wave of proliferation and pruning that occurs later in childhood and

that the final, critical part of this second wave, affecting some of our highest mental functions, occurs in the late teens. Unlike the prenatal changes, this neural waxing and waning alters not the number of nerve cells but the number of connections, or synapses, between them. When a child is between the ages of 6 and 12, the neurons grow bushier, each making dozens of connections to other neurons and creating new pathways for nerve signals. The thickening of all this gray matter—the neurons and their branchlike dendrites—peaks when girls are about 11 and boys 12½, at which point a serious round of pruning is under way. Gray matter is thinned out at a rate of about 0.7% a year, tapering off in the early 20s. At the same time, the brain's white matter thickens. The white matter is composed of fatty myelin sheaths that encase axons and, like insulation on a wire, make nerve-signal transmissions faster and more efficient. With each passing year (maybe even up to age 40) myelin sheaths thicken, much like tree rings. During adolescence, says Giedd, summing up the process, "you get fewer but faster connections in the brain." The brain becomes a more efficient machine, but there is a trade-off: it is probably losing some of its raw potential for learning and its ability to recover from trauma.

Most scientists believe that the pruning is guided both by genetics and by a use-it-or-lose-it principle. Nobel prizewinning neuroscientist Gerald Edelman has described that process as "neural Darwinism"—survival of the fittest (or most used) synapses. How you spend your time may be critical. Research shows, for instance, that practicing piano quickly thickens neurons in the brain regions that control the fingers. Studies of London cab drivers, who must memorize all the city's streets, show that they have an unusually large hippocampus, a structure involved in memory. Giedd's research suggests that the cerebellum, an area that coordinates both physical and mental activities, is particularly responsive to experience, but he warns that it's too soon to know just what drives the buildup and pruning phases. He's hoping his studies of twins will help answer such questions: "We're looking at what they eat, how they spend their time—is it video games or sports? Now the fun begins," he says.

No matter how a particular brain turns out, its development proceeds in stages, generally from back to front. Some of the brain regions that reach maturity earliest—through proliferation and pruning—are those in the back of the brain that mediate direct contact with the environment by controlling such sensory functions as vision, hearing, touch and spatial processing. Next are areas that coordinate those functions: the part of the brain that helps you know where the light switch is in your bathroom even if you can't see it in the middle of the night. The very last part of the brain to be pruned and shaped to its adult dimensions is the prefrontal cortex, home of the so-called executive functions—planning, setting priorities, organizing thoughts, suppressing impulses, weighing the consequences of one's actions. In other words, the final part of the brain to grow up is the part capable of deciding, I'll finish my homework and take out the garbage, and then I'll IM my friends about seeing a movie.

"Scientists and the general public had attributed the bad decisions teens make to hormonal changes," says Elizabeth Sowell, a UCLA neuroscientist who has done seminal MRI work on the developing brain. "But once we started mapping where and when the brain changes were happening, we could say, Aha, the part of the brain that makes teenagers more responsible is not finished maturing yet."

Raging Hormones

Hormones, however, remain an important part of the teen-brain story. Right about the time the brain switches from proliferating to pruning, the body comes under the hormonal assault of puberty. (Research suggests that the two events are not closely linked because brain development proceeds on schedule even when a child experiences early or late puberty.) For years, psychologists attributed the intense, combustible emotions and unpredictable behavior of teens to this biochemical onslaught. And new research adds fresh support. At puberty, the ovaries and testes begin to pour estrogen and testosterone into the bloodstream, spurring the development of the reproductive system, causing hair to sprout in the armpits and groin, wreaking

INSIDE THE ADOLESCENT BRAIN

The brain undergoes two major developmental spurts, one in the womb and the second from childhood through the teen years, when the organ matures by fits and starts in a sequence that moves from the back of the brain to the front

Nerve Proliferation ...

By age 11 for girls and 12 for boys, the neurons in the front of the brain have formed thousands of new connections. Over the next few years, most of these links will be pruned

Corpus Callosum

Thought to be involved in problem solving and creativity, this **bundle of nerve fibers** connects the left and right hemispheres of the brain. During adolescence, the nerve fibers thicken and process information more and more efficiently

Prefrontal Cortex

The CEO of the brain, also called the **area of sober second thought,** is the last part of the brain to mature—which may be why teens get into so much trouble. Located just behind the forehead, the prefrontal cortex grows during the preteen years and then shrinks as neural connections are pruned during adolescence

Basal Ganglia

Larger in females than in males, this part of the brain acts like a **secretary to the prefrontal cortex** by helping it prioritize information. The basal ganglia and prefrontal cortex are tightly connected: at nearly the same time, they grow neuron connections and then prune them. This area of the brain is also active in **small and large motor movements,** so it is important to expose preteens to music and sports while it is growing

Amygdala

This is the emotional center of the brain, home to **such primal feelings as fear and rage.** In processing emotional information, teens tend to rely more heavily on the amygdala. Adults depend more on the rational prefrontal cortex, a part of the brain that is underdeveloped in teens. That may explain why adolescents often react more impulsively than adults

Sources: Dr. Jay Giedd, chief of brain imaging, child psychiatric branch—NIMH; Paul Thompson; Andrew Lee; Kiralee Hayashi and Arthur Toga, UCLA Lab of Neuro Imaging; Nitin Gogtay and Judy Rapoport, child psychiatry branch, NIMH

TIME Diagram by Joe Lertola; text by Kristina Dell

THE IMAGE BANK—GETTY IMAGES

... and Pruning

Those that are used and reinforced—the pathways involved in language, for example—will be strengthened, while the ones that aren't used will die out

Cerebellum

Long thought to play a role in physical coordination, this area may also regulate certain thought processes. More sensitive to environment than to heredity, the cerebellum supports activities of higher learning like **mathematics, music and advanced social skills.** New research shows that it changes dramatically during adolescence, increasing the number of neurons and the complexity of their connections. The cerebellum is the only part of the brain that continues growing well into the early 20s

Time-Lapse Brain

Gray matter wanes as the brain matures. Here, 15 years of brain development are compressed into five images showing a shift from red (least mature) to purple (most mature)

havoc with the skin, and shaping the body to its adult contours. At the same time, testosterone-like hormones released by the adrenal glands, located near the kidneys, begin to circulate. Recent discoveries show that these adrenal sex hormones are extremely active in the brain, attaching to receptors everywhere and exerting a direct influence on serotonin and other neurochemicals that regulate mood and excitability.

The sex hormones are especially active in the brain's emotional center—the limbic system. This creates a "tinderbox of emotions," says Dr. Ronald Dahl, a psychiatrist at the University of Pittsburgh. Not only do feelings reach a flash point more easily, but adolescents tend to seek out situations where they can allow their emotions and passions to run wild. "Adolescents are actively looking for experiences to create intense feelings," says Dahl. "It's a very important hint that there is some particular hormone-brain relationship contributing to the appetite for thrills, strong sensations and excitement." This thrill seeking may have evolved to promote exploration, an eagerness to leave the nest and seek one's own path and partner. But in a world where fast cars, illicit drugs, gangs and dangerous liaisons beckon, it also puts the teenager at risk.

