THE ADOLESCENT BRAIN:
CURRICULUM FOR STUDENTS, PARENTS, AND TEACHERS

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THE ADOLESCENT BRAIN:
CURRICULUM FOR STUDENTS, PARENTS, AND TEACHERS

A Project

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Abstract

of

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by

Brooke Blake

Meghan Salter

This project addresses the problem of the challenges that teenagers, their parents, and their teachers face during the adolescent years. Adolescents’ brains are fully developed in the emotional center but not in the frontal lobe, the seat of critical thinking, organization, and decision-making.

The authors worked together to develop curriculum for the three stakeholders: a one-week introductory course on the brain for students, an educational night for parents, and a handbook with brain-friendly lesson plans for teachers.

An extensive review of literature provided sources of data for the project. Components addressed in the literature review include brain physiology, executive functioning skills, strategies to support adolescents, and a discussion of objections regarding the existence of the adolescent brain.
The authors concluded that providing information to students, parents, and teachers about the changes occurring in the adolescent brain benefits all parties involved. Students understand more about their experiences, parents gain useful strategies for supporting their children, and teachers receive support in creating effective, brain-friendly lessons for use in the classroom.

__________, Committee Chair
Dr. Zephaniah T. Davis
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Chapter 1

INTRODUCTION

The adolescent years are a time of turmoil and triumph, especially in the 7th, 8th, and 9th grades. This is a period of physical, emotional, and intellectual growth when adolescents and the adults in their lives confront a number of challenges. These unique challenges may include any or all of the following:

1. Hormones rage, emotions run high, and adolescents often view successes and failures in extremes.

2. Parents frequently express a feeling of helplessness in terms of finding ways to help their child succeed academically in school.

3. Teachers may experience frustration when students continually demonstrate a lack of organizational skills or when students do not respond to repeated reminders about what they must do in order to improve academically.

Brain research is a fascinating area of study for educators, especially when one considers that the teaching profession revolves around forming brains in new and beneficial ways. The very process of learning creates physical changes inside students’ heads. In order to be an even more effective teacher, it is important to understand how learning occurs and what other factors can influence the behavior and success of the adolescents in the classroom. One of the biggest factors influencing teenagers in the classroom is the development of their brains. Today scientific research supports previously anecdotal observations made in the classroom about human development and
learning. For teachers, adolescent students, and parents, understanding more about the process of myelination and back-to-front development in the teenage brain exemplifies the complicated changes occurring in students.

During adolescence, the brain undergoes a form of “reconstruction” involving a process of neural pruning. This stage of adolescent brain development manifests itself in several ways. According to current brain research, teens may experience difficulties with academic performance, strained relationships with adults in their life, and general feelings of lack of control in their lives. In addition to the stress created by negative interactions with others, a number of adolescents feel actually “out of control” of their own lives. Often they experience intense emotions and not understand how to successfully deal with them. Negative interactions and hostility at this stage, however, can be minimized. Studies have shown that students can be more successful in school when they understand that learning is a process rather than a fixed quantity (Dweck, 1999). Using the adage that “knowledge is power,” providing information about the adolescent brain for teenagers, their parents, and their teachers will increase understanding between the three groups and will allow them to develop effective plans for success rather than having participants feel powerless.

Information about the teenage brain has the potential to make a huge impact on teachers and their attitudes toward students, but the benefits are not limited to only the classroom. Understanding the development of the adolescent brain allows adults who work with these children to have more patience, understanding, and empathy. When the knowledge is shared with students and parents, students can experience more continuity
and support from better orchestration between home and school. In addition, a stronger working relationship will develop between parents and the school as both sides share a common language and basic information as they work together for the success of the teenagers.

Finally, understanding the teenage brain is most important for the adolescents themselves. During the period of adolescence, teenagers often have a feeling of helplessness or of not being “in control” of their own lives. This sense of confusion is illustrated in a poem written by a seventh grade student. During a poetry unit, students had the opportunity to write a free verse poem on a topic of their choice. One of the students in the class, formerly an honor roll student, had been struggling all year with low grades and with the transition to junior high. She chose to write her poem about the conflict within herself, stating, “I really, really hate it when they ask why my work isn’t done/And I don’t know what to say/Because I don’t really know the answer to that question./ I have a problem.” (For full text, see *Free Verse Poem: A Poem by Quinlan, 7th-grade Student* in Appendix A.) Watching this student struggle with school and with parent relationships and knowing that she questioned her abilities and her own worth provided an example of why it is just as critical for teenagers to understand how their brain develops as it is for educators and parents.

*Purpose of the Thesis*

Current research suggests there are many things that teachers can do to help students and their parents understand and make the most of developmental changes during adolescence. One of the defining qualities of an educational leader is the ability to
recognize and to ameliorate problems. Here the problem is the adverse academic and
social effects of the stereotypical interaction between students, their parents, and teachers
during adolescence. The purpose of this project, therefore, was to help teachers, students,
and parents understand current knowledge about adolescent brain development and then
use the knowledge to improve curriculum, instruction, learning, self-awareness, and
interpersonal relationships in school and beyond. Specifically, this thesis describes how
we developed and implemented a curriculum for teachers, students, and parents
empowering them to improve life and learning through understanding adolescent brain
development and how to apply that knowledge.

The changes occurring in the brain can cause interactions that are unpleasant and that
negatively affect relationships between adolescents and adults. In addition, learning is impacted
through the effects of executive dysfunction. One of the most powerful tools that we, as
educators, can give to families is knowledge. Creating a curriculum specifically for parents and
adolescents empowers them to have more control in their lives. While adolescents obviously
cannot control every aspect of their lives, they can learn to address the impact of executive
dysfunction to increase academic success, and they can learn to build healthy relationships with
their parents and other adults in their lives.

**Guiding Questions**

In order best to address the needs of adolescents, parents, and teachers, we used
the following questions to guide our Culminating Experience.

- How is the adolescent brain different from an adult brain?
- What effect does “neural pruning” have on academic abilities?
• What are the areas of executive dysfunction?
• What are “executive functioning” skills, and what can be done to help teens improve theirs?
• What are some strategies teachers and parents can use to help adolescents be more effective learners?
• How can teachers make their instruction more brain-friendly?
• How does motivation affect academic performance?
• What role do parents play in an adolescent’s life?

Definition of Terms

Certain key terms and phrases are commonly used in research on the adolescent brain and are integral to understanding and discussing this project.

Adolescent brain. The brain of an adolescent, a child between the ages of 13 and 18; this definition is used for the purposes of our project although, according to some research, the “adolescent brain” does not actually finish developing until between the ages of 25 and 30

Amygdala. The amygdala is a structure located in the temporal lobe that controls the “fight-or-flight” response and emotional responses, including feelings of fear.

Axon. An axon is a long fiber of a nerve cell that carries messages between neurons.

Brain development. Brain development refers to the development of the brain as determined by its increased dendritic connections and pruning of unused connections.
**Brain-friendly teaching strategies.** These teaching strategies are consistent with methods known to support learning and memory based on brain development.

**Dendrites.** Dendrites are branching fibers extending from the cell body of a neuron that receive incoming information.

**Executive dysfunction.** Executive dysfunction is defined as “a neuropsychological concept referring to the cognitive processes required to plan and direct activities, including task initiation and follow-through, working memory, sustained attention, performance monitoring, inhibition of impulses, and goal-directed persistence” (Guare & Dawson, 2004).

**Executive functions:** Executive functions include ten areas that support critical thinking and planning behaviors; these include sustaining attention, shifting attention, inhibiting impulses, initiating activity, working memory, emotional control, planning and organizing, organization of materials, self-monitoring, and time management (Warner, 2008).

**Hippocampus.** The hippocampus is a structure found in the temporal lobe that plays an important role in declarative memory storage and retrieval (Wolfe, 2001).

**Myelin.** Myelin is a sheath of fatty tissue.

**Myelination.** Myelination is the process by which axons are covered with myelin, allowing for faster and more efficient communication between neurons.

**Neural pruning.** Neural pruning is the process by which certain connections in the brain are eliminated based on lack of use.
Parent/adolescent relationships. A parent/adolescent relationship is the relationship between parents and their children during the teenage years.

Synapse. A synapse is the small gap between neurons across which messages are sent using neurotransmitters.

Teen brain. For this paper, the term “teen brain” is used interchangeably with “adolescent brain,” referring to the brain of a child between 13 and 18 years of age.

Project Development

Our project developed curriculum to use with adolescents, their parents, and their teachers to increase the understanding of changes that occur in the teen brain during adolescence (myelination, development of critical thinking skills, etc.) and to explore what can be done to support these students in learning. There were three components to the project: curriculum, resources, and training. The final product addresses all of these aspects. For adolescents and teachers, there is a weeklong unit about the brain and a website which summarizes important information about the adolescent brain. The unit includes lecture notes, worksheets, and materials used to support learning. In addition, teachers are provided with sample brain-friendly lesson plans to encourage the continued use of the strategies throughout the year, once the initial unit is complete. For parents, there are notes from the PowerPoint presentation used during a parent education workshop and a handout summarizing key strategies. In addition, parents are directed to other helpful sources of information about the adolescent brain (articles, books, and videos).
Specifically, this project was implemented at a K-8 elementary school in Grass Valley, California, with students in seventh and eighth grades. Approximately 45 seventh graders and 60 eighth graders were presented a weeklong unit on the adolescent brain in August 2008. In October 2008, the parent education night was piloted to twelve parents and four students. Another parent education night was offered in October 2009; fourteen parents and four students attended. Following each presentation, parents and students were asked to provide input along with suggestions to improve content for future presentations. In April 2009, the original 105 junior high students were asked to navigate through a website on the adolescent brain that we developed based on our continuing research. Those students were also asked to provide input regarding the website’s content and ease of use. Finally, we developed sample lesson plans for a variety of content areas to demonstrate for teachers how the five basic concepts of creating a brain-friendly lesson plan can be easily applied to existing curriculum.

**Limitations**

The effectiveness of the curriculum developed depends upon the school cultures in which it would be implemented. In our situation, we had the advantage of implementing the curriculum within our own district. As teachers in the district, we already possessed a positive relationship with our students and their parents, so they were willing to accept the information we presented and to participate in the parent education night. Other school districts may not have the participation rates or the ability to offer incentives such as free childcare and dinner to those families who attended the parent education night.
In addition, our administration recognizes the value of brain research and its application in the classroom. We were allowed the opportunity to present to the entire staff at a district-wide in-service and the opportunity to offer the parent education night. The administration also supported our attendance at the Learning and the Brain conference in San Francisco in February 2009 and provided opportunities for us to share with our staff the information we gathered. All of these steps required a financial investment on the part of the district. In order to implement new curriculum, having the support of administrators is critical to the success of the program.

While our project regarding the adolescent brain can be used in isolation by individual teachers, it would be much more effective if one has more widespread support of the district and the school community. Lack of support from staff members or administration, in all likelihood, would limit the success of the program.
Chapter 2
REVIEW OF LITERATURE

Given the nature of this problem facing adolescents, parents, and teachers, this chapter will review what educators and other experts from various fields know about the physiological development of the adolescent brain, executive functioning skills, and strategies for teaching and learning that work for adolescent education. A characterization follows describing objections to stating that brain function is an important variable in educational problem-solving. The chapter closes with a summary of the tentative conclusions that constitute the premise for the solution undertaken in this project.

Brain Physiology

Stereotypical adolescent qualities of struggling with coordination and riding an emotional roller coaster are only part of what is actually occurring inside teens’ bodies. Their brains are still a work in progress rather than in final form. Conventional wisdom claimed that the major “wiring” of the brain was completed in very early childhood and that the brain was fully mature by age 10 or 12 when the brain reached adult size. Current brain research, however, has turned previous assumptions upside down (Lenroot & Giedd, 2006; Giedd et al, 1999; Blakemore & Choudhury, 2006). This research shows that “the greatest changes to the parts of the brain that are responsible for functions such as self-control, judgment, emotions, and organization occur between puberty and adulthood” (Spano, 2002, p. 1). There is actually a physiological reason why teenagers’
emotions often take precedence over logic and why certain executive functions are lacking.

The bulk of what is known about the development of the human brain has been learned within the last 25 years. Brain research is currently one of the fastest growing areas within the medical field. Early research focused on diseases of the brain or on the formative years of a child’s development (Wolfe, 2001). Scientists studied the brains of people who suffered from brain damage or from an injury to a particular area of the brain. Performing autopsies was another way to examine the brain to determine when certain parts of the brain developed. With the advent of new imaging techniques, such as functional magnetic resonance imaging (fMRI), scientists are now able to study the brain in various “normal” states as well (Spinks, 2000). This has prompted an unparalleled wave of brain research.

A basic understanding of the structure and functions of the brain supports students, parents, and teachers in understanding this complicated organ. The brain is made up of billions of cells, among which are neurons. These cells have the job of carrying signals from the brain to other parts of the body. Each nerve has dendrites (which carry signals toward the cell body) and axons (which carry signals away). The axons are covered with a fatty substance, myelin, which insulates the axon and helps messages move more efficiently and at a faster pace. A small group of neurons is referred to as a nerve because it transmits electrical-chemical signals called nerve impulses. The nerves do not actually touch one another; instead, they send the electrical
impulses across the synapse, or tiny gap (Simon, 1997). One might consider the analogy of how a spark plug works in an engine to illustrate this process.