That is especially so because the brain regions that put the brakes on risky, impulsive behavior are still under construction. "The parts of the brain responsible for things like sensation seeking are getting turned on in big ways around the time of puberty," says Temple University psychologist Laurence Steinberg. "But the parts for exercising judgment are still maturing throughout the course of adolescence. So you've got this time gap between when things impel kids toward taking risks early in adolescence, and when things that allow people to think before they act come online. It's like turning on the engine of a car without a skilled driver at the wheel."

Dumb Decisions

Increasingly, psychologists like Steinberg are trying to connect the familiar patterns of adolescents' wacky behavior to the new findings about their evolving brain structure. It's not always easy to do. "In all likelihood, the behavior is changing because the brain is changing," he says. "But that is still a bit of a leap." A critical tool in making that leap is functional magnetic resonance imaging (fMRI). While ordinary MRI reveals brain structure, fMRI actually shows brain activity while subjects are doing assigned tasks.

At McLean Hospital in Belmont, Mass., Harvard neuropsychologist Deborah Yurgelun-Todd did an elegant series of FMRI experiments in which both kids and adults were asked to identity the emotions displayed in photographs of faces. "In doing these tasks," she says, "kids and young adolescents rely heavily on the amygdala, a structure in the temporal lobes associated with emotional and gut reactions. Adults rely less on the amygdala and more on the frontal lobe, a region associated with planning and judgment." While adults make few errors in assessing the photos, kids under 14 tend to make mistakes. In particular, they identify

Source: Wallis, C., "What Makes Teens Tick" © 2004 TIME Inc, reprinted by permission.

fearful expressions as angry, confused or sad. By following the same kids year after year, Yurgelun-Todd has been able to watch their brain-activity pattern—and their judgment—mature. Fledgling physiology, she believes, may explain why adolescents so frequently misread emotional signals, seeing anger and hostility where none exists. Teenage ranting ("That teacher hates me!") can be better understood in this light.

At Temple University, Steinberg has been studying another kind of judgment: risk assessment. In an experiment using a driving-simulation game, he studies teens and adults as they decide whether to run a yellow light. Both sets of subjects, he found, make safe choices when playing alone. But in group play, teenagers start to take more risks in the presence of their friends, while those over age 20 don't show much change in their behavior. "With this manipulation," says Steinberg, "we've shown that age differences in decision making and judgment may appear under conditions that are emotionally arousing or have high social impact." Most teen crimes, he says, are committed by kids in packs.

Other researchers are exploring how the adolescent propensity for uninhibited risk taking propels teens to experiment with drugs and alcohol. Traditionally, psychologists have attributed this experimentation to peer pressure, teenagers' attraction to novelty and their roaring interest in loosening sexual inhibitions. But researchers have raised the possibility that rapid changes in dopamine-rich areas of the brain may be an additional factor in making teens vulnerable to the stimulating and addictive effects of drugs and alcohol. Dopamine, the brain chemical involved in motivation and in reinforcing behavior, is particularly abundant and active in the teen years.

Why is it so hard to get a teenager off the couch and working on that all important college essay? You might blame it on their immature nucleus accumbens, a region in the frontal cortex that directs motivation to seek rewards. James Bjork at the National Institute on Alcohol Abuse and Alcoholism has been using fMRI to study motivation in a challenging gambling game. He found that teenagers have less activity in this region than adults do. "If adolescents have a motivational deficit, it may mean that they are prone to engaging in behaviors that have either a really high excitement factor or a really low effort factor, or a combination of both." Sound familiar? Bjork believes his work may hold valuable lessons for parents and society. "When presenting suggestions, anything parents can do to emphasize more immediate payoffs will be more effective," he says. To persuade a teen to quit drinking, for example, he suggests stressing something immediate and tangible—the danger of getting kicked off the football team, say—rather than a future on skid row.

Persuading a teenager to go to bed and get up on a reasonable schedule is another matter entirely. This kind of decision making has less to do with the frontal lobe than with the pineal gland at the base of the brain. As nighttime approaches and daylight recedes, the pineal gland produces melatonin, a chemical that signals the body to begin shutting down for sleep. Studies by Mary Carskadon at Brown University have shown that it takes longer for melatonin levels to rise in teenagers than in younger kids or in adults, regardless of exposure to light or stimulating activities. "The brain's program for starting nighttime is later," she explains.

Pruning Problems

The new discoveries about teenage brain development have prompted all sorts of questions and theories about the timing of childhood mental illness and cognitive disorders. Some scientists now believe that ADHD and Tourette's syndrome, which typically appear by the time a child reaches age 7, may be related to the brain proliferation period. Though both disorders have genetic roots, the rapid growth of brain tissue in early childhood, especially in regions rich in dopamine, "may set the stage for the increase in motor activities and tics," says Dr. Martin Teicher, director of developmental biopsychiatry research at McLean Hospital. "When it starts to prune in adolescence, you often see symptoms recede."

Schizophrenia, on the other hand, makes its appearance at about the time the prefrontal cortex is getting pruned. "Many people have speculated

7 Rules for Parents

Drawing on the latest scientific studies of adolescents, Laurence Steinberg, a professor of psychology at Temple University, offers this advice for the parents of teens:

1. What you do matters.
Many parents mistakenly believe that by the time children have become teenagers, there's nothing more a parent can do. Wrong. Studies clearly show that good parenting continues to help teenagers develop in healthy ways, stay out of trouble, and do well in school.

2. You can't be too loving.
Don't hold back when it comes to pouring on the praise and showing physical affection. There is no evidence that adolescents are harmed by having parents who are unabashedly loving—as long as you don't embarrass them in front of their friends.

3. Stay involved.
Many parents who were actively involved in their child's life during the early years withdraw when their child becomes a teenager. This is a mistake. It's just as important for you to be involved now—maybe even more so. Participate in school programs. Get to know your child's friends. Spend time together.

4. Adapt your parenting.
Many parenting strategies that work at one age stop working at the next stage of development. As children get older, for example, their ability to reason improves dramatically, and they will challenge you if what you are asking doesn't make sense.

5. Set limits.
The most important thing children need from their parents is love, but a close second is structure. Even teenagers need rules and limits. Be firm but fair. Relax your rules bit by bit as your child demonstrates more maturity. If he or she can't handle the freedom, tighten the reins and try again in a few months.

6. Foster independence.
Many parents erroneously equate their teenager's drive for independence with rebelliousness, disobedience or disrespect. It's healthy for adolescents to push for autonomy. Give your children the psychological space they need to learn to be self-reliant, and resist the temptation to micromanage.

7. Explain your decisions.
Good parents have expectations, but in order for your teenager to live up to them, your rules and decisions have to be clear and appropriate. As your child becomes more adept at reasoning, it's no longer good enough to say "Because I said so."

Laurence Steinberg's most recent book is *The 10 Basic Principles of Good Parenting (Simon & Schuster).*

Source: Steinberg, L, "7 Rules for Parents," 2004. Used with permission.

that schizophrenia may be due to an abnormality in the pruning process," says Teicher. "Another hypothesis is that schizophrenia has a much earlier, prenatal origin, but as the brain prunes, it gets unmasked." MRI studies have shown that while the average teenager loses about 15% of his cortical gray matter, those who develop schizophrenia lose as much as 25%.

What's A Parent To Do?

Brain scientists tend to be reluctant to make the leap from the laboratory to real-life, hard-core teenagers. Some feel a little burned by the way earlier neurological discoveries resulted in Baby Einstein tapes and other marketing schemes that misapplied their science. It is clear, however, that there are implications in the new research for parents, educators and lawmakers.

In light of what has been learned, it seems almost arbitrary that our society has decided that a young American is ready to drive a car at 16, to vote and serve in the Army at 18 and to drink alcohol at 21. Giedd says the best estimate for when the brain is truly mature is 25, the age at which you can rent a car. "Avis must have some pretty sophisticated neuroscientists," he jokes. Now that we have scientific evidence that the adolescent brain is not quite up to scratch, some legal scholars and child advocates argue that minors should never be tried

as adults and should be spared the death penalty. Last year, in an official statement that summarized current research on the adolescent brain, the American Bar Association urged all state legislatures to ban the death penalty for juveniles. "For social and biological reasons," it read, "teens have increased difficulty making mature decisions and understanding the consequences of their actions."

Most parents, of course, know this instinctively. Still, it's useful to learn that teenage behavior is not just a matter of willful pigheadedness or determination to drive you crazy—though these, too, can be factors. "There's a debate over how much conscious control kids have," says Giedd, who has four "teenagers in training" of his own. "You can tell them to shape up or ship out, but making mistakes is part of how the brain optimally grows." It might be more useful to help them make up for what their brain still lacks by providing structure, organizing their time, guiding them through tough decisions (even when they resist) and applying those time-tested parental virtues: patience and love.

—With reporting by Alice Park/New York

READING 3

Moving Your School to Brain Compatibility

Wayne Jennings and Joan Caulfield

Three key features characterize this empowering, systems approach to learning:

1. Brain-based curriculum and teaching methods.
2. Advisor programs and personal learning plans.
3. Partnerships with home, businesses, agencies, and postsecondary education.

Each of these is described separately but all work interactively as a system to create a powerful model of schooling for youth.

Brain-Based Curriculum and Teaching Methods

The educational approach is brain compatible. This means that learning accelerates when students receive great amounts of input and mental stimulation and have many opportunities to learn by doing, inquiring, discovering, and performing. Learning must be active and engaging, and provide for immediate application. Brain-based education, a systemic approach, encompasses many practices to advance permanent learning.

Experiential learning and learning by application engage the energy and enthusiasm of youth. Examples include community service projects, working with a mentor from the community, serving apprenticeships, preparing television or theatrical presentations, researching a topic or problem, peer teaching, cross-age tutoring, coaching, adventure and challenge activities, using technology, establishing democratic classrooms and school organizations, and using a curriculum that is interdisciplinary and addresses the academic, career, cultural, and personal needs of every student.

Brain-based learning provides for rapid, deep, and satisfying learning. Its key elements are

1. Providing the brain with massive amounts of input. The brain is starved for input in most classrooms, hence is idle, daydreams, or resists. Input is accomplished by immersing students in issues, using real-world projects, field trips, speakers, and many kinds of media.
2. Giving youth many opportunities and challenges to apply learning or providing experiential learning projects. In most school settings, students are like race cars at the starting line, energized and ready to go. But the flag never falls, so they sit and wait. Students need to be given responsibility, encouraged to tackle new tasks, involved in complex projects and interdisciplinary, life-linked studies—in short, to learn by doing. Teachers need to listen to youth and take into account their ideas and interests as beginning and important points to complex societal issues.
3. Providing feedback to help students understand how they are doing in the course of real-world learning. The feedback must be immediate and helpful. Most classrooms give little individualized feedback beyond test scores and grades. Students need coaching and suggestions. They want to receive peer reactions and see the results of their efforts in important endeavors, such as writing a real letter or teaching a younger child arithmetic.
4. Providing a safe, secure setting free from threat. The brain, in effect, downshifts under threat and overloads from emotional stress. Learning conditions must not result in fear of ridicule, for example. Students must be able to test their skills at real tasks in a safe, noncritical environment.

In short, for maximum and permanent learning, content and methods must be meaningful, provide

Source: From "Moving Your School to Brain Compatibility," by W. Jennings and J. Caulfield, 1997, *The Networker, 9*(2), 5. Copyright by Wayne Jennings. Reprinted with permission.

for immediate application of learnings, and have an emotional impact (e.g., satisfaction, enjoyment, challenge).

Students can learn how the world works by studying their own family and community structure and their personal and social needs. In doing so, they conduct research on their history and traditions, collect data through surveys, analyze family income and housing figures from census reports, organize information, and devise ways to summarize and report the findings. These processes provide students with exercises in problem solving, thinking skills, information management, research methods, presentation skills, and writing competencies. They learn to examine information, draw inferences, chart or graph data, trace roots of modern issues, and prepare recommendations. They use modern tools of technology to concentrate on the issues and avoid the tedium of typing drafts and devising charts by hand.

These kinds of learning exemplify the meaning, application, and emotional features of brain-based learning. Other examples of brain-compatible content and teaching methods: students using nearby colleges or universities to observe advanced arts activities in dance, painting, photography, drama, music; or students studying airports, transportation systems, television studios, city government, juvenile delinquency, and world events. The topics of interest to youth are endless. In each area, they can receive training in skills, such as interviewing and recording notes. In the process, students learn content in context, such as history, geography, literature, math, and science.

As another example, students can assist in the running of their school. They are immersed in the tough problems of management, finance, discipline, and facility maintenance. They give of themselves in service to the school by handling important tasks. Service in the school and the community provides important growth experiences for students finding their place and has a direct impact on how well they handle responsibility and the faith others have placed in them.

This approach replaces the fragmented day of hourly subjects taught in isolation from each other and from the rest of the world. The approach reduces the dreary reliance on textbooks and worksheets. School becomes an exciting place where students have important tasks to do and do not want to let others down. They exercise academic and problem-solving skills in the crucible of real-life experience. The school becomes a miniature democratic enterprise. Each person contributes and has an important stake in the operation. How different from coming into a conventional school, flopping into a chair, and relying on others to extrinsically motivate and coax students into participating!