Communication between neurons occurs at the synapses. A message in one neuron follows an electrical signal through the axon to the synapse where the communication is changed to a chemical one. The chemicals cross the synapse and attach to dendrites of another neuron, and the process continues. This basic understanding of how information travels through the brain illustrates the idea of “use it or lose it.” For many years, scientists have known that the brain grows by expanding and then pruning connections between cells. This concept is similar to a farmer pruning a tree: certain branches are pruned in order to strengthen the tree. In the human brain, the neural connections that are not used undergo “neural pruning,” a process that insures that the strongest and most efficient neural connections will remain. Brain research suggests that periods of such brain reorganization occur in the womb and again at about the age of two (Wolfe, 2001). At those ages, there is a tremendous amount of neural connections in the child’s brain and extensive neural pruning occurs. This process is often accompanied by erratic behavior as the brain sorts out the neural connections, hence the reference to the “terrible twos.” Neurologists now know that there is also a second wave of overproduction of gray matter just prior to puberty. This growth spurt occurs predominately in the frontal lobe, the part of the brain that has to do with executive functions, including planning, impulse control, and reasoning (Rapoport, 1999). With major restructuring occurring in the brain, the connections that are used grow stronger and more efficient while those that are not used over and over literally die. When
learning new material, “The more fully we process information over time, the more connections we make, the more consolidation takes place, and the better the memory will be” (Wolfe, 2001, p. 128). For parents who are struggling with the academic performance of their child, knowing how the learning process occurs in the brain may help them choose strategies to support their child at home.

Students need to understand that the choices they make do, in fact, shape their brains. For example, when meeting to discuss their child’s progress in school, parents frequently express concern about the amount of time their teen spends on the Internet or playing video games as opposed to completing schoolwork. The student, on the other hand, does not seem to make a connection between the time he spends on these activities and the effect it has on his performance in school. While the games themselves may not affect the student’s grades, recent studies suggest that correlated variables might account for the impression that the activity poses learning-related problems. For example, the time spent playing video games could be better used to activate different parts of the brain. One particular study examined the effect of violent video games on teens. Dr. Vincent Mathews (Mathews, 2007), a professor of radiology at Indiana University School of Medicine in Indianapolis, used fMRI imaging to record metabolic changes in brain activity. His study included 44 adolescents between the ages of 13 and 17. After playing a violent or nonviolent video game for thirty minutes, the adolescents were asked to perform a series of tasks. The adolescents who played the violent video game had more activation in the amygdala and less activation in the prefrontal cortex. Activation in the prefrontal cortex correlates to control, focus, and concentration. Mathews claims his
study showed that violent video games result in an increase in emotional arousal, activating the fight-or-flight response (Cited in Violent video games poison the teenage brain: study, 2007). Mathews’ observations support the idea that teenagers may be emotionally drawn to video games (activation in the amygdala) but do not benefit intellectually (less activation in the prefrontal cortex). At a time when the adolescent brain is rewiring, other activities that activate the frontal lobe would be more beneficial to the teen’s brain development with regard to learning.

Another extensive study of the teen brain resulted in similar findings. Dr. Jay Giedd (1999), from the National Institute of Mental Health in Bethesda, Maryland, used fMRIs to look at the brains of 145 normal children every two years in order to understand how the brain develops. The fMRIs allowed the researchers involved to measure the amount of white and gray matter in the brain. This measurement showed an elimination of synapses after adolescence, supporting the theory that connections are pruned during the teenage years. Giedd hypothesizes that whatever a teen spends time doing will impact brain development. Specifically referring to the process of the growth of gray matter followed by neural pruning, Giedd says that whatever a teen does, those cells and connections will be hardwired. Whether the activities include music, sports, academics, or lying on the couch, those connections will be the ones to survive (Spinks, 2000). Understanding how certain activities affect brain development could lead to better communication between parents and teens about how the teens choose to spend their time.
Two other important structures in the brain are the amygdala and the frontal cortex. The amygdala is involved in the fight-or-flight response and acts as the “alarm system” of the brain (Wolfe, 2001). Its job is to help determine emotion and to decide how to respond to certain stimuli. The frontal lobe of the brain performs the most complex functions of the brain and helps distinguish humans from other species. Decision-making, problem-solving, and conscious thought all occur in the frontal lobe. The prefrontal cortex has been the subject of recent studies that implicate it as critical for emotional self-regulation; in other words, part of the prefrontal cortex helps to regulate the emotional responses triggered by the amygdala.

With regard to adolescents, one of the most important discoveries is that the brain develops back-to-front. The process of myelination, making the connections between neurons more efficient, occurs in the back areas of the brain first, meaning that the frontal lobe does not fully develop until a person is twenty-five to thirty years of age. The frontal lobe of the brain occupies the largest portion of the cortex and is responsible for the most complex functions. The highest forms of mental activity occur in the prefrontal cortex which controls functions such as the ability to prioritize and to set goals, planning, organization, impulse inhibition, self-control, and emotional control (Wolfe, 2001).

Meanwhile, the emotional center of the brain is completely developed, which helps to explaining why teenagers feel emotions so strongly while an older person is able to mediate a calmer, more logical response to a situation. All of the rational, critical thinking skills that parents and teachers expect of teenagers have not fully developed at the stage when the students need them more than ever before. This disconnect sometimes
manifests itself in teenagers misreading emotional cues from others, resulting in misinterpreted communication and often leading them to interpret anger where there is none. In one study, a team led by Dr. Deborah Yurgelun-Todd at Harvard’s McLean Hospital used fMRIs to compare teens’ and adults’ brain responses. Yurgelun-Todd showed both teenagers and adults a series of pictures and asked them to identify the emotion shown in each picture while monitoring how their brains responded. Adults recognized fear 100% of the time, while teenagers correctly identified the same emotion less than half of the time. The study found that, when compared to adults, adolescents have lower activity in their frontal lobes and more activity in the amygdala when processing emotions (Wolfe, 2001).

This research has astounding implications for educators who work with teens, as well as for the parents of teens. The structural changes in the brain, not just hormones, affect the behavior of adolescents (Roberts, 2004). The stereotypical teenager seen as frustrating, irrational, irresponsible, and lazy should instead be seen as a young person whose brain may temporarily shut down in part while under reconstruction (neural pruning). While this certainly does not excuse all undesirable teenage behaviors or suggest that teens be exempt from accepting responsibility for their actions, it does help one understand how such behaviors can occur.

*Executive Functioning Skills*

Executive dysfunction is “a neuropsychological concept referring to the cognitive processes required to plan and direct activities, including task initiation and follow-through, working memory, sustained attention, performance monitoring, inhibition of
impulses, and goal-directed persistence” (Guare & Dawson, 2004, p. 6). Normally, the brain develops skills that allow for “executive functioning,” meaning that a person can plan, monitor performance, and achieve set goals. Executive dysfunction harms a person’s ability to do those things.

Problems with “executive functioning” fall into ten areas: sustaining attention, shifting attention, inhibiting impulses, initiating activity, working memory, emotional control, planning and organizing, organization of materials, self-monitoring, and time management (Warner, 2008). Conditions associated with executive functioning problems include Attention Deficit Hyperactivity Disorder, Oppositional Defiance Disorder, and autism; another condition is “pre-adolescence.” Since teenagers have brains that are not yet fully developed and because their brains are actually undergoing a second wave of neural pruning, strategies can help students, parents, and teachers deal with the phenomenon of adolescence from a brain development perspective. Having a plan to address the challenges removes the sense of helplessness.

Interventions to support adolescents with executive functioning tasks depend on which area is most affected. For example, if a student struggles with planning and organization, teachers and parents can provide support by monitoring as students break large tasks into smaller chunks, assisting when necessary and assessing progress as the plan is carried out (Warner, 2008). Key to developing executive functions in teenagers is providing the appropriate intervention in response to a particular area needing support. If a student struggling with organization is asked to complete another step requiring organization, such as keeping a homework log or taking around a grade sheet to his
teachers, chances are that the intervention will be unsuccessful. If he was not misplacing papers in the first place, he would have no need of the intervention. Relying on a student’s area of weakness in order to improve the area of weakness rarely succeeds.

It is helpful to use an analogy of the brain as a corporation in order to understand the process that occurs. Using the analogy, the amygdala plays the role of the chief of security, screening for danger if an uncomfortable situation arises. When a teenage student’s amygdala is fully engaged, a response is more likely to be based on emotion than on logic. The frontal lobe is like the CEO of a corporation, taking in information, developing plans, deciding what is worth doing, controlling behaviors, evaluating, and adjusting. The hippocampus, an area of the brain that stores memory, can be seen as an executive secretary involved with the storage of information. This analogy has led to the term “executive function,” cognitive functions one needs in order to achieve goals. Executive function is “related to” intelligence “rather than an indication of” intelligence (Warner, 2008). Executive functions are essentially brain functions.

Students, parents, and educators benefit from knowing that problems with executive functioning are widespread. There is no official diagnosis for executive dysfunction; however, problems in the ten areas previously listed are seen in students with a wide range of learning disabilities and other health-related concerns such as seizure disorders and fetal alcohol syndrome (FAS). In addition, due to the neural pruning going on inside teenagers’ brains, they, too, are prime candidates for problems with executive functioning (Warner, 2008). Clearly, there is a connection between brain development (specifically the side effects of neural pruning) and executive dysfunction:
lack of “organizational skills...difficulty completing long-term projects, forgetting to bring home from school materials to complete homework, and frequently losing things and forgetting instructions” (Guare and Dawson, 2004, p. 6). Teens, just by nature of being teens, are pre-disposed to having problems with executive functioning. There are ways, however, to assist them in compensating for any perceived shortcomings. Some of the suggestions for compensating for executive dysfunction include: getting an adequate amount of sleep, encouraging proper nutrition, getting exercise, modeling desired behavior, building routines at home and at school, and recognizing that it will take time to change learned behaviors (Warner, 2008).

**Strategies for Teaching and Learning**

Despite the challenges of the adolescent years, there are a number of strategies that help students, parents, and teachers understand this unique phase in a child’s life. Most importantly, the three constituencies need clear communication and the opportunity to work together. Students benefit from adult support and knowledge about the brain; their understanding of learning as a process increases motivation and leads to higher achievement in school. Parents benefit from knowledge about their children because the family is a huge source of support for learning. Finally, educators have the opportunity and obligation to work with families to insure the success of the adolescents. When the three stakeholders work together toward a common goal, difficulties are minimized and everyone involved benefits.

One of the most critical developmental phases in a person’s life is the period of adolescence. Teens undergo tremendous changes in their physical, emotional, and
intellectual beings. As they move toward young adulthood, they are increasingly weaned from parents and teachers who have, in most cases, offered an extremely supportive scaffold for years. They are expected to take on more personal responsibility for their schoolwork, to deal with increasingly complex social relationships, and to feel positive about the physical changes taking place in their bodies. Understandably, for many adolescents, this is an overwhelming expectation. Lowenthal, Thurnher, and Chiriboga (1975), in their study about the four stages of life, claimed that 40% of the people they surveyed ranked adolescence as the worst time of their life. What happens that causes so many adolescents to experience a drastic change from their younger years?

Researchers have identified several differences between elementary school and junior high school that may help one understand the changes. “The junior high school environment emphasizes competition, social comparison, and ability for self-assessment at a time of heightened self-focus; it is associated with a decrease in decision making and choice at a time when the desire for control is growing; and it disrupts social networks and support when they are most needed” (Blackwell, Trzesniewski, & Dweck, 2007, p. 246). Frequently, parents find themselves involved with their children’s education in a different way than they were involved in the younger years. Instead of meeting with a teacher to discuss the wonderful progress being made in school, many parents find themselves meeting with the junior high teacher to discuss concerns about the child’s progress or attitude.

Parent conferences, whether an informal meeting in a classroom or a formal student study team (SST) meeting attended by the school counselor and administrator,
help shed some light on what is going on inside the teenage brain. Parents routinely express irritation at dealing with the same concerns over and over, and the students, when asked why they are making the choices they are making, frequently offer a frustrated, “I don’t know” which may be interpreted as being difficult instead of caring about academic performance. The meetings usually end with the parents hearing the standard recommendations: check to make sure the students write assignments down in their planners, ask them if they have any homework when they get home from school, provide a quiet place at home for them to work, and help them organize their papers in their backpacks so they do not lose the completed homework before they turn it in. The parents typically guarantee there will be a change, and the students say they are going to “do better.” To a teacher these meetings often feel as if they are only a formality, that the concerns will continue, and that he or she is ineffective as a teacher. As teens and their parents try to understand the new phases of their respective lives, it is time for them to understand what is really occurring inside the teen’s brain.

Understanding adolescent brain development can also help students improve their attitudes toward school. Carol S. Dweck researched the impact of praise on student performance and classified students into one of two groups: growth mind-set or fixed mind-set. She discovered “When students believe that they can develop their intelligence, they focus on doing just that” (Dweck, 1999). In the growth mind-set, as opposed to the fixed mind-set, students are more willing to take risks and to learn from mistakes because they do not see intelligence as a set quantity.
Students’ attitudes toward learning depend on their perspectives. Students with a fixed mind-set believe that people have a certain amount of intelligence; in this case, people are either smart or not, and making a mistake means that a person lacks ability. The concept of intelligence for these students is that if someone has the ability, effort is unnecessary (Blackwell, Trzesniewski, & Dweck, 2007). In this case, having to try is equated with being unintelligent. These students have difficulty with setbacks in school, may consider cheating, and try to hide mistakes rather than correcting them (Nussbaum & Dweck, 2007). From an educator’s perspective, students who have a fixed mind-set will need to undergo significant changes in attitude to be successful in college or in the workplace.

Conversely, the growth mind-set should be cultivated in the classroom. These students care more about the process of learning than the result. When mistakes are made, it merely means it is time to correct them. Students with a growth mind-set see that “effort is a positive thing: It ignites their intelligence and causes it to grow. In the face of failure, these students escalate their efforts and look for new learning strategies” (Dweck, 2007). Since these students view intelligence as something that can be developed, they are more likely to invest in their education and to view failure as a path to success.

Dweck and her colleagues performed an intervention in a New York City junior high school where students struggled in the transition year. During an eight-session workshop, all students learned study skills, time management techniques, and memory strategies. In the growth mind-set intervention, however, students were also taught about
their brains and how to make intelligence grow. The program was expanded to include
20 New York City schools. Ultimately, the students who received information about how
the brain formed new connections through effort subsequently became more invested in
their studies, outperformed their peers in math, and showed more motivation. The
students completed an anonymous poll and reported that their study habits had changed
and that they were more motivated to learn (Dweck, 2007). Teaching students about their
brains also removes some of the “perils” regarding praise. The types of praise offered by
teachers (“You must be smart at math!” versus “You must have worked hard on those
problems!”) affect students’ perceptions of their learning. Teaching students that success
in school is more than simply being smart allows them to master their own learning and
to understand how they can develop their brains.

The knowledge about how the adolescent brain develops and how it affects a
adolescent’s education should be shared with students, parents and teachers. It is important
to create collaborative partnerships between schools and families. Educators could
develop a parent education class about the teenage brain and invite parents of adolescents
as well as the adolescents themselves. This would fit perfectly with the idea of a
partnership: “family support and family understanding of child and adolescent
development… are necessary elements to assist students as learners” (Epstein, 1995). In
fact, a parent education class (one evening long) on the adolescent brain is an idea that is
long overdue. In many cases, parents and teachers have exhibited frustration with
students’ choices and behaviors for several years, and students have been at a loss for
how to turn the situation around. Considering the increasing availability of research on
the adolescent brain, it is time for educators to come together as a team to help the parents and, most importantly, the students recognize how brain development is affecting their performance. The same amount of attention that is given to early childhood development should be given to teens as they go through their neural pruning. “The brain is still developing through this period, the brain is adaptable, and needs to be moulded and shaped” (Blakemore, 2005, p. 82). Many adults tend to look at the teenage years as a stage not at all unlike the “terrible twos.” It is often seen as a period of time the teens and parents hope to survive without doing irreparable damage to their relationship. Parents and the students themselves may be relieved to learn that there is a logical, research-based explanation for what is going on inside the teenage brain. A better understanding of this physiological process could mean that instead of dreading the teenage years, parents and their teens could actually embrace them as a time of tremendous potential in terms of brain growth.

Educators have an obligation to learn and to share knowledge about the adolescent brain. With the number of parenting courses available, a “down-to-earth” parent class could clearly explain the main issues and reassure parents who are struggling with adolescents that it is not too late to be successful (Roberts, 2004). In order to make collaborative partnerships happen, schools can look for the availability of funding from federal, state, or local partnerships that have as their goal curricular and instructional reform (Epstein, 1995). Current brain research suggests there are very real reasons for some of the concerns with which educators, parents, and students have been dealing for
decades, and it is in the students’ best interest to have schools begin to share this information.

Sharing current brain research with students and parents will strengthen the relationship between a school and its junior high and high school families. By looking at how students are developing as a whole rather than just how they perform in an individual classroom, educators show they truly care about their students. Sharing information with students and parents will enable them to work together with teachers to develop strategies to compensate for areas of concern that are affecting student performance in the classroom. Parents will have a higher level of understanding about and patience with their teens. If one agrees that sharing an understanding of the adolescent brain strengthens the relationship between teacher, student, and parent by developing trust, a student will, in all likelihood, experience a higher level of success. Students more readily accept teachers who develop a relationship with them that involves care and trust (Noddings, 2005). Certainly, making the effort to help students, parents, and teachers understand the dynamics of the adolescent brain can only help.

While teenagers continue to develop their concepts of self-as-student, parents are an integral piece of the equation. First, parents are often the most important adults in a child’s life. Even though adolescence can be a tumultuous time in the relationship between parents and children, having parent support makes a tremendous difference. Next, reflection with adults is important in developing stronger decision-making skills in teenagers, and having a parent available for such interaction creates a support network (Weaver, 2007). Finally, because of the plasticity of the brain, changes can occur, and
the chance of having a positive result increases when student success is a goal both at
school and at home. With increased communication between school and home, and with
basic moral support occurring between parents and teachers, a child has a better chance
of succeeding and of developing skills that will be beneficial in adulthood.

Working together is an integral part of student success. Opening communication
and allowing exchanges between school and home benefits students. When “parents,
teachers, students, and others view one another as partners in education, a caring
community forms around students and begins its work” (Epstein, 2001). Providing
information about the teenage brain helps parents in multiple types of involvement as
defined by Joyce Epstein. Intervention strategies fall into the “parenting” and “learning
at home” areas. Also, empowered with a common understanding of how the adolescent
brain develops, the relationship between teachers and parents would ideally become more
collaboration than instruction, allowing for information to flow both ways rather than
always from the school to the parents.

Working with teenagers and their parents to understand changes occurring in the
adolescent brain also displays caring on the part of the teacher. Ultimately, teachers are
responsible for students’ learning. When teachers make an effort to include both students
and parents in providing information that will be beneficial to all, the student can see that
the teacher cares beyond the walls of the classroom. Once a student understands that a
teacher cares, trust develops. The same trust develops in the parents who understand that
the school is invested in their children and that everyone works together to achieve
success.
Objections

There exists the argument that the adolescent brain is more “myth” than physiology; such an approach warns of the dangers of making excuses for students who choose to do poorly (Epstein, 2007). The benefits of educating students and their parents on the topic, however, far outweigh these objections.

Since these objections occur on a more philosophical level, they are difficult to remedy. The first is the concern over the “myth” of the teenage brain. Robert Epstein, a contributing editor for Scientific American Mind, is a frequent author on the topic. He argues, “There is clear evidence that any unique features that may exist in the brains of teens – to the limited extent that such features exist – are the result of social influences rather than the cause of teen turmoil” (Epstein, 2007). In other words, Epstein does not believe in the phenomenon of the teenage brain as outlined in other research. Instead, he feels that American society has created in teenagers the inability to be responsible or to act like adults because of unnecessary restrictions placed upon them. In his view, the teenage brain forms to reflect experience rather than undergoing new stages of development during adolescence. To support this idea, he cites research by anthropologists Beatrice and John Whiting that suggests problems with teenagers only begin to appear in other cultures after Western influences arrive. Anthropologist Alice Schlegel and psychologist Herbert Barry III (1991) found in their studies that 60% of 186 preindustrial societies do not have a word for “adolescence” in their language and that poor behavior by teenagers was either mild or nonexistent. Their studies provide additional support for the idea that Western culture creates adolescence and forms the
brains of teenagers to reflect an imaginary stage. In this situation, “isolated from adults and wrongly treated like children, it is no wonder that some teens behave, by adult standards, recklessly or irresponsibly” (Epstein, 2007). In her article “The Teen Brain, Hard at Work,” Leslie Sabbagh (2007, p. 58) acknowledges Epstein’s argument and adds that he sees the notion of a teen brain as a hoax continued by drug companies who may benefit from sales of pharmaceuticals. Sabbagh continues to say that while Epstein’s views are interesting, she does not agree. The experiments of neurologists such as Beatriz Luna “control for cultural differences because they look at brain function based on emotionally neutral stimuli, not socially relevant behavioral decisions” (Sabbagh, 2007, p. 59).

It is important to remember that regardless of why the teenage brain develops in certain ways (whether because of society or because of biology), teachers and parents are dealing with students who do not have fully-developed frontal lobes. Even Epstein recognizes that teenagers use smaller areas of the cortex than adults do and that declines in delta-wave activity could, in fact, be connected to neural pruning. A number of studies using fMRI comparisons prove that brain activity in teenagers differs from brain activity in adults (Blakemore, S. & Choudhury, S., 2006; Gied, et al., 1999; Lenroot & Giedd, 2006). Whether or not adolescence should be occurring is not the issue; teenagers walk into the classroom with brains that have limitations, and what is happening inside their skulls should be taken into account.

The final major objection is somewhat related: providing excuses for children who may not be investing full effort in school. Parents and teachers both want to help
children become successful, but one concern is helping too much or enabling students. This is difficult when considering problems with executive functioning. Dr. Colleen Warner (2008) asks a series of questions to help determine whether a student is simply not trying or whether other problems may be involved:

- Does the student seem to want to do well?
- Does the student seem surprised when he/she has problems?
- Is the performance inconsistent?
- Do problems continue in spite of consequences?
- Does performance improve under adult supervision?

If the answer to these questions is “yes,” then it is likely that problems in executive functioning are interfering with success because human nature does not encourage people to choose to be unsuccessful (Warner, 2008). As for excuses, providing support for children who are struggling with important pieces of executive functioning allows them to develop necessary life skills. In adolescence, teacher and parent expectations increase, teacher monitoring and support decreases, students are expected to absorb more information, and physical and emotional changes of puberty occur. Although adults may be tempted to remove what they see as micromanaging support, “if such support is not forthcoming, a decline in performance and an increase in behavioral conflicts at home and school typically follow” (Guare & Dawson, 2004, p. 6). Helping children to develop and to master their executive functioning skills will benefit everyone involved. Although such interventions take time, doing nothing does not help to solve the challenges.
Parents who think back to their own teenage years, in all likelihood prior to any brain research suggesting the notion of a teen brain, may side with Robert Epstein and think the research is being used to excuse inappropriate behavior by teens. The logic is similar to the parents who comment that when they were in school there were lots of children who displayed the tendencies we now associate with ADD or ADHD, but they weren’t given any medication; instead, there were just stricter consequences. That may have been the case, but as new information is made available, educators should not ignore it for the sake of status quo. There are enough studies available that suggest neural pruning has an effect on teenagers’ performance in school and on interactions with others outside of school that the information cannot, and should not, be ignored.

Summary of Tentative Conclusions

Three goals in providing information on the teenage brain to adolescents, parents and educators are increased understanding between educators, teenagers and their parents, appropriate interventions, and an improved sense of self for the teenager.

Improved understanding. A parent education class on the teenage brain would enable parents and their teens to have a better understanding of how the brain develops and how neural pruning affects executive functions. The new insight would potentially lead to more empathy and patience from the parents and to better decision-making from the teens. The strategies to help teens improve their executive functions are life skills that can be used by students, parents, and teachers alike. Whether or not one agrees completely with current brain research, it is clear that if certain concerns have been expressed year after year and the same recommendations have proven unsuccessful in
changing certain behaviors, a new approach may be in order. Schools must begin by educating the parents because they possess an opportunity and an obligation to educate adolescents about what is going on in their brains and the role they play in determining their brain structure and functioning for the rest of their lives (Wolfe, 2001).

Along with basic information about the brain, parents and teens would learn how neural pruning affects executive function. For teens, it should be very reassuring to learn that there is a scientific reason for some of the problems they face in school. Instead of wondering why they haven’t been able to change the habits that have hampered their success in school, they will be able to face the challenges with a new approach. Parents and students would learn a variety of strategies to improve executive functions.

The school community would also be strengthened as a result of a parent education class on the teenage brain. It would show a school’s commitment to providing families with the support they need in order to help their students succeed. The ultimate beneficiaries, however, would be the students. Not only would they become educated about the brain and its development, they would also see just how committed their parents and school personnel are to them. By providing students with the necessary information, educators will empower them to take a more active role in their education, a very worthwhile goal.

Understanding the development of the adolescent brain provides students, parents, and teachers with a scientific explanation for some seemingly inexplicable behavior. For educators and parents, realizing the complex changes occurring in students in this stage increases patience and renews hopes of making progress. Instead of feeling that a child is
intentionally lying or being irresponsible, parents can understand the changes occurring within the brain. They will view adolescence as a phase that is not just to be survived but embraced. Teachers and parents will realize that there are specific interventions that can support a student whether at school or at home.

_Appropriate interventions._ Choosing appropriate interventions makes an amazing impact on the success of students. Instead of expecting students to use interventions that rely upon skills that they lack (such as filling out a planner or maintaining a homework log), interventions can be selected to help students develop these skills. This may include modeling, monitoring, or other necessary support. In choosing appropriate interventions, the goal is more than helping a student pass a class. Instead, students will be supported as they learn to master life skills that will be necessary for all of their adult lives.

_Improved sense of self._ Finally, the understanding of the adolescent brain should extend to the teenagers. They are as frustrated as the parents and teachers in being unable to comprehend why they make poor choices or why things feel out of control. Whether crying after “breaking up” with a boyfriend or getting into a physical altercation with a peer over a seemingly meaningless comment, there are times when adolescents truly do not know what they were thinking – mainly because they were not! If nothing else, sharing with them how the brain works and why things may be happening a certain way allows them to understand their choices. In a way, it reassures them that these changes are, in fact, normal and that they can have power over their choices.