Advisor Programs and Personal Learning Plans

Each student has an advisor as an anchor point in the school. The advisor schedules regular meetings with the student and parent(s) to set goals, tailor the program to the student's needs, review progress, and assist with successful advancement in the school. The advisor remains with the student over a period of years, although students may request a change of advisor if personalities clash. The advisory, the small group of students with a common advisor, provides a home-base setting, a supportive team, and an opportunity for social events.

Each student has a personal learning plan (PLP) that takes into account the student's learning style, interests, strengths, and needs. It helps the advisor, parent, and student determine the best program for the student. It can be adjusted as needed. The advisor respects the student and parent for their input, advice, and suggestions on how to capitalize on the student's strengths and interests to create the PLP.

Partnerships with Home, Businesses, Agencies, and Postsecondary Education

Advisors invite parents to participate in designing their child's program. This respect assumes parents know something about life and living and that they know a great deal about their child's interests, history, and strengths. Parents are welcome to visit at any time, to call the advisor with questions, or to inquire about any aspect of the school. It is their school! The school asks about parent contributions to the educational program, whether knowledge,

skills, or in-person support and participation. Parents can share their experiences, assist in the learning process through tutoring or other activities, and help with important governance and committee work.

Businesses are tapped for experiences such as shadow studies (following a person for a day or so), career awareness, apprenticeships, mentorships, and work experiences.

Most youth know little to nothing about how society's work is accomplished. Thus, they don't see the connection between school learning and success in jobs. More than 70 percent of the jobs in the year 2007 will be new or substantially changed from those of 1997. According to the U.S. Department of Labor SCANS report, employers expect far more of employees in terms of skills, knowledge, initiative, and responsibility than in the past. An outreach coordinator can arrange to tap the rich assortment of small and large businesses within easy access of the school.

A myriad of governmental and nonprofit social agencies, museums, and historical and other organizations await tapping to enrich and enliven schooling. Students need to learn about their community and its complicated functioning by getting into the real world, gaining experience, and having the opportunity to reflect about it with teachers and other students.

One student might spend time at the state fish hatchery; another working with a museum curator; another examining the differences between state, city, and county governing bodies; and another assisting the elderly in a nursing home.

Here are some examples of how modern learning principles can be applied to increase learning dramatically for all students through a variety of means:

1. Specifying the skills, knowledge, and attitudes students are to attain—otherwise known as competency-based education or outcome-based education. Example: Students demonstrate writing proficiency by writing letters to the editor.
2. Making learning meaningful to students. Example: Students learn world geography through their interest in shortwave radio.
3. Applying what is learned to real-life tasks. Example: Students use statistics to conduct and analyze a community survey of attitudes about taxes.
4. Recognizing the importance of attitudes and emotions in learning. Example: Studies are made interesting and challenging through projects like building a model of a city of the future.
5. Using interdisciplinary approaches. Example: Students use and learn math, science, writing, and social issues in a study of energy conservation.
6. Making community and service learning activities a part of the school experience. Example: Students understand aging by doing odd jobs for seniors.
7. Using experiential approaches. Example: Students create a miniature society by taking the executive, judicial, and legislative roles.
8. Increasing input to the brain by a factor or ten (through brain-based learning strategies). Example: Schools present material in writing, orally, visually, with speakers, through videos, through simulations, with role-playing, with field trips, by analogies, and with stories.
9. Using real problems to develop thinking skills. Example: Students analyze recent election results and develop other scenarios or projections.
10. Using projects and cooperative learning methods. Example: Students plan a new school playground and work in teams to accomplish the complex task of building it.
11. Empowering learners with the extraordinary technology. Example: Students use desktop publishing to create newsletter reports of their research.
12. Involving students in planning content and learning processes. Example: Students design a school course of providing a consumer complaint service for the community.

Creative teachers use such activities to challenge their students and to energize schooling. Schools organize to ensure a safe setting where every student is known and special.

READING 4

Safe Schools for the Roller Coaster Years

Linda Inlay

Structuring middle schools with adolescents' cognitive and psychological needs in mind creates a secure space for learning.

The "roller coaster years" is an apt descriptor of adolescence. One minute, a 7th grade girl is sweet and cooperative, and the next minute she's immersed in high drama because she doesn't like how she looks. A 6th grader no longer wants to hold her father's hand in public. An 8th grade boy, once a model student, is now more concerned about fitting in with the popular crowd.

As the director of River School, a small middle school in Napa, California, and a mother of two, I have encountered many behaviors like those described above. Changes taking place in adolescents' brains, even more than the obvious physical changes, are the catalyst for such dramatic ups and downs. To give adolescents a safe track to roll through these years undamaged, educators need to look at the emotional and psychological needs that come with this intense brain development. By attending to these needs, we can create safe schools that will enhance students' capacity to learn.

The Need to Experiment

Key parts of adolescents' brains develop at different rates. The brain's emotional centers surge into hyperdrive long before the "judgment seat"—the prefrontal cortex, which mitigates emotional ups and downs—has matured. In terms of their brains, adolescents are still more like children than young adults, although the appearance of physical maturity tricks us into thinking otherwise. It is not until age 25 that humans' prefrontal cortex matures and the capacity to make sound judgments is fully developed. Possibly this is why the highest car insurance premiums are charged to males under age 25.

During adolescence the brain's capacity to make connections nearly doubles, which encourages lots of experimentation between ages 11 and 25 (such as long hair in my generation and green hair today). During this time the brain is "hardwired," as the neural networks for certain tendencies and habits are established. After adolescence, the brain's capacity for connection returns to normal. The neural connections established during the teen years are kept intact and connections that were not used disappear. As Brownlee and colleagues put it,

> Teenagers are choosing what their brains are going to be good at—learning right from wrong, responsibility or impulsiveness, thinking or video games. (Brownlee, Hotinski, Pailthorp, Ragan, & Wong, 1999)

Creating a School That Supports Adolescents

The Need for Autonomy

Keeping in mind what I know of how the adolescent brain develops, I have structured the River School to help our students develop a sense of autonomy and responsibility as well as personal connectedness. In this stage, adolescents are trying on different personas to figure out "who they are." Analytical thinking also starts in adolescence and leads to questioning authority. Teenagers begin to separate emotionally from parents (no more hand-holding and lots of rolling of the eyes) and to develop their own unique identities—a crucial process in becoming psychologically healthy, independent adults.

Source: From "Safe Schools for the Roller Coaster Years," by L. Inlay, 2005, *Educational Leadership, 62*(7), pp. 41–43.
Copyright 2005 by the Association for Supervision and Curriculum Development.

When adolescent students feel safe to be themselves yet also connect to their peers, they are more grounded. This emotional safety provides a foundation that prevents narcissism on the one hand and reduces vulnerability to peer pressure on the other.