Ultimately, such education should expand into curriculum for use within the classroom to reach all junior high students. Parents should continue to be involved, but
ultimately teenagers need to understand how they learn in order to take more responsibility for their education and other aspects of their adolescent lives.
Chapter 3

METHOD

This chapter outlines the development of our project. The demographics of our site influenced our ability to create and implement our response to the problem of adolescent education. Next, the design process integrated research with classroom practice to create feasible curriculum. Finally, implementation describes how we introduced the project at our site.

Demographics

The school at which we implemented our project is a K-8 elementary school in Grass Valley, California. The student population is mainly comprised of white students who range from upper-middle class to low-income families. Overall, according to an October 2008 CBEDS report, the school’s enrollment for the 2007-2008 school year showed 89.4% White, 3.5% Hispanic, 1.2% Asian, 0.9% Native American, and 4.1% multiple/no response. The junior high classrooms reflect this trend. Only 0.5% of school students are English Language Learners, but 25% are on the free or reduced lunch program. In particular, we used our developed curriculum over a two-year period with our seventh and eighth grade classes. During the 2008-2009 school year, we implemented the student curriculum in two of three seventh grade homeroom classes and two of three eighth grade block classes, involving 48 and 62 students, respectively. During the 2009-2010 school year, we implemented the student curriculum in two of three seventh grade homeroom classes and both eighth grade social studies classes, involving 54 and 70 students, respectively.
The parent curriculum involved parents who chose to attend evening workshops in October 2008 and October 2009. In 2008, twelve parents and four students attended. In 2009, fourteen parents and four students attended. Participation depended upon a number of factors; most importantly, the workshops were offered on a weeknight when three school athletic activities were scheduled. Many parents were unable to attend because of these outside obligations despite expressing interest in the workshop.

**Design**

We designed the project with four components for three constituencies: students, parents, and teachers. The overlapping constituencies shared the common goals to promote understanding within and between their ranks in an effort to increase success, both academic and social, for the adolescents. We designed four main components to facilitate the project: an instructional unit for students, a website for students and parents, a parent education night, and a teacher handbook.

**Instructional unit for students.** We involved the students in a weeklong introductory unit describing brain processes and changes that take place in the adolescent brain affecting their social and academic achievements. (See *How to Teach the Adolescent Brain: A Handbook for Teachers* in Appendix B.) As a first step in designing the introductory unit, the most important topics for understanding the brain were identified and refined into five categories: brain basics, learning and memory, the adolescent brain, brain health, and a review day. Organizing the content into five topics was important because it allows the unit to be completed within one week at the pace of one topic each day. In addition, we compiled the essential information for each lesson.
into a handbook for teachers and included suggestions about how to implement the lessons in the classroom.

_Website for students and parents._ In an additional support component of the project, we developed a website for students and parents to access information about key concepts organized into individual web pages: brain physiology, the adolescent brain, learning, memory, and brain health. (See _The Teenage Brain: A Website for Adolescents--and maybe even their parents!_ in Appendix C). Using principles for clear web design with visual appeal, each page focuses attention on short and to the point information presented with an illustrative visual aid and a color-coded background. The pages link to each other for easy navigation and are written at a level accessible to adolescents. The material is aimed at an independent learning level for the audience overall, and users can navigate easily to areas according to their own particular interests. In order to enhance interest in the website, we included fun facts about the brain and links to other related sites of potential interest. The additional sites include resources in the forms of articles, video clips, and brain-friendly games.

_Parent education._ We designed the component for parent education about the teen brain to provide an accessible summary of information to them, primarily through a parent education night venue. (See _Parent Education Night_ in Appendix D for Parent Education Night Flyer, Parent Participation Consent Letter, Teen Brain PowerPoint Presentation, and Parent Night Evaluation.) Including discussion, the session runs for one and one-half hours. The PowerPoint presentation covers the basic areas necessary for parents to understand the changes occurring within their children’s brains: basic
structures in the brain, how the adolescent brain develops, how brain development affects learning, “executive dysfunction” and its effects, strategies to improve student performance, and modeling of those strategies. After receiving input from the initial 2008 presentation, sections on social concerns, brain health, and the parent/child relationship were added to the 2009 presentation. Although we presented the PowerPoint through a projector, we also provided parents with copies of the presentation to facilitate note taking. The overall presentation incorporates time for questions, discussion, and providing resource information (e.g., articles) to parents for content instruction.

Teacher handbook. The teacher handbook is designed to inform and guide teachers practically on how to implement the weeklong introductory unit with their students. (See How to Teach the Adolescent Brain: A Handbook for Teachers in Appendix B.) The weeklong introductory unit on the brain provides some ideas but can be adapted best to meet the needs of teachers in terms of time and resources available. The handbook includes key points and helpful resources so that a teacher does not need to search for information. In addition to the introductory unit, the handbook emphasizes creating brain-friendly lesson plans. Five guidelines for creating brain-friendly lessons and an explanation about why each one works provide teachers with support in planning their own lessons. Those guidelines are then applied to sample lessons in five subject areas corresponding to the California State Standards for seventh and eighth grades. Teachers receive lessons that are standards-based and brain-friendly in the hopes that they will then tailor their own lessons to become more brain-friendly.
Implementation

Implementation of the weeklong introductory unit was completed in August 2008 and August 2009. In August 2008, approximately 48 seventh graders and 62 eighth graders participated in the unit. In August 2009, approximately 54 seventh graders and 70 eighth graders participated. The units differed in that use of the website was included at the end of the first year (May 2009) and was part of the weeklong unit in August 2009. The students participated in discussion and activities for five days at the beginning of the school year to give them an idea of how their brains are developing and ways to be more successful in school using given strategies. We implemented these strategies throughout the year in regular classes. For example, students in eighth grade social studies classes used mnemonic devices to help students remember the five categories of duties of the President. In August 2008, two teachers each instructed one class of seventh graders and one class of eighth graders. In August 2009, one teacher instructed one class of seventh graders and the other teacher instructed one class of seventh graders and two classes of eighth graders. Each day required approximately 40 minutes of instructional time to cover the information and provide time for activities and instruction. The website review required more time, so two periods were assigned to the task (approximately 100 minutes). The extra time for the website review allowed students time to explore the additional resources.

The parent education nights occurred in October 2008 and October 2009. Parents and attending students received the option of dinner paid for by the school district as well as free childcare for younger children. Dinner started at 5:45 p.m., and the presentation
lasted from 6:00 to 7:30 p.m. During that time, we presented a PowerPoint, and parents and students had time to discuss the topic and to ask questions. At the end of the evening, a number of parents chose to provide feedback about how useful they found the information and about which other areas of the topic they would be interested in learning more. We also recommended additional resources to parents for use throughout the year.

The teacher’s handbook includes an outline of the introductory unit on the brain and sample lesson plans for five different subjects for both seventh and eighth grade. The sample lesson plans have been implemented in the classroom successfully. However, the stand-alone handbook for teachers has not been comprehensively piloted to date. The school district supports the project, and it is our hope that other teachers will be willing to utilize the information and will provide feedback about what could be done to improve the handbook.

Summary

All three facets of the project (curriculum for students, parents, and teachers) were implemented at one site, primarily in two classrooms. While the teachers using the project found the material quite useful, wider implementation will help determine how to improve the material. Although the target population was mainly white, middle- to lower-class families, information could be tailored to other communities fairly easily. Research has not shown differences in brain development among subsets of American society, so the resources would still prove to be accurate.
Chapter 4

DISCUSSION

After spending two years implementing our project at our site, we learned quite a bit about the needs of our community and how to address the problem of adolescent education. Input from parents and students, as well as our own experiences in the classroom, allowed us to reflect upon successes and changes we hope to make in the future. Overall, the curriculum introduced at our site was valuable to students, parents, and teachers, and we hope to continue its expansion on our campus and in area schools.

Reflections

When we initially implemented our project at a K-8 elementary school in Grass Valley, there were no programs specifically addressing adolescent brain development. The parent education nights offered at the school applied to parents of students in all grade levels, not specifically junior high. In addition, no direct instruction about the brain occurred in any junior high classes. While many lessons in the various subject areas were already unintentionally brain-friendly, teachers did not specifically attempt to meet the guidelines for constructing brain-friendly lessons.

The introductory unit on the brain proved to be worth the investment in both time and effort. At first, the idea of spending the first week of school instructing students about their brains was nerve-wracking because it took time away from the normal routines and introductory units in language arts and social studies. With pressure placed upon standards-based instruction, moving away from academic curriculum to include a brain-friendly approach was at first questionable. However, the benefits soon became
obvious. First, instructing students about their brains started each year with a high-interest topic. Students participated in activities and discussion and asked thoughtful questions about the information presented. The topics opened up opportunities to talk about other pressing issues like peer pressure and substance abuse. In addition, students began to understand the learning process and how their brains operate in the academic setting. Specific learning strategies, such as mnemonics and songs, were used to help students master content. Even after the introductory unit was over, students continued to employ these strategies in their different classes throughout the year. As a teacher, instruction became easier because students had a background in learning strategies and understood why certain approaches would work. They were also more willing to participate in activities they knew would assist their learning, whether review activities or projects. The learning climate changed with open discussion; students understood that learning is a process rather than a fixed amount and that their choices affected their performance and accomplishments.

Similarly, intentionally integrating brain-friendly lessons into the curriculum led to increased learning and excitement in the classroom. It is easy to become overwhelmed with the day-to-day requirements of teaching and to rely upon traditional methods such as worksheets, but having guidelines for brain-friendly lessons increased the incentive to incorporate those guidelines into daily activities. Not every day can be a high-energy, time-intensive activity, but making the effort to include such activities maintains positive attitudes and student participation. For example, building a mosque out of recycled materials in seventh grade social studies took more time to prepare than a lesson out of
the textbook and led to a less-controlled feeling during the class period; however, such an activity involved critical thinking skills, group work, and application of learned content. At the end of the lesson, students had mastered more concepts than they would have simply reading out of the textbook. In addition to the academic concepts, they also developed social skills and learned more about how to operate successfully within a group. Reflecting upon brain-friendly lessons reinforces the idea that the effort is worth the results.

Feedback from parents and their students at the parent education night was also very positive. Many of the parents at our site feel overwhelmed when their child reaches adolescence, and they are not sure how to address the new issues that arise. Having a one-night presentation to open communication and directly address some of their concerns created a positive working relationship. Following the October 2008 presentation, parents who attended the informational night stayed in contact and laughed about things that had previously been seen as challenging and frustrating – such as angry teens, arguments over cell phone texting, or lack of organization. Sharing a common language and common goals for the students helped create a more cooperative, understanding relationship between parents and teachers.

While the relationship between teachers and parents has improved, there is also a noted difference in the feelings of the students and their relationship with the participating teachers. In the past, some of our junior high students felt as though there was something “wrong” with them. They did not understand their emotions or their decision-making, and that often contributed to reasons why they got into disciplinary
situations. We also observed more anger and frustration. With direct instruction about
the adolescent brain, participating students have a better understanding of the changes
occurring. They recognize times when their amygdala is in charge rather than their
frontal lobe, and they are more receptive to strategies to help them calm down. From a
teacher’s perspective, there are no longer moments where the question “What were you
thinking?” is asked. Often, the adolescent was not consciously thinking, so it is more
helpful to move on to why a behavior was inappropriate and what can be done to prevent
it the next time. Instead of feeling picked on when being disciplined for an infraction, the
student and teacher can discuss why that might have happened and what a better response
may be. Many times the parties involved are able to laugh instead of becoming angry;
after all, students, parents, and teachers are all on this journey together.

Revisions and Future Goals

In order to have more credible, convincing evidence, it would be helpful to collect
measurable data rather than anecdotal notes. For the brain-friendly lessons, it was
difficult to not implement an idea and to have a control group because it was obvious that
incorporating brain-friendly activities would benefit the students. It may have been more
telling, however, to teach a lesson in a brain-friendly way in one class and in a traditional
way in the other class and then to compare assessment results. Such data could help
establish the value of brain-friendly lessons rather than relying upon anecdotal
observations. Strategies for learning and memory could have been tested in the same
way; for example, one class could learn the five categories of duties of the President in
mnemonic form and the other could be expected to simply memorize the information.
Assessment results would more clearly show which approach worked best. Again, in an area like teaching, it is difficult to refrain from using the best method even though a comparison would reinforce the idea that brain-friendly lessons are the “best” method.

For the parent education night, a follow-up survey at the end of the school year would have also been helpful in assessing impact of the program. Questions could include what information presented at the parent education night was the most helpful throughout the year, what strategies parents implemented, and what else would have been useful. It is the hope of the authors that such a survey will be conducted in Spring 2010 with parents from the October 2009 informational night, although any results will be unavailable at the time this project is completed. Having specific data, even for a project, increases credibility and also provides administration with reasons to continue supporting such instruction. In addition to conducting a formal follow-up with parents, it is a future goal to create a parent resource library. Such a library would include books, articles, and videos to support parents during their children’s adolescent years. Our site currently has some parent resources available, but nothing is specific to junior high students. Parent interest in the topic has been encouraging, and providing additional support would benefit the school community.

The introduction of brain-friendly curriculum has been positive at the initial site, and we ultimately would like to see it expand to other schools in the county and beyond. Students, parents, and teachers all benefit from inclusion of brain research in the curriculum. Students perform better in the classroom when they understand the learning process and take a more active role in it. Parents are able to breathe a sigh of relief and
come to an improved understanding of their children when they have scientific support for what is happening within the brain. Teachers can deliver instruction more effectively. The three stakeholders, working together, are more effective when there is a common goal and a common understanding of adolescence, whether its challenges or its advantages. Working with our junior high students in terms of understanding their brain development and how this affects their learning has been extremely beneficial. Incorporating the same ideas at different sites has the potential to improve education and to allow other teachers and communities to experience the same success we have.
APPENDICES
APPENDIX A

Free Verse Poem
Free Verse Poem
by Quinlan, 7th grade Student

I know what’s coming.
“Why did you forget?”
“Why can’t you focus?”

I already asked myself the same questions.

Again
And again
And again.

I really, really hate it when they ask why my work isn’t done
And I don’t know what to say
Because I don’t really know the answer to that question.

I have a problem.
And I’m not sure how I’ll get out of it.
But I know somehow
It’ll all be okay
I’ll do better
(Really, I don’t have a choice).
APPENDIX B

Handbook for Teachers
How to Teach the Adolescent Brain

A Handbook for Teachers

Created by
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Dear Colleagues:

As teachers with a combined total of twenty years of experience teaching seventh and eighth grade students, the topic of the adolescent brain has become central to our instruction. Early on in our Master’s program at CSU, Sacramento, we took a course that instructor Betsy Stenklyft lovingly referred to as “The Brain Class.” She promised better results in our classrooms with less effort on our part. We quickly realized that brain research supports much of what excellent teachers do instinctively and that recognizing what is happening in the brain allows for more effective teaching.

Building upon knowledge gained from this class, we chose to focus on the adolescent brain for our Master’s project. The research we found on adolescent brain development provided scientific support for some of the methods we were already using in the classroom. In addition, it changed the way we view instruction, so we now recognize the importance of making our classrooms even more brain-friendly. Teachers of adolescents know that this age can be tumultuous yet rewarding. By tailoring instruction to address what is occurring in the adolescent brain, teachers can, indeed, get better results with less effort. By taking time to teach adolescents about how their brains are changing, teachers have the ability to empower students to take control over their lives, both academically and socially.

This handbook is designed to assist teachers in sharing information about the adolescent brain with their students as well as in planning brain-friendly lessons. By following five basic guidelines, lesson plans can be adapted to address the needs of the developing adolescent brain. You do not have to reconstruct every lesson plan you have; you will see that much of what you do is already brain-friendly, and with minor modifications, all lessons can be adjusted.

Included in the following pages are a one-week unit on the adolescent brain to use with your students, five basic guidelines for creating brain-friendly lesson plans, sample brain-friendly lesson plans for a variety of academic subjects, and a list of resources you can access for additional information. We hope that you will find the information easy to use and that your successes will encourage you to teach with the adolescent brain in mind.

Sincerely,

Brooke Blake and Meghan Salter
Grass Valley, California
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Introductory Unit on the Adolescent Brain

Day 1: Brain Basics

There are many ways to introduce the brain to your students. On the first day of the introductory unit, your goal is to teach the students the basics about their brain, its four lobes, and the basic functions of each lobe. This is easily accomplished in lecture format, although you can be as creative and hands-on as you want. It depends on the amount of time you have available and how in-depth you want to go.

Key concepts:
1. The brain is the control center of the body. It controls everything that happens, from breathing to movement to conscious thought.
2. The adult brain is about the size of a cantaloupe, looks like a cauliflower, and has the consistency of butter. At full size, it weighs about three pounds. This creates a visual for your students. Even better, you can bring in the items and show them what these comparisons actually mean.
3. There are four lobes in the brain: occipital, parietal, temporal, and frontal. Each lobe actually has two parts because the brain duplicates lobes and structures. For example, there is a right occipital lobe and a left occipital lobe.
4. The occipital lobe is where vision is processed. A hint to remembering this is that it is in the back of the skull, directly behind the eyes.
5. The parietal lobe is in charge of sensory information (touch, pressure, temperature, and pain). You might want to point out that the motor cortex is in this section of the brain – which makes sense, when you consider what the parietal lobe controls!
6. The temporal lobe processes sound. Language, music, and other sounds are identified in this area.
7. The frontal lobe is the “C.E.O.” of the brain. It controls higher thinking, decision-making, emotions, and many other functions. This lobe is extremely important to remember throughout the unit because of its impact on adolescents and learning.
8. The hippocampus is a structure in the brain that controls how memories are stored and whether or not a person can recall information. It is located in the limbic system, part of the brain between the two temporal lobes.
9. There are three types of memory: working (short-term), declarative (long-term), and procedural. Working memory lasts only a few seconds or minutes. It consists of what a person is doing in the present – remembering what you just had for breakfast or a phone number to dial. Declarative memory is fact memory – something you can declare and that happened farther in the past. For example, your students may remember the name of their first pet. Working memory can
become declarative memory if rehearsed and/or used frequently. Procedural memory is recalling skills such as how to tie your shoes or ride a bike. (Depending on time, you may want to wait until Day 2 to discuss specifics regarding the types of memory.)

10. The amygdala is a structure found at the end of the hippocampus. It controls a person’s “fight-or-flight” response. In other words, the amygdala decides in a split second if there is any threat to one’s safety and how best to respond to a situation. It is important to note that a threat does not need to be physical. The amygdala also works in processing emotions.

Sources We Recommend:

   This book has great information and pictures. It is also written at a level easily accessible to most adolescents. You may choose to do a read-aloud, preview the text and summarize when showing pictures, or have it available for students to read on their own.

2. *The Great Brain Book: An Inside Look at the Inside of Your Head* by H.P. Newquist
   Another book written for children and young adults, this reference also has wonderful pictures and illustrations that will capture the interest of your students. You may choose to break your class into groups and assign each group one structure or section of the book to read and explain to the rest of the class (jigsaw). This works especially well for some of the brain’s basic structures.

3. Learning Resources Cross-Section Human Brain Models
   After researching many models of the human brain, we were not disappointed with this one. Although it is not life-size, it is colorful, accurate, and much more affordable than many models. It is also constructed of foam, so you can allow students to look at it without too much worrying.

4. “Brain Poster Set of 5” from Teacher’s Discovery
   Despite the initial cost ($44 as of 2009), the posters are well worth the investment. They are large, high-quality, laminated, and convey the information in an understandable and interesting manner. They are perfect for junior high and high school levels. You may choose to display them in a bulletin board fashion or integrate one each day for use in your lesson plan.
Day 2: Learning and Memory

Key Concepts:
1. There are three types of memory: working, declarative, and procedural (see Day 1, concept 9).
2. Learning occurs when the same pattern is repeatedly activated in the brain.
3. Neurons are brain cells. They have three main parts: dendrites, soma, and axon. 
The dendrites are like fingers at the end of the cell body. They connect one 
neuron to another. The soma is the cell body. The axon is the sheath that 
stretches from the axon terminals (where dendrites send information) to the soma. 
It might help to have students use their forearm as an example: the elbow would 
be the axon terminals, the main forearm is the axon, the palm is the soma, and the 
fingers are the dendrites.
4. When one neuron communicates with another neuron, it sends a message 
electrically through itself (from axon to soma to dendrites) and chemically to the 
next neuron (from its own dendrites to the axon terminals of the neighboring 
neuron). These neurons do not actually touch. Instead, the dendrites release 
neurontransmitters (chemicals produced in the brain) that cross the small space 
between dendrites of one neuron and the axon terminals of the next. This space is 
called a “synapse.” Again, for purposes of demonstration, you may have a few 
students come to the front of the class and demonstrate the communication with 
their forearm neurons.
5. The more a neural pathway is activated, the easier it becomes for communication 
to occur. It’s like the adage “Practice makes perfect,” although in this case, 
practice makes permanent, not necessarily perfect.
6. Repeating learning over and over to make the pathway permanent means that the 
information becomes declarative (or procedural, if it is a physical skill). Students 
will more likely relate to a procedural example, such as practicing free throws in 
basketball or throwing a baseball. The same goes for academic learning, though. 
If a student practices a certain concept many times, the information will become 
permanent. Cramming may help keep information in working memory, but it will 
not make that information last. (This is also important for teachers to understand 
because it supports the concept of review.)
7. Discuss the “magic number 7.” Basically, the adult human brain (or adolescent 
brain, based on its development) has the ability to remember seven chunks of 
information, plus or minus two. Go through examples with students: seven 
numbers in a phone number, three “chunks” of numbers for a social security 
number, etc. “Smarter” people do not hold an unlimited number of chunks. 
Instead, they increase the amount of information contained in each chunk.
8. If time permits, try a few memory activities with your students. The first one 
illustrates the importance of chunking. Begin by showing your students a sheet 
with twenty pictures either on the overhead or on the projector. (Sample
illustrations follow these plans.) Give them one minute to memorize as many as possible; it is important to keep the classroom quiet during this time. After the minute is over, turn off the projection and have students record as many items as they can remember. After approximately one minute (or when the pencils are no longer writing), return the projection to the screen and have students count how many they got correct. Say that you’ll do another set of pictures, but ask them to use one of two strategies this time. They can either create chunks (remember animals, accessories, tools, etc. together) or tell a story using the items (i.e. the bear sat on the unicycle and went to the store to get some milk). Project the second set of pictures and give students one minute. Turn off the images, have students record their answers, allow time for correcting, and then compare between the two sets of pictures. Did their memory improve when they used a strategy?

Sources We Recommend:
1. “Brain Poster Set of 5” from Teacher’s Discovery
   Again, you’ll use this set consistently if you make the investment. The learning and memory poster has wonderful visuals of neurons and how information passes through them.
2. Clip art to create your own images – you can tailor chosen images to fit your class. For example, we try to include one or two that should be especially significant for our students based on emotional investment (the school’s mascot or a teacher’s favorite animal, for example) to see how many students specifically remember that item. We then discuss the importance of emotion in memory; when something matters to a student, he or she is more likely to remember it because it is seen as significant.
**Day 3: Adolescent Brain and Implications**

**Key Concepts:**

1. Although the adolescent brain is about the same size as an adult brain, it functions differently.
2. Myelin is a fatty substance that covers the axon of a neuron. It acts like insulation, making communication between neurons more efficient. Myelination is the process of the neurons being covered with myelin.
3. Myelination occurs from back to front in the brain. That means it begins with the cerebellum and progresses to the frontal lobe.
4. Recall that the frontal lobe is considered the CEO of the brain and controls its “executive functions” such as organization, planning, rational thought, and decision-making.
5. Because the adolescent brain is experiencing myelination, the parts of the brain controlling emotional responses (such as the amygdala) are more developed than the part of the brain that controls decision-making (frontal lobe). This is one reason why adolescents are more likely to make an emotional response than a rational one.
6. In addition to myelination, adolescents are experiencing “neural pruning.” This is the second time in their lives that the process of neural pruning occurs; the other time is during the “terrible twos.” Basically, neural pruning means strengthening the connections that are considered necessary and used often and eliminating connections that are not used. There are huge implications when teenagers understand how this process affects their brains. If an adolescent uses all of his or her time mastering a video game, those connections are strengthened. Similarly, if energy goes to playing music, practicing athletics, or completing homework, those connections will be strengthened. At this time in their lives, adolescents have the ability to literally shape their brains and to determine what will be strengthened and eliminated.
7. Depending on time, you may want to enter a discussion on the importance of sleep. Neurologists recommend that teenagers get 8.5 to 10 hours of sleep each night; however, this is not a reality for many adolescents who cannot fall asleep until later in the evening and who must get up early for school. Sleep is one way that the brain consolidates learning. A sleep deficit affects the brain’s processing of what was learned and its ability to put what was learned into declarative memory.
8. In a study by Deborah Yurgelun-Todd, adolescents were more likely to recognize anger in pictures of adult faces. Adults, on the other hand, were able to recognize a wide variety of emotions including fear, sadness, or confusion. Discuss with the students how this might impact their daily lives – for example, assuming that their parents are angry when, in reality, they might be feeling something completely different.
9. Discuss strategies that adolescents may use to help mitigate these factors. They might try “sleeping on it” before making a major decision, walking away from an emotionally-charged situation, or activating their frontal lobe by counting backwards from 200 by fives. Any task that requires conscious thought helps move away from the amygdala’s immediate emotional response and toward the frontal lobe’s logical processing.

Sources We Recommend:

1. *Frontline: Inside the Teenage Brain*
   This PBS special is a must-see for teachers and can also be incorporated into the classroom depending on how interested the students are in the topic. *Inside the Teenage Brain* is available to order on DVD, but the full program (and separate segments of it) may be viewed online at [http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/](http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/). The opening “Teenagers and Their Inexplicable Behavior” with Charlie and his parents is especially effective, and students also seem intrigued by “From Zzzz’s to A’s” about adolescents and sleep research. You can incorporate as much or as little of the show into your lesson plan as desired. The website also includes interviews with neurologists and other interesting facts about the teen brain. If you have access to a computer lab, you may want to have your students explore the site more.