Rudolf Dreikurs (1971) wrote about the challenges of educating students during a period when social institutions were moving from a reliance on autocratic relationships to a focus on democratic relationships. I agree with Dreikurs that the old paradigm "Do as I say because I'm the adult" does not produce happy, responsible young people at home or in school. Nor does the permissive model, which produces what Shaw (2003) calls an epidemic of indulged children. When adults follow the autocratic model, children are passive; in the permissive paradigm, children have too much inappropriate power and become selfish and arrogant. Dreikurs offered another way to relate with young people: democratic parenting and democratic education in schools. This approach encourages adults and young people to treat each other with mutual respect and regard.

In keeping with this philosophy, teachers at River School provide a safe place where students can practice making good and poor choices within appropriate boundaries. Middle school students need the chance to make a lot of mistakes; that's part of the experimentation and limit-testing important to adolescence (Mackenzie, 2001). Child psychiatrist Jay Giedd has observed,

> I see kids who are cracking up because of the stress of the workload and because they see only one way to success, to getting a good job. They don't take many real risks because they are afraid. But maybe because of that, they have not learned to make their own decisions. That worries me. I think kids need to learn life's lessons. . . . They need to take risks, to make some mistakes. (quoted in Strauch, 2004)

In an environment that feels safe, mistakes can powerfully teach young people about choices and consequences, about freedom and responsibility. When students at our school lie about bad choices they have made, they invariably tell me they did so because they "didn't want to get in trouble." These students are willing to accept consequences for their mistakes, but they will lie if they fear having someone get angry at them. When human beings feel safe, they use their cerebral cortex rather than the "fight or flight" part of their brain, and they can better reflect on mistakes.

Instead of showing anger and disapproval when adolescents behave in undesirable ways, educators should guide teens to reflect on their behavior. Teenagers can then focus on themselves and the choices they made rather than worry about defending themselves against adult anger. At River School, teachers and student mentors lead students through the following reflective process, which trains them to make better choices and accept responsibility for their mistakes:

- Acknowledge your mistake instead of blaming, lying, or making excuses.
- "Clean it up" with those involved.
- Accept the consequence for the mistake.
- Learn from your behavior so that you are less likely to make the mistake again.
- Forgive yourself for the mistake and move on.

Richard DuFour talks about the "loose-tight" leadership style of principals in successful professional learning communities (DuFour & Eaker, 1998). The same leadership style can be applied to middle schools, with the school climate being "tight" in the sense of having clear expectations and consequences but "loose" in terms of allowing students to make appropriate choices.

As River School has become more democratic and respectful in relating with our students, we have found that some students' parents may be too autocratic while others may be too indulgent. Through parenting classes and conferences, we educate parents about the possibility of shifting more control to teenagers and letting teens learn from their mistakes through trial and error. A partnership of parents, teachers, and students has been

very effective in helping students develop a strong sense of self and display personal and social responsibility.

The Need to Belong—Yet Be Yourself

Adolescents vacillate between two psychological needs—need for a sense of self and need for a sense of belonging (Adler, 1927/1992). Psychologist H. Scott Glenn (1989) believes that all human beings have three needs that help nurture both a sense of self and a sense of belonging: the need to be listened to, the need to be taken seriously, and the need to make a contribution.

At River School we attempt to fulfill these needs by organizing small listening groups, each composed of a teacher advisor and several students who meet regularly to share their concerns and successes. Students look forward to these sessions and often carry on even when the teacher is absent. Besides providing a safe place to vent, listening groups encourage students to speak up for themselves, to think critically and develop opinions, and to engage more in their classes.

We also work hard to develop in students a sense of community and belonging through events that unite 6th, 7th, and 8th graders, such as "The Amazing Race" scavenger hunt in San Francisco. We team each 6th grade class with a group of 7th and 8th graders to form a "family" that meets at least once a month for community-building activities. Before we started this "family" program, many 6th graders were afraid of the 8th graders who tried to connect with them; the 8th graders felt rebuffed and gave up. Now the 6th grade students make friends with the older students and show more confidence, speaking up at school meetings, for example. We do not have a pecking order by grade level.

When our students feel emotionally safe, when they can walk down the halls unafraid of being teased, when they have people they can talk to about their concerns, and when adults nurture that climate of safety, students respond better to academic challenges.

The Need for Personal Meaning

We have learned over the years that unless curriculum is presented in ways that middle school students can connect with personally, they will forget what they have learned within a short time (National Middle Schools Association, 2002). For example, one teacher at River School helped students relate to the history of the American Revolutionary War by comparing the colonists' demands for autonomy and independence to adolescents' need to be heard and to have their rights considered by their parents.

Another way to help students connect to their learning is to have them develop their own questions to investigate within broad parameters set by the teachers. For example, when teachers at River School initiated a unit on cultures that have developed alongside rivers, they posed the overarching question, "How does geography affect culture and how do cultures affect geography?" Students then thought of subquestions that they were eager to investigate:

- How does geography shape the religions and beliefs of a culture?
- Does having less make people care more?
- What comforts do people take for granted that make them less concerned about the earth?

We also help students at River School find meaning by tapping into their need to make a contribution. We encourage 8th graders in particular to contribute to creating a supportive student culture at the school by providing peer mediation, speaking at conferences, participating in a panel at a parenting class, hosting visitors, or mentoring struggling 6th graders. Our 6th and 7th graders act as ambassadors for the school, creating presentations (including one performed with music) to share at local elementary schools. Such activities help students see that they matter at the school, lessen the attitude of entitlement and disdain that adolescents often display, and heighten their confidence and self-esteem.

When middle schoolers relate with adults and peers in mutually respectful ways, when they are not afraid to take intellectual risks, and when they are presented with a challenging and personally meaningful curriculum, they thrive academically and become engaged with their school community, laying the foundation for engagement in the larger community.

I witnessed the results of the culture of safety and engagement we foster at River School on one particular last day of school. After the last bell, the whole school lingered in the courtyard signing yearbooks, saying goodbye, hugging, and crying. Parents entering the courtyard were amazed at students' depth of caring and their uncharacteristic response to the start of summer. Whereas most adults remember middle school as one of the most uncomfortable and awkward passages in their lives, our students recall the River School fondly.

References

Adler, A. (1927/1992). *Understanding human nature*. Oxford, UK: One World Publications.

Brownlee, S., Hotinski, R., Pailthorp, B., Ragan, E., & Wong, K. (1999, Aug. 9). Inside the teen brain. *U.S. News and World Report*.

Dreikurs, R. (1971). *Character education and spiritual values in an anxious age*. New York: Alfred Adler Institute.

DuFour, R., & Eaker, R. (1998). *Professional learning communities at work*. Alexandria, VA: ASCD.

Glenn, H. S. (1989). *Raising self-reliant children in a self-indulgent age*. Rocklin, CA: Prima Publishing.

Mackenzie, R. (2001). *Setting limits for the strong-willed child*. Rocklin, CA: Prima Publishing.