2. *Do Hard Things* by Alex and Brett Harris (2008)
   This may be a controversial book to include depending on your school’s culture because it is heavily Christian in content, but it is the best selection written by teenagers that we’ve found so far. Alex and Brett Harris became interested in the role of teenagers in society. Their research led them to believe that teenagers often have a bad reputation because society’s expectations for teenagers are too low. Rather than reading the entire book, Chapter 3 on “The Myth of Adolescence” makes the point well and avoids most of the controversial content. After discussing how the adolescent brain is different from the adult brain, students can debate how much these differences truly matter and what adolescents can accomplish when challenged. The Harris brothers provide a different opinion and argue that teenagers can accomplish much more when they have high expectations for themselves.
Day 4: Brain Health

Key Concepts:

1. There are three main topics to cover: nutrition, sleep, and substance abuse.
2. Nutrition is extremely important for a healthy brain. The brain cells consist of about 2/3 fat, so a diet with no fat can be detrimental. Fats found in avocados, nuts, and lean meats are a healthy alternative to more fatty foods.
3. Hydration is also important. The brain’s volume is approximately 85% water. Dehydration can result in headaches and fatigue.
4. Sleep consolidates learning. During REM sleep, the brain replays what was experienced during the day. The sleep segment from Inside the Teenage Brain illustrates how two students with varying amounts of sleep are affected when given a learned task. Building up a sleep deficit negatively impacts both academic performance and daily life, causing a teen to become irritable.
5. Substance abuse alters the performance of neurotransmitters in the brain. Neurotransmitters are chemicals that transmit messages throughout the brain. Many addictive substances are “Trojan horses” for neurotransmitters, mimicking the structure of naturally-produced chemicals. The introduction of foreign substances through the use of drugs, tobacco, or alcohol can affect the production of neurotransmitters in the brain and ultimately leads to addiction.
6. Depending on your class, you may choose to go more or less in-depth on various substances. Students often have questions that go beyond the scope of what we know off the top of our heads, so we often record the questions and go in search of the answers. The National Institute on Drug Abuse has lots of information about various substances and also has a branch of their website dedicated to students. Especially helpful is the “Facts on Drugs” section that lists commonly abused drugs and how they affect the body.
7. The main point on brain health is to remind students that the choices they make physically alter their brains. Informed choices will lead to healthier brains, and uninformed choices can have long-term consequences.

Sources We Recommend:

1. Frontline: Inside the Teenage Brain
   If you haven’t already, you may choose to incorporate the segment “From Zzzz’s to A’s” about the importance of sleep. This section will only take about five minutes, but it is worth the time when students see the science behind sleep.
2. National Institute on Drug Abuse website at http://www.drugabuse.gov/. This website provides information on various substances and how they affect the body. Use the student link to go to http://teens.drugabuse.gov/index.php to get information written specifically for teens. In addition, this section of the website includes personal stories and information about the science of addiction.
Day 5: Website Review

Key Concepts
1. Today is a day for review. Students will go through the main points from the first four days of lessons and have the opportunity to explore more in their areas of interest.
2. Have students access http://theteenbrain.bravehost.com and provide each student with a copy of the scavenger hunt. Since they have already covered the basics in class, they should be able to navigate the website and find the information. Remind them that covering the information again is strengthening those connections and helping it become more permanent learning.
3. When students have completed the questions, they have an opportunity to explore additional sites. This provides links for Frontline: Inside the Teenage Brain, NIDA for Teens, and a number of other brain-friendly sites. Students may want to do additional research on certain topics or play brain-friendly games. You may adjust the scavenger hunt and additional sites to meet your goals for the period.
4. If you do not have website access, you may choose to use the review day to implement strategies such as mnemonics or songs. Tying learning strategies to actual content helps students understand how to apply their knowledge to academic situations and allows them opportunities to succeed in the future.

Sources We Recommend:
   Obviously, access to the website allows for the lesson to go as planned!
2. Schoolhouse Rock
   If you’re looking for examples of songs, Schoolhouse Rock provides everything from grammar to American history. Rather than just learning the songs, discuss with the students why this approach works. Instead of seeming silly, it should make more sense now that they understand brain basics.
3. Online searches
   In this technological age, there is a wealth of information online. Whether on personal websites or through YouTube, you can find examples of songs and activities used by other teachers to help students remember key concepts. Search for what you’re currently studying and see what resources work for you. For example, we accessed http://teachers.net/gazette/DEC02/continents.html for songs to teach the seven continents. Not all of them worked well for us (between tune and difficulty), but we integrated a few into our social studies class, and the students were successful in memorizing their continents. As teachers, we always adapt and use what works best in our own classrooms. Nobody can tell you exactly what to do, but your professionalism allows you to adjust as needed.
Brain Website Review Answer Key

Access http://theteenbrain.bravehost.com to answer the following questions.

1. What lobe is important for language and is also home to the hippocampus?
   Temporal

2. Damage to what lobe could result in problems with color recognition?
   Occipital

3. What lobe helps us understand depth perception?
   Parietal

4. What are three symptoms when the amygdala reacts?
   Faster breathing, sweating, increased heart rate

5. When does myelination occur?
   Around adolescence and up to the age of 30

6. Why does sensory data reach the amygdala before the cortex?
   It has a shorter path.

7. What is something you can do to avoid overreacting?
   Count in multiples of 7 or backwards from 200 by 5s, take a deep breath, walk away

8. What does the liver do during a “fight or flight” response?
   Releases glucose

9. How do you get smarter?
   Increase the number of connections between dendrites and axons

10. What can we call the place where new information connects to old?
    The “hook”

11. Practicing by repetition works when you need to get something to what level?
    Automatic

12. People can only do two things well when one is what?
    Automatic (procedural memory)

13. What is the name for a group of pieces of information you remember together?
    Chunk

14. Do the “try it out” on the mnemonics page– but you can leave off the picture…

15. When shouldn’t you exercise in order to be able to fall asleep?
    After dinner

16. About what percentage of your brain is water?
    85%

17. What does exercise “lower”?
    Stress levels

18. Alcohol disrupts activity in what part of the brain?
    Hippocampus

19. What percentage of people who start smoking before age 21 successfully quit?
    Less than 10%

20. When was the first recorded use of the word “brain”?
    Around 1700 B.C.

Extra Credit: On the back of this sheet, explain why one of the games found on the Additional Sites page is brain-friendly or summarize information you found on another link. Up to five points is possible depending on quality.
Brain Website Review

Access http://theteenbrain.bravehost.com to answer the following questions.

1. What lobe is important for language and is also home to the hippocampus?
2. Damage to what lobe could result in problems with color recognition?
3. What lobe helps us understand depth perception?
4. What are three symptoms when the amygdala reacts?
5. When does myelination occur?
6. Why does sensory data reach the amygdala before the cortex?
7. What is something you can do to avoid overreacting?
8. What does the liver do during a “fight or flight” response?
9. How do you get smarter?
10. What can we call the place where new information connects to old?
11. Practicing by repetition works when you need to get something to what level?
12. People can only do two things well when one is what?
13. What is the name for a group of pieces of information you remember together?
14. Do the “try it out” on the mnemonics page— but you can leave off the picture…
15. When shouldn’t you exercise in order to be able to fall asleep?
16. About what percentage of your brain is water?
17. What does exercise “lower”?
18. Alcohol disrupts activity in what part of the brain?
19. What percentage of people who start smoking before age 21 successfully quit?
20. When was the first recorded use of the word “brain”?

Extra Credit: On the back of this sheet, explain why one of the games found on the Additional Sites page is brain-friendly or summarize information you found on another link. Up to five points is possible depending on quality.
Basic Guidelines for Constructing Brain-Friendly Lessons

1. New information must be recognized as important in order to make it into working memory.

   The brain does not actually process all stimuli – that would be next to impossible! In fact, approximately 99% of all information taken in through the senses is dropped. However, it is incorrect to assume that a student is not paying attention. The brain is always paying attention, just not always to what we would hope. As a teacher, your goal is to be one stimulus that the brain does not ignore. How can we get the attention of our students?
   
   **Novelty:** When something is new, it catches the brain’s attention. This could take the form of posters, bulletin boards, new seating charts, etc. You may choose to bring in realia (real objects pertaining to the lesson) or to create a skit instead of doing a worksheet. Remember, though, that even novel approaches can lose their effectiveness when they become predictable rather than maintaining their status as different.
   
   **Intensity:** Commercials get our attention by increasing their volume. The same can work in the classroom. Intensity changes volume, pace, or emotional impact. Instead of giving students ten minutes to complete an assignment, put them on a timer with seven minutes. Play a review game to increase competition, leading students to invest emotionally in the activity.
   
   **Movement:** Keep students active! Movement increases oxygen and blood flow to the brain, helping students stay more attentive. Take your class for a review walk. Have them build something. The more they’re moving, the more likely it is that information will get into their brains.

2. The more ways information gets into the brain, the more ways it can be retrieved.

   The ideas of multiple intelligences and different learning modalities are widely recognized in the field of education. These aren’t just theories – they actually have their basis in brain research. Experiences are stored in different lobes of the brain. For example, the occipital lobes store visual information. The temporal lobes store auditory memories. When one memory is reconstructed, the brain calls upon the various lobes for different pieces of information. As a teacher, if you present information in a variety of ways, your students will have more ways to retrieve that information.
   
   **Visual:** Notes on the board, pictures to accompany materials, videos, etc.
   
   **Auditory:** Stories, lectures, music, discussion, etc.
Physical: Creating projects, incorporating hand motions into songs, dance, etc.

Obviously there are many approaches you can take to present information in various ways – and the more you do, the more effective your teaching will be.

3. New information must connect to prior knowledge.

The brain creates connections between neurons at the synapses. The message travels down the neuron using an electrical impulse and then sends the message on to the next neuron by releasing chemicals in the synapse. Why does that matter? In this process, it is much easier to create connections if you can attach them to an already-formed one. Sometimes, curriculum is cyclical and you can refer to prior grade levels where information was covered on a more basic level. Other times, you look for similarities within information. If you have already taught students about Japanese samurai, it is easier to teach about European knights because they had a lot in common. Presenting the connections between prior knowledge and new learning directly to the students helps them see where the information can be “filed” in their preexisting system.

What if students don’t have any prior knowledge? The best solution is to create experiences upon which they can “hook” the new learning. If a student had never seen a dog, the easy solution would be to bring in a dog. The same theory holds true for more complicated learning. If a student has not worked with fractions, cooking is a useful application that creates the experience. Field trips can also be used to create new learning experiences.

4. Create a learning community; learning is not as effective in isolation.

Marian Diamond did quite a bit of research involving rats and their brain development. One of her major findings was that the brains of rats in enriched environments have more connections and density than those of rats in impoverished environments. In addition, rats raised with social groups had more connections than rats raised in isolation. Diamond’s findings do not apply solely to rats. Part of the idea of an enriched environment is the allowance of social interaction. Students truly do benefit from working with each other. In addition to progress in social areas, interaction also allows students to support each other in learning. Having a community of learners promotes exploration and the fun of learning, creating a positive brain state.
5. **Review, review, review!**

Connections in the brain are strengthened the more they are used. The more often a certain pattern of neurons is activated, the more efficient the synapse becomes. The result of this efficiency is learning and memory. Neurologists like to say, “What fires together, wires together.” In order for students to actually retain the information they are taught, review is necessary. Every time a student reactivates the connection, it becomes stronger. Some teachers worry that review takes time away from teaching new curriculum. The choice is yours; you can cover more information on a superficial level and have students forget it, or you can spend the time reviewing and increase retention. Review does not have to take a long time – it can be touched upon in discussion or in just a few questions at the beginning or end of class to remind students of the main points.

- **Pair and Share**: have two students discuss a review topic or share one thing they learned
- **Door Pass**: students write down one fact or one of the main points of the day’s lesson on a slip of paper before they leave class
- **Journal/Quick Write**: have students record the main points that they learned during the lesson

Overall, teaching is not just about covering curriculum but about getting learning to stick. These five points help keep in focus what can be done to make lessons more brain-friendly and efficient.

As brain researcher Eric Jensen stated, “Unless schools are purposeful about creating a consistent enrichment response, they’re shortchanging our students. Enrichment is not a bonus, not a treat, or a reward. Enrichment is the whole point of school” (2006).
Sample Lesson Plan for 7th Grade Language Arts

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

7th LA: 1.3 Identify all parts of speech and types and structures of sentences

Students will be able to place words into the appropriate categories for parts of speech: noun, verb, adjective, adverb, preposition, conjunction, pronoun, and interjection. This lesson plan can be modified to reduce the number of parts of speech or to be more specific (i.e., proper nouns, collective nouns, etc.).

How do these goals provide systematic and multiple instructional opportunities for teaching:

➢ English second language learners?
The teacher will first present a mini-lesson on the board. Depending on where the lesson fits into the school year, there will be a certain amount of prior knowledge that students will be able to access in order to complete the task. Once guidelines are given, students will work in groups to complete the assignment. The group work creates a positive affective domain and allows for peer interaction and support.

➢ Students with special needs?
Many of the strategies that support English Language Learners also support students with special needs. The ability to interact with peers fosters cooperative learning. In addition, there are many possible answers in the given work time, so students may work on their own level to achieve success.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Each group of students (3-5 students per group, depending on class size) will complete a parts of speech poster created from given literature passages provided by the teacher. Achievement of the goal will be assessed based on correct answers given in the poster.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?
In the initial mini-lesson, the teacher will check for understanding by asking review questions (i.e., an example of an adverb). During the group work time, the teacher will circulate and check for understanding with each individual group, monitoring participation and comprehension. The completed poster is the “graded” part of the assessment; at that point, students should be successful on the poster given the peer support and teacher guidance during the activity.