National Middle Schools Association. (2002). NMSA position statement on curriculum integration. Available: www.nmsa.org/news/positionpapers/integrativecurriculum.htm

Shaw, R. (2003). *Epidemic: The rot of American culture*. New York: HarperCollins.

Strauch, B. (2004). *The primal teen*. New York: Doubleday.

Linda Inlay is Director of the River School in Napa, California; 707-253-6813; linlay@nvusd.k12.ca.us.

READING 5

A Case for School Connectedness

Robert W. Blum

Students are more likely to succeed when they feel connected to school.

School bonding, school climate, teacher support, student engagement: Researchers have used these terms over the years to address the concept of school connectedness. School connectedness refers to an academic environment in which students believe that adults in the school care about their learning and about them as individuals.

Klem and Connell (2004) provide a frightening statistic in this regard, noting that

> By high school, as many as 40 to 60 percent of all students—urban, suburban, and rural—are chronically disengaged from school. (p. 262)

Is it possible that half of our high school students may not believe that adults in school care about their learning and about them as individuals? More to the point, what can educators do to reconnect these large numbers of chronically disconnected students?

Although connecting students to school is important at all grade levels, it's especially crucial during the adolescent years. In the last decade, educators and school health professionals have increasingly pointed to school connectedness as an important factor in reducing the likelihood that adolescents will engage in health-compromising behaviors. A connected school environment also increases the likelihood of academic success.

A great deal of research looks at school connectedness. But because this research spans so many fields—medicine, education, psychology, and sociology—and because it tackles so many related concepts, such as student engagement and school climate, the concept of school connectedness does not offer a clearly defined empirical base. In this era of accountability and standards, school connectedness can seem like a soft approach to school improvement. It can, however, have a substantial impact on the measures of student achievement for which schools are currently being held accountable.

In response to the weight of evidence that supports school connectedness, my colleagues and I convened an invitational conference at the Wingspread Conference Center in Racine, Wisconsin. Our goal was to bring together key researchers as well as representatives from the government, education, and health sectors to identify the current state of research-based knowledge related to school connectedness. Using this information, we synthesized a set of core principles about school connectedness to guide schools across the United States.[1] We titled this synthesis the *Wingspread Declaration on School Connections* (see box).

Distilling the Research

When one looks at the research literature across the different fields of inquiry, three school characteristics stand out as helping young people feel connected to school while simultaneously encouraging student achievement: (1) high academic standards coupled with strong teacher support; (2) an environment in which adult and student relationships are positive and respectful; and (3) a physically and emotionally safe school environment. Students who

[1]This work was supported by the Centers for Disease Control and Prevention's Division of Adolescent and School Health (DASH). The proceedings from the invitational conference and the Wingspread Declaration on School Connections are available at www.allaboutkids.umn.edu/Wing fortheWeb/schooldeclaration.pdf. ASCD was a conference participant.

Source: From "A Case for School Connectedness," by R. W. Blum, 2005, *Educational Leadership, (62)*7, pp. 16–20. Copyright 2005 by the Association for Supervision and Curriculum Development.

feel connected to school (independent of how these students are faring academically) are less likely to use substances, exhibit emotional distress, demonstrate violent or deviant behavior, experience suicidal thoughts or attempt suicide, and become pregnant (Lonczak, Abbott, Hawkins, Kosterman, & Catalano, 2002; Samdal, Nutbeam, Wold, & Kannas, 1998). In addition, when young people feel connected to school, they are less likely to skip school or be involved in fighting, bullying, and vandalism (Schapps, 2003; Wilson & Elliott, 2003). These students are more likely to succeed academically and graduate (Connell, Halpern-Felsher, Clifford, Crichlow, & Usinger, 1995; Wentzel, 1998).

What are the factors that influence school connectedness? Students who experience school connectedness like school, feel that they belong, believe teachers care about them and their learning, believe that education matters, have friends at school, believe that discipline is fair, and have opportunities to participate in extracurricular activities.

Major threats to school connectedness include social isolation, lack of safety in school, and poor classroom management. Social isolation, which is especially risky for adolescents, can result from students being ignored, bullied, or teased (Bishop et al., 2004) and tends to flourish in environments predominated by social cliques. Unsafe or chaotic schools and schools with poorly managed classrooms simply cannot provide a stable environment for respectful and meaningful student learning.

How Schools Can Help

How can schools encourage school connectedness? It does not come about purely as the result of rules, regulations, and zero-tolerance policies, which can actually mold harsh school environments. Connections spring instead from individual action on the part of both teachers and administrators as well as from more elusive factors, such as school environment.

Teachers are obviously central to the equation. Although school connectedness might suggest smaller class sizes, the classroom's culture seems to matter more than its size does. Effective teachers can create connectedness in the classroom in a number of ways. When teachers make learning meaningful and relevant to their students' lives, students develop a stake in their own education. When teachers create a clear classroom structure with consistent expectations for behavior and performance, they provide a healthy setting in which students can exercise autonomy and practice decision-making skills. Teachers build connectedness in the classroom when they encourage team learning exercises. Cooperative learning tends to break down social isolation by integrating student teams across gender, academic ability, and ethnicity. Rewarding a variety of student achievements and recognizing student progress—not only top performance—are also important components.

But teachers cannot create school connectedness on their own. Without a supportive administration, teachers will not be able to effectively support their students. For example, when a school allows a young person to fail—when it doesn't do everything in its power to retain that student—students get the message, "In this school, there are winners and there are losers." This assumption sets up a dysfunctional dichotomy: Those less likely to do well academically will strive to create an anti-academic climate because they know they can't win at the game. The perceived winners—those who are academically proficient—are seen as "nerds," as "dorks," and, ironically enough, as "losers." But when a principal calls home, when he or she follows up every time a student misses school, students get a different message entirely: "In this school, all students are expected to succeed."

A study panel from the National Research Council and the Institute of Medicine (2004) identified a series of factors associated with school engagement. Educators can substantially increase school connectedness in their students when they

- Avoid separating students onto vocational and college tracks.
- Set high academic standards for all students and provide all students with the same core curriculum.
- Limit the size of the school to create small learning environments.

Wingspread Declaration on School Connections

Students are more likely to succeed when they feel connected to school. School connection is the belief by students that adults in the school care about their learning as well as about them as individuals. The critical requirements for feeling connected include students' experiencing

- High academic expectations and rigor coupled with support for learning.
- Positive adult/student relationships.
- Physical and emotional safety.

Increasing the number of students connected to school is likely to influence critical accountability measures, such as

- Academic performance.
- Incidents of fighting, bullying, or vandalism.
- Absenteeism.
- School completion rates.

Strong scientific evidence demonstrates that increased student connection to school promotes

- Motivation.
- Classroom engagement.
- Improved school attendance.

These three factors in turn increase academic achievement. These findings apply across racial, ethnic, and income groups.

Likewise, there is strong evidence that a student who feels connected to school is less likely to exhibit

- Disruptive behavior.
- School violence.
- Substance and tobacco use.
- Emotional distress.
- Early age of first sex.

The most effective strategies for increasing the likelihood that students will be connected to school include

- Implementing high standards and expectations and providing academic support to all students.
- Applying fair and consistent disciplinary policies that are collectively agreed upon and fairly enforced.
- Creating trusting relationships among students, teachers, staff, administrators, and families.
- Hiring and supporting capable teachers skilled in content, teaching techniques, and classroom management to meet each learner's needs.
- Fostering high parent/family expectations for school performance and school completion.
- Ensuring that every student feels close to at least one supportive adult at school.

Best Bets Warranting Further Research

- Programs and approaches that create positive and purposeful peer support and peer norms.
- Strategies that work to promote connection to school among disenfranchised groups.
- Analysis of the costs and effectiveness of different programs for fostering school connectedness.
- Evaluation of new and existing curricular approaches, staff and administrator training, and various institutional structures.
- Effects of school connectedness in students on teacher morale, effectiveness, and turnover.

- Form multidisciplinary education teams in which groups of teachers work with students.
- Ensure that every student has an advisor.
- Provide mentorship programs.
- Ensure that course content is relevant to the lives of students.
- Provide service learning and community service projects.
- Provide experiential, hands-on learning opportunities.
- Use a wide variety of instructional methods and technologies.

- Extend the class period, school day, and/or school year.
- Provide opportunities for students who are falling behind to catch up.

The Wingspread Declaration on School Connections

A generation of exciting research has reviewed strategies that have proven effective in creating engaging school climates in which young people feel connected. The Wingspread Declaration on School Connections is based on a detailed review of this research as well as on in-depth discussions among leaders in the health and education fields. The declaration's insights can form the foundation for school environments in which all students, regardless of their academic capacity, are engaged and feel part of the education endeavor.

We are responsible for our schools. We need to use what research and experience have taught us to create schools where students feel connected. We want high schoolers who are convinced that the adults with whom they interact care about them as individuals and care about their learning. These schools must establish high standards, challenge all students to reach their potential, and provide the support students need to succeed.

References

Bishop, J. H., Bishop, M., Bishop, M., Gelbwasser, L., Green, S., Peterson, E., et al. (2004). *Journal of School Health, 74*(7), 235–251.

Connell, J. P., Halpern-Felsher, B., Clifford, E., Crichlow, W., & Usinger, P. (1995). Hanging in there: Behavioral, psychological, and contextual factors affecting whether African-American adolescents stay in school. *Journal of Adolescent Research, 10*(1), 41–63.

Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health, 74*(7), 262–273.

Lonczak, H. S., Abbott, R. D., Hawkins, J. D., Kosterman, R., & Catalano, R. (2002). The effects of the Seattle Social Development Project: Behavior, pregnancy, birth, and sexually transmitted disease outcomes by age 21. *Archives of Pediatric Adolescent Health, 156*, 438–447.

National Research Council and Institute of Medicine. (2004). *Engaging schools: Fostering high school students' motivation to learn*. Washington, DC: The National Academies Press. Available: www.nap.edu/books/0309084350/html/

Samdal, O., Nutbeam, D., Wold, B., & Kannas, L. (1998). Achieving health and educational goals through schools. *Health Education Research, 13*(3), 383–397.

Schapps, E. (2003, April). *The role of supportive school environments in promoting academic success*. Sacramento, CA: California Department of Education Press.

Wentzel, K. R. (1998). Social relationships and motivation in middle school. *Journal of Educational Psychology, 90*(2), 202–209.

Wilson, D., & Elliott, D. (2003, June). *The interface of school climate and school connectedness: An exploratory review and study*. Paper presented at the Wingspread Conference on School Connectedness: Strengthening Health and Educational Outcomes for Teens, Racine, Wisconsin.

Robert W. Blum is Professor and William H. Gates Sr. Chair, Department of Population and Family Health Sciences, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland.

References

The Adolescent Learner. (2005, April). *Educational Leadership, (62)*7.

Blum, R. W. (2005, April). A case for school connectedness. *Educational Leadership, (62)*7, 16–20.

Caulfield, J., & Jennings, W. (1997, Spring). Moving your school to brain compatibility. *The Networker, (9)*2, 5.

Diamond, M., & Hopson, J. L. (1998). *Magic trees of the mind: How to nurture your child's intelligence, creativity, and healthy emotions from birth through adolescence*. New York: Dutton.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Inlay, L. (2005, April). Safe schools for the roller coaster years. *Educational Leadership, 62*(7), 41–43.

Wallis, C. (2004, May 10). What makes teens tick. *Time, 163*(19), 58–65.

Wolfe, P. (2003), January). *The adolescent brain: A work in progress* [online article]. Retrieved November 29, 2005, from www.patwolfe .com/index.php?pid=100

Resources

Brodhagen, B. L. (1995). The situation made us special. In M. W. Apple & J. A. Beane (Eds.), *Democratic schools* (pp. 83–100). Alexandria, VA: Association for Supervision and Curriculum Development.

Caulfield, J., & Jennings, W. (2002). *Inciting learning: A guide to brain compatible instruction*. Reston, VA: National Association of Secondary School Principals (NASSP).

Dahl, R. (2003, Summer). Beyond raging hormones: The tinderbox in the teenage brain. *Cerebrum: The Dana Forum on Brain Science, (5)*3. Retrieved November 29, 2005, from www.dana.org/pdf /specialpublications/cerebrum_dahl.pdf

Jennings, W., & Caulfield, L. (2005). *Bridging the learning/assessment gap: Showcase teaching*. Lanham, MD: Rowman and Littlefield Publishing Group, Inc.

Other Video Programs and Series Available from ASCD

*Programs with an asterisk are also available on DVD.