2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO
Focus/motivation: How will you capture the learner’s attention?

Do a quick review of parts of speech. This can tap into emotion and motivation if it is challenging and fast-paced. For example, call on various students to provide an example of an adjective. Switch to a different part of speech. Some of the examples can be written on the board with reminders about what qualifies in each category – this is useful for the students in the following activity. In addition to getting students’ attention, the opening taps into prior knowledge and activates their learning.

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

Grammar may not be an exciting part of the curriculum, but it is necessary for mastering language skills. By making the activity enjoyable, students will be more receptive to the information. Providing literature passages rather than using exercises from the grammar book allows students to see relevance because parts of speech are something that authors must use correctly. Moving away from the textbook also creates novelty. Relevance can be demonstrated to students as short-term (necessary for foreign language in high school) or long-term (students have the potential to become professional authors).

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Mini-lesson reviewing the parts of speech. Students provide examples of each category. (If this is a new concept, you can modify the lesson to give an overview of the part of speech and a few examples, then draw upon the students for additional examples.)
2. Explain the expectations for the poster. It helps to draw an outline on the board, illustrating that the paper is drawn into categories for the parts of speech where cut-out words will be glued. Reinforce the idea that not all posters need to look the same – the categories can be different shapes and sizes. The important thing is that all categories are clearly labeled. This allows for creativity and personalization.

3. Break the class into groups. Limiting groups to 3-5 seems to work best, but adjustments can be made depending on class size. There are many ways to create the group – numbers, birthday months, pulling index cards with names on them, student choice, etc.

4. Provide each group with literature passages, markers, scissors, glue sticks, and a piece of paper to create their poster. This could be normal size, legal size, newsprint, etc. The more space there is to work with, the better, although text can get lost on the paper if the sheet is too big. A few suggestions on the literature passages… First, choose excerpts that are interesting. Think of this as advertising books. If students are intrigued with the selections, they may want to read the book. Next, copy each passage on a different color paper if possible. This helps students “divide and conquer” and keep track of who has what piece. It also makes the poster look more interesting. Finally, it is helpful to enlarge the passage when copying it. You may not get the facing pages to fit on one sheet, but you do not need all of that anyway – a sampling is fine, and larger text is easier to use.

5. Set a time limit and update students throughout. Having less time for an activity can actually be more effective because it creates a sense of urgency, as well as competition, leading to increased focus. Choose something you think is realistic for your class. This might mean having 15 minutes to work on the poster and requiring at least ten words in each category. It also allows for modifications depending on group ability levels and dynamics.

6. Circulate among groups during the work time. Check that students are working together well and all contributing. Also check for accuracy in the poster; do not make too many corrections, but if you see an error, use it to reteach the concept so that students will ultimately be successful on their graded assignment. Depending on how well the groups are working, you may need to suggest strategies to help them become more efficient. For example, they could each work on a separate passage, have one person in charge of gluing the words down, have one person checking for accuracy in each category (dictionaries acceptable), etc.

7. Give the students specific guidelines for finishing the task and cleaning up their areas. Collect the posters to assess.
Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?
If this is a review activity, students will already possess the knowledge of parts of speech. If this is an introductory activity, students still have knowledge of various words to use – they just need help figuring out how to categorize them.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.
Today’s lesson will help you identify parts of speech in everyday materials. Grammar isn’t just limited to the classroom and textbooks; it is something that you need to understand in order to master language and its use.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.
Return to whole class instruction. Go through each category and ask a different group member to share the most creative or interesting word they identified in that category. To create more of a challenge, do not allow words to be repeated from group to group.

3. REFLECT
OTHER FACTORS TO CONSIDER: What are your plans to include?
Critical thinking, cooperative learning activities, social skills:
For critical thinking, students need to identify words on their own. There is not a single correct answer for the overall poster. In addition, a word can fit into more than one category depending on its use. The poster activity requires cooperative learning and social skills because the assessment is a group grade rather than an individual grade. (This can, of course, be modified depending on circumstances.) If the requirements are made challenging enough, no single student can take over the group and individually accomplish what needs to be completed; it requires teamwork to meet the objectives.

Different learning modalities:
The mini-lesson supports students who excel with direct instruction. Varying the paper color of the literature passages and allowing artistic representations on the poster address visual stimuli. Group interaction allows for auditory processing and also creates emotional investment in the assignment. Finally, cutting and gluing words supports motor skills and kinesthetic learning.
Students with special needs:
Students with special needs are able to participate fully in this activity. They may have a special task (such as gluing) or be an integral part of the word finding. Since they have support from their peers, there is an opportunity to be successful. In addition, the activity can be modified to address various ability levels.

Expansion activities/early finishers:
Remind students that the minimum required is just that – a minimum. You may decide to put forth a challenge of how many words students can find for each category. By controlling the time, there should be enough content for students that they will not completely deplete their word bank. You may also decide to have the group create a certain number of original words to fit each category or form a wacky sentence using at least one word from each. The possibilities for extension and adaptation are endless!

4. APPLY

EXPANSION/APPLICATION (*BEYOND*): How will you help students practice new learning and apply it in new situations?

Grammar has the ability to adapt to multiple situations. You can review the parts of speech with students while reading other passages. You can ask quick questions during class (what part of speech is ________________?). You could ask students to name all eight parts of speech from memory. If you want to get tricky, you could even provide passages in other languages and see if students can predict word categories based on the rules and patterns they know from English. Finally, you can make it cross-curricular and conduct a grammar scavenger hunt where students need to find content-specific parts of speech in other classrooms or textbooks.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?
This activity allows for modification in a number of ways. The number of words expected can be reduced to accommodate students with learning disabilities. The expectation can be increased to provide greater challenge for GATE students. The aspect of individual and group responsibility addresses social needs. Even the formation of groups can be manipulated to support various students in the classroom.
Sample Lesson Plan for 8th Grade Language Arts

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

Grade 7 California English-Language Arts Content Standards:
*Evaluation and Revision* 1.6 Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.

Students will understand how to revise their writing based on input from their peers.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- **English second language learners?**
  English language learners will have peer support. They will also be able to participate in different roles; with a specific task, they can contribute to the discussion of composition.

- **Students with special needs?**
  Students with special needs can also contribute to the discussion. They will get peer input and will have specific tasks allowing them to give input to their peers, as well.

LEARNER OUTCOME:
Lesson objective: What *specific behaviors* will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will provide input for their peers regarding revisions and will also record suggested revisions.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

The teacher will check peer input, both written and oral, to make sure that students are both contributing and receiving feedback. Revisions will be evident between rough draft and final draft versions.
2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO

Focus/motivation: How will you capture the learner’s attention?

With revision, it often helps to have an example of an edited paper (one that has lots of comments on it) or some interesting fact – for example, J.K. Rowling rewrote the opening chapter of *Harry Potter and the Sorcerer’s Stone* a total of 15 times. Even famous, professional authors do not get their stories exactly right the first time around.

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

Students will use revision throughout their school careers and often beyond. Writing is communication, and it is important to make sure to communicate your message clearly. In addition, revision does not only apply to writing – it’s a concept that can be used in all areas. Basketball players work on improving their shots, and writers work on improving their writing.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Discuss the importance of revision with students. See how they feel about the process. Often, they’re so happy to get things done once that they don’t feel like putting writing through a process. Talk about authors and their challenges as well as comparing revision to other areas, such as sports.

2. Have students get out their drafts of whatever piece of writing you’re having them revise today – this works for narratives as well as expository writing.

3. If students do not have a draft for editing purposes, you have two choices. You may have them participate with whatever they have written (even if they have nothing drafted), or you can remove them from the group activity and have them complete drafting. Having them participate is valuable, so consider all of your options before making the decision.

4. Divide students into groups of four. It often works better if students do not have choice. When they gravitate towards their friends, they do not usually receive objective input. If you have students write their names on index cards, you can draw out four names and have “fate” decide on the groupings. Students should form small groups facing each other so that they can focus on their group and keep appropriate volume levels.

5. Each student has one of four roles: reader, praiser, summarizer, and
questioner. The reader is in charge of reading his or her paper out loud to the rest of the group. At the end of the reading, the other three group members provide input. The praiser provides compliments about the paper. The summarizer summarizes what occurred in the writing. The questioner asks any questions about content. The reader should not respond to comments from the other group members; instead, he or she records their input for later revision. The praiser recognizes strengths, something that the reader can use to guide revision. The summarizer either understands the main concepts or missed key points; if there are pieces lacking, the reader knows that certain areas need clarification. Finally, the questioner asks about what is missing or unclear. The reader may or may not decide to address these questions.

6. When the first reader has finished getting input from the group, roles rotate. Each member of the group will fill each role once.

7. At the end of the rotations, group members can ask for more input and can begin to make revisions.

8. If beneficial, bring the students back together as a whole group and ask guided questions. They may be able to identify common areas as strengths or places needing improvement. This is also a good time to have students publicly recognize some of the helpful advice they received from peers, as such discussion strengthens the writing community.

9. Set a time for the final piece to be due. Make sure that students use their revisions and turn in all process work.

Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

Students likely have experience with revision and with peer input, but this activity provides a focus and specific jobs for each student.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Today’s lesson focuses on how to give direct, helpful input in the revision process. By the end of class, you should have useful suggestions to assist you in moving from your rough draft to your final draft.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Bring the class back together for whole group discussion. Ask about common strengths and areas needing improvement. Ask students to share some of the
helpful feedback they received. Support the idea that writing is a process and that the goal of revision is to create a better end product.

3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include?
Critical thinking, cooperative learning activities, social skills:
Students need to think critically to provide input to their peers and to sift through the input they receive. Students will work together during the peer editing process, both gaining experience and developing appropriate social skills.

Different learning modalities:
Oral presentation is a major focus for this lesson. In addition, students have the ability to process information visually. There is a large interpersonal component in the editing process, as well.

Students with special needs:
Students with special needs will benefit by having a specific task during the editing process. Rather than feeling overwhelmed or left out, they will have an important role and will be looking for one area in which to provide input. In addition, they will receive input from three other students.

Expansion activities/early finishers:
Students who finish early can continue discussing with their group to get more input. They may also choose to begin revising their paper while the discussion is still fresh in their minds. Having students record a summary of the input allows them to remember it when they go back to make changes.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?

This method of providing peer input is easy to use once students are trained in the process. Throughout the year, the teacher continues to emphasize the importance of editing and revision.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?
During group work time, the teacher has the ability to circulate and listen to the conversations occurring. Individualized instruction can happen during this time, although the teacher should allow input to come from group members first and only provide input if asked. However, when the time for peer input has passed, the teacher will have a better idea of which students need additional support.
Sample Lesson Plan for 7th Grade Literature

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

7th Grade ELA Reading: 3.3 Analyze characterization as delineated through a character’s thoughts, words, speech patterns, and actions; the narrator’s description; and the thoughts, words, and actions of other characters.

7th Grade ELA Writing: 1.2 Support all statements and claims with anecdotes, descriptions, facts and statistics, and specific examples.

Students will be able to analyze a literary character by citing evidence in the text used to create the character.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- English second language learners?
  ELL students will benefit from close literary analysis in a group setting. This supports their ability to identify important pieces of text and to look for the main ideas. The group activity also supports acquisition of speaking skills as all students participate.

- Students with special needs?
  Students with special needs also benefit from group activities because of the peer interactions that occur. They will complete a challenging literary activity, but discussion of the topic is at a conversational level.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will complete a character poster in small groups. Each group will identify six areas that create the character in the literary work.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?
The poster will be evaluated in terms of specific passages chosen from the work and how well they support the different areas of characterization. In addition, the teacher is able to complete formative assessments during group discussion to check for understanding.

2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO
Focus/motivation: How will you capture the learner's attention?

Provide students with general background on the Holocaust. Explain that the short story “Suzy and Leah” by Jane Yolen is a fictional account of what a Jewish girl may have experienced when forced to move to America during World War II. Encourage students to look for personal connections during the reading – how would they have felt in the same situation? Have they experienced something similar when getting to know a new person who is seemingly incredibly different?

(This lesson can be adapted to any short story or literary work; we are using “Suzy and Leah” as an example from our literature anthology.)

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

Often, students have a basic understanding of literary characters but may not be able to support their concepts with specific facts. As students progress in literature, it becomes important to be able to cite passages from a literary work that support their claims about characterization. This skill can be transferred to new situations by explaining how important it is to provide evidence when making an argument.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Have students take notes on six areas of characterization: how the character looks/dresses, how the character speaks, what the character thinks (if omniscient narrator), what the character does, what the narrator says, and what other people think/say about the character. Provide examples from stories with which the students will be familiar (for example, we know the stepmother in Cinderella is wicked because the narrator says so). Focus on
how each specific piece of evidence can be categorized under characterization. If you have special needs or ELL students, you may want to provide notes for them or have an outline they can fill in during the mini-lecture.

2. Provide generalized, age-appropriate background about the Holocaust and answer general questions. (If you don’t set guidelines, your entire class period may be used in discussion… which is not always a bad thing but which does alter your lesson plan.)

3. Read “Suzy and Leah” aloud with the class. Since the story is written in diary form, it works well to have students read one entry each. Remember, according to brain research, a student who is reading aloud is focused on reading, not comprehension. For this reason, it is important to discuss and summarize at the end of each entry, both for the understanding of the student who was reading and to make sure that the entire class understands what is occurring in the story. Leave time for questions, too!

4. When you have finished the story, ask students to go back to their notes on characterization for review. You may want to take one example from each category and post it on the board to get them started thinking about how they can describe either Suzy or Leah.

5. Break students into small groups (3-5 if possible). For this activity, you may want to allow them to choose their own groups.

6. Provide each group with a piece of newsprint (or large paper) and a box of markers. They should also have at least one anthology with them.

7. Explain the poster. In the middle, students will draw a picture of the character (either Suzy or Leah). The rest of the paper needs to be divided into six sections that are labeled with one of the areas of characterization. In each area, students need to find specific evidence from the book and cite the page number.

8. Give students a set amount of time to complete the poster. Monitor progress during work time and check for understanding. This may be a good time to provide suggestions about group work – dividing up the task and giving people specific jobs are good strategies for completing the assignment.

9. Stop work time and have students clean up their areas. Remind them to put their names on their poster!

10. Debrief as a class. Ask groups what they learned or noticed from the activity. You may ask each group to share one category with their specific evidence. Make sure they clarify which character they chose so that nobody is confused.

11. Display the posters in the classroom so that everyone can see what each group accomplished.
Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?
By drawing on students’ understanding of common texts, they are applying the new skills to literature they already know. Fairy tales work well because there is often the same story (or storyline) in many cultures, so ELL students can also contribute to the discussion. You may choose to broaden the discussion and ask about students’ first impressions of a person and why they made certain assumptions. (A safe starter, depending on your confidence level, is to ask for their first impressions of you on the first day of school.)

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson. Explain that specific examples strengthen opinions. Citing specific passages in literature shows the audience that the writer understands the content and is an expert on the subject. This applies not only to literature but to all content areas.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome. Have each group present one area of characterization. Discuss common traits the groups discovered. Does this activity make the students feel like they know the characters better? What was the easiest category to cite? What was the hardest? Why is it important to include all of the categories of characterization rather than focusing on one? What can they apply toward their own writing based on what they learned in analyzing an author’s story?

3. REFLECT
OTHER FACTORS TO CONSIDER: What are your plans to include?
Critical thinking, cooperative learning activities, social skills:
In groups, students have to analyze a piece of literature and select relevant details to provide support. This requires critical thinking in order to categorize and to select appropriate details. The group setting requires students to work cooperatively in order to successfully complete the assignment. By requiring the assignment to be completed in a group rather than individually, students draw on each other’s individual perspectives and recognize that each person views literature differently.

Different learning modalities:
The initial notes and the poster assignment use visual learning. Reading the story aloud and facilitating discussion supports auditory learners. Creating the poster also addresses kinesthetic learning, creativity, and social interaction.
Students with special needs:
Students with special needs contribute at their individual ability levels. They have the opportunity to participate in reading, discussion, poster creation, and presenting of information.

Expansion activities/early finishers:
You can adjust the number of examples required for each category depending on time constraints and class ability levels. Groups who finish early could do both characters, provide suggestions to the author on what would more fully develop the character they chose, or create additional details that they believe could fit the character based on what they already know from the story.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?
Citing literature passages is routinely used in literature classes. By requiring page numbers on the poster, you create the expectation that students will provide specific examples and also model how that should be done. Evidence is also important in persuasive writing. The more evidence a student can provide in persuasive writing, the more convincing the argument becomes. The specifics about characterization can be applied to any piece of literature. When a student makes a claim about a character, ask what support there is and which category fits that claim.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?
In this activity, students work at their own ability levels. They are asked to work in both an individual and group capacity. The activity (supported by notes, class discussion, and examples) allows students to understand and to be successful when contributing in their groups.
Sample Lesson Plan for 8th Grade Literature

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

Grade 8 California English-Language Arts State Standard:
3.5 Identify and analyze recurring themes (e.g., good versus evil) across traditional and contemporary works.

Students will be able to identify various themes found in a novel. This can also be adjusted to identify themes across novels to compare and contrast their purposes.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- English second language learners?
  English language learners will benefit from the initial group brainstorming and the ability to have peer support during the activity.

- Students with special needs?
  Students with special needs will also benefit from working in a group. They can provide ideas without having to write them down or they may be the recorder and listen to the ideas of their peers.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will be able to provide support for themes found in the novel by identifying specific details from the work.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

Students will record their ideas in different marker colors, making it easier to identify which groups had certain ideas, which were able to identify many pieces of support, and which found the activity to be difficult.
2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO

Focus/motivation: How will you capture the learner’s attention?

Get large pieces of poster paper to place in the front of the room. Ask students to define theme and to identify various themes found in the novel. (For sake of example, Roll of Thunder, Hear My Cry will be used in this lesson.)

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

As students continue their education in the field of literature, they are often asked to identify theme. This ties in with understanding why an author wrote the novel and identifying its larger purpose. Working as a group to find the “point” helps students internalize the process for later use on their own.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Ask students to define theme – the main message or purpose in a work.
2. Brainstorm possible themes for Roll of Thunder, Hear My Cry. These may include the importance of equality, that pride is something nobody can take away from you, that making the “right” decision is not always easy, etc. Record each potential theme on a piece of poster paper.
3. Break students into small groups. This will be determined by your number of students and the number of themes. If you have five main themes and 30 students, each group will consist of six students. Provide each group with a different colored marker.
4. Use a “carousel” activity to have students provide details from the story that support the theme on the sheet at their station. One person should be the recorder while the others provide input. For example, if the theme is “A person’s pride cannot be taken away,” support from the novel may include Uncle Hammer selling his Packard. He lost his car, but he kept his pride. Students should brainstorm as many supporting details as possible within the time given and provide quotes and page numbers. This time can be adjusted, but five minutes to start works well.
5. After reaching the set time, have groups rotate to the next station. The same process will be followed, but this time there is the added step of reading what the previous group recorder. For this reason, you may want to increase time in later rotations.
6. When students have rotated to each station, have one representative bring the sheet back to the front of the class. Another can collect markers.

7. Discuss the themes as a class. After rotating through all of them, students might recognize a few that seem stronger than the others. Is there one overarching theme? If using the activity to compare literary works, look for a common theme among them.

8. Save the posters for use later, whether with a final essay or during a test.

Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

Students have knowledge of the literary work. They should also have background on theme. This lesson works to apply the concept of theme to a specific novel.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Today’s lesson asks you to find support for various themes found in *Roll of Thunder, Hear My Cry*.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Discuss the themes with the class. Look at the specific details recorded for each theme. Challenge students to assess the support: What are the strongest examples? What seems to be a stretch? Did they find anything they weren’t expecting as they dug deeper into the novel?

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3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include? Critical thinking, cooperative learning activities, social skills:

Students think critically about the content of the literary work while working together in a group to complete the task. Having peer support during discussion will result in an increased number of ideas.

Different learning modalities:

Students will receive information visually and orally. There is ability to move and to interact with peers during the lesson.
Students with special needs:
Students with special needs can participate in the group discussion. They may provide input, listen to the input of their peers, or record ideas.

Expansion activities/early finishers:
Early finishers can rank the themes in order of most important to least convincing.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?

Students may use the specifics they brainstormed in today’s lesson on a later essay or test. The concept of identifying theme and supporting it with specific details will continue throughout the year with different pieces of literature.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?

All students are supported in the group brainstorming because they are each able to participate in some way. During work time, the teacher can circulate and assess what students need more help with the concept.
Sample Lesson Plan for 7th Grade Mathematics

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

7th Grade Math: 1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- English second language learners?
  ELL students will be supported by the hands-on nature of the lesson and the ability to work with a partner in its completion.

- Students with special needs?
  Students with special needs will also benefit from having a hands-on activity and having the support of a peer to complete the activity. The peer with which they work does not necessarily have to be one of high ability level; the lesson can be modified to apply to a pair of special needs students, as well.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will complete a worksheet that requires use of fractions, decimals, and percentages applied to situations using coin values.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

The summative assessment is correcting the worksheet. During the lesson, the teacher will monitor student progress and check for understanding individually.


2. TEACH

**INTRODUCTION:** The purpose of the introduction is to set the stage for the lesson. *INTO*

**Focus/motivation:** How will you capture the learner’s attention?

Using manipulatives in the form of coins will catch the students’ attention. It is something different from the normal textbook lesson, thus providing novelty.

**Purpose of the lesson:** Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

In the real world, conversions from fractions to decimals to percentages occur all of the time. It is important for students to recognize these situations so that they will value the importance of mastering the skill.

**PROCEDURES:** Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. *THROUGH*

1. Label columns for fractions, decimals, and percentages on the board. Ask students for an example of each (what it looks like). What is specific to concept? (For example, fractions are written showing a numerator and a denominator, decimals use a decimal point, and percentages are followed by a percent sign.)

2. Take an example given by a student and demonstrate how to convert from a fraction to a decimal to a percent. For example, if a student says $\frac{1}{2}$, write that in the fraction column. In the decimal column, show how $\frac{1}{2}$ means 1 divided by 2 and do the math. From the decimal column (0.50), show students how to move the decimal place over two, resulting in 50%. (It may be helpful to remind them of place value – tenths, hundredths, etc.) Ask for at least two more examples, and challenge students to do the math themselves. They usually enjoy the ability to write on the board. If you want to encourage students with lower ability levels to participate, you may ask them to be the “scribe” and write out what other students suggest in order to solve the problem.

3. Have students form partnerships. These could be self-selected or assigned. If you have an odd number, have one group of three.

4. Provide each partnership with a total of five dollars (either real or play money), one dollar each for pennies, nickels, dimes, quarters, and dollar bill.

5. Distribute the math worksheet. You may choose to have each student complete one individually or to have one sheet per partnership. The
worksheet has four columns: number of coins, fraction, decimal, and percentage. The number of coins is given. (See sample worksheet following lesson plan.)

6. Have students complete the worksheet. They have the coins and dollar bill to use as manipulatives. If the information provided is “3 nickels,” students should line up their nickels and pull three from the line. For the fraction, they would have 3/20 (three nickels out of twenty used to make one dollar). For the decimal, they would calculate 3 divided by 20: 0.15. For the fraction, they would move the decimal over two places and have 15%. It should not take long for them to discover the pattern: whatever the number value of the coins is, that will also convert to the decimal and percent.

7. Monitor the partnerships during work time. Check that all students are participating equally and that they have correct answers.

8. Have each partnership clean their area and return coins to the bags. Students can either count the coins on their own, you can check the numbers, or you can appoint students to be the official coin counters to insure that all materials are returned.

9. Return to whole class instruction. Ask students if they discovered a pattern. Discuss the pattern and write examples on the board. Explain that the pattern occurs because the total was 100, the base for percentages and easy decimal use. Answers will vary when the total is not 100, but converting to a decimal from the fraction allows for easy conversion to percentages.

10. Provide more problems on the board, but start with either percentages or decimals rather than fractions. Have students work “backwards” from what they were doing in order to convert the number into all three formats. (For example, give students 35%. They should easily convert this to 0.35. The fraction is 35/100, but remind them about the importance of reducing. They can apply their coin knowledge to understand how best to do this.)

Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

Many students have experience using coins, as it is a real-world skill. They should already have a basic understanding of fractions, decimals, and percentages from earlier grade levels, so make sure to draw upon this prior knowledge.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Have students provide examples about when fractions, decimals, and percentages are used in real-world situations. Ask them why understanding these concepts is a useful skill. Reinforce the idea that there are many times when students will need to understand the concepts and apply them in their own lives.
Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome. Challenge students to convert numbers from either decimals or percentages to the other formats. This lesson may be a good day to apply an exit strategy to check for understanding. If possible, and if you are changing classes, release the students in small groups. If you have a class of 30, state that you will allow three students to leave – if either fraction, decimal, or percentage can be identified. If a student recognizes that is 10% of the class, allow that student and two friends to leave. Continue the problems from there until all students are gone, varying the challenge as appropriate.

3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include?

Critical thinking, cooperative learning activities, social skills:
Students are applying the concept to real-world situations. They are able to work with a partner to gain understanding of the formats.

Different learning modalities:
Visual learners benefit from the mini-lesson and information provided on the board, as well as from the use of manipulatives. Auditory learners benefit from the initial instruction and conversations with their partners. Kinesthetic learners benefit from the use of manipulatives and from the ability to move to the board and complete problems in front of the class rather than from their desks.

Students with special needs:
Students with special needs have the support of a partner and the ability to use manipulatives. Scaffolding from the teacher and other students supports learning. ELL students are supported in the use of money, which both bridges the cultures and teaches them more about American money.

Expansion activities/early finishers:
Have students combine the types of coins to create their own problems. They can write their own examples on the back of the sheet. Perhaps they want to give a decimal ($0.74) and illustrate different ways to create that number from the coins given. The partners could also challenge each other with problems they create individually.
4. APPLY

**EXPANSION/APPLICATION (BEYOND):** How will you help students practice new learning and apply it in new situations?

By starting with coins, students are able to master how to convert the three formats into each other. This skill will help in new situations when the total is not based on 100. The skills are used throughout the math curriculum. It may help to use the concept with cooking or food. Fractions are used in most recipes, and foods like pizza or pies also use fractions. Make the learning applicable to real situations.

**MEETING THE NEEDS OF ALL STUDENTS:** What strategies will you use to meet the learning needs of all students?

The lesson is both relevant and high-interest, drawing students into the lesson. The strategies are varied (mini-lesson by teacher, work time with partner, group review, etc.), so all students will be supported since information is presented