Action Research: Inquiry, Reflection, and Decision Making *(4-tape series)*
Assessment and Grading: What's the Relationship?
Assessment in Elementary Science *(3-tape series)*
At Work in the Differentiated Classroom *(3-tape series)**
Balanced Assessment: Improving Student Achievement and Standardized Test Results *(3-tape series)**
Best Practices in Action *(multitape series)**
Books in Action
- Becoming a Multiple Intelligences School
- Closing the Achievement Gap
- Guiding School Improvement with Action Research
- Multiple Intelligences of Reading and Writing: Making the Words Come Alive

The Brain and Early Childhood (*2-tape series*)
The Brain and Learning *(4-tape series)*
The Brain and Mathematics (*2-tape series*)
The Brain and Reading *(3-tape series)*
Breaking Through Barriers to Achievement *(3-tape series)**
Building Academic Background Knowledge (*3-tape series*)*
Catch Them Being Good: Reinforcement in the Classroom *(3-tape series)*
Challenging the Gifted in the Regular Classroom
Classroom Management That Works *(3-tape series)**
The Common Sense of Differentiation: Meeting Specific Learner Needs in the Regular Classroom *(3-tape series)**
Cooperative Learning *(5-tape series)*
Curriculum Mapping: Charting the Course for Content *(2-tape series)*
Developing Performance Assessments
Differentiating Instruction *(2-tape series)*
Dimensions of Learning Training Program and Video Package
Educating Everybody's Children *(6-tape series)*
Examining Student Work *(4-tape series)*
Getting Results from Cooperative Learning *(3-tape series)**
How to *(multitape series; 15-minute tapes on a variety of helpful classroom practices)*
Implementing a Reading Program in Secondary Schools
Improving Instruction Through Observation and Feedback *(3-tape series)*
Inclusion *(3-tape series)*
Instructional Strategies for the Differentiated Classroom: Tapes 1–7 (*7-tape series)*
Integrating the Curriculum *(2-tape series)*
The Lesson Collection *(multitape series; 15-minute sample classroom lessons)*
Managing Today's Classroom *(3-tape series)*
Maximizing Learning for English Language Learners (*3-tape series*)
Mentoring the New Teacher *(8-tape series)*
Mentoring to Improve Schools *(2-tape series)*
Motivation: The Key to Success in Teaching and Learning *(3-tape series)*
Multicultural Education
Multiple Intelligences *(3-tape series)*

Opening Doors: An Introduction to Peer Coaching *(2-tape series)*
Planning Integrated Units: A Concept-Based Approach
The Principal Series *(7-tape series)*
Problem-Based Learning *(2-tape series)*
Qualities of Effective Teachers *(3-tape series)**
Raising Achievement Through Standards *(3-tape series)*
Reading in the Content Areas *(3-tape series)*
Reporting Student Progress
The Results Video Series *(2-tape series)*
A Six-Step Process for Teaching Vocabulary*
Teacher Portfolios *(2-tape series)*
The Teacher Series *(6-tape series)*
Teaching Strategies Library *(9-tape series)*
Teaching Students with Learning Disabilities in the Regular Classroom *(2-tape series)*
Understanding by Design *(3-tape series)*
Using Classroom Assessment to Guide Instruction (*3-tape series*)
Using Standards to Improve Teaching and Learning *(3-tape series)*
A Visit to a Classroom of English Language Learners
A Visit to Classrooms of Effective Teachers*
A Visit to a Differentiated Classroom
A Visit to a Freshman Advisory Program*
A Visit to a Motivated Classroom
A Visit to One School's Bullying Prevention Program*
What Works in Schools *(3-tape series)**

For information on how to purchase or preview these programs, call ASCD's Service Center at 1-800-933-2723 or 1-703-578-9600. Or visit the Online Store at http://shop.ascd.org.

About ASCD

Founded in 1943, the Association for Supervision and Curriculum Development is a nonpartisan, nonprofit education association, with headquarters in Alexandria, Virginia, USA. ASCD's mission statement: *ASCD, a community of educators, advocating sound policies and sharing best practices to achieve the success of each learner.*

Membership in ASCD includes a subscription to the award-winning journal *Educational Leadership*, the newsletter *Education Update*, and other products and services. ASCD sponsors affiliate organizations around the world; participates in collaborations and networks; holds conferences, institutes, and training programs; produces publications in a variety of media; sponsors recognition and awards programs; and provides research information on education issues.

ASCD provides many services to educators—prekindergarten through grade 12—as well as to others in the education community, including parents, school board members, administrators, and university professors and students. For further information, contact ASCD via telephone: 1-800-933-2723 or 1-703-578-9600; fax: 1-703-575-5400; or e-mail: member@ascd.org. Or write to ASCD, Information Services, 1703 N. Beauregard St., Alexandria, VA 22311-1714 USA. You can find ASCD on the World Wide Web at www.ascd.org.

ASCD's Executive Director is Gene R. Carter.

2005–06 Board of Directors

Mary Ellen Freeley (*President*), Richard Hanzelka (*President-Elect*), Martha Bruckner (*Immediate Past President*), Donald Davis, Lavinia T. Dickerson, Margaret S. Edwards, Debra A. Hill, Linda Mariotti, Doris Matthews, Anthony Mello, Michaelene Meyer, Gail Elizabeth Pope, Keith Rohwer, Sara Shubel, Thelma L. Spencer, Sandra Stoddard, Valerie Truesdale

Belief Statements

Fundamental to ASCD is our concern for people, both individually and collectively.

- We believe that the individual has intrinsic worth.
- We believe that all people have the ability and the need to learn.
- We believe that all children have a right to safety, love, and learning.
- We believe that a high-quality, public system of education open to all is imperative for society to flourish.
- We believe that diversity strengthens society and should be honored and protected.
- We believe that broad, informed participation committed to a common good is critical to democracy.
- We believe that humanity prospers when people work together.

ASCD also recognizes the potential and power of a healthy organization.

- We believe that healthy organizations purposefully provide for self-renewal.
- We believe that the culture of an organization is a major factor shaping individual attitudes and behaviors.
- We believe that shared values and common goals shape and change the culture of healthy organizations.

Does Your Professional Development Program Have Impact?

The next time you need professional development resources that will make a positive difference for your organization, turn to ASCD. We have proven tools that are helping schools, districts, and regional service agencies around the world:

Self-Help Resources—We have books, audiotapes, subscriptions, and other self-help publications on an array of topics important to today's educators.

Materials for Study Groups and Improvement Teams—Choose from a variety of our multimedia tools and kits to keep teams supplied with learning activities, discussion questions, research readings, exemplars, and video demonstrations.

Video Resources for Workshops and Other Meetings—These are the ideal tools to reach groups in your school community in the most effective and cost-efficient way.

Tools for Curriculum and Assessment Design—Many ASCD professional development resources have built-in components to help you guide staff members through each step of the curriculum and assessment design process.

Online Distance-Learning Courses—Our acclaimed Professional Development Online courses at our Web site offer your staff members interactive, in-depth learning experiences on a broad range of educational topics. Each course equals 15–20 clock hours toward CEU credit.

On-Site Consulting and Staff Development—Whether you need focused training on a particular topic or a long-term plan for improvement, ASCD can help you find the right consultant for virtually any issue.

We have the resources to support ongoing professional development on virtually any topic in education!

Where to Start!

Not sure how to begin planning a professional development program for your school or district?

Take our quick and easy professional development planning survey at:

http://www.ascd.org/planyourpd

How to Contact Us

Talk to an ASCD representative about planning comprehensive professional development; please call 1-703-575-5634.

ASCD®
Association for Supervision and Curriculum Development

1703 North Beauregard Street • Alexandra, Virginia, 22311-1714
1-800-933-ASCD (2723) • 1-703-578-9600 • Fax: 1-703-575-5400 • http://www.ascd.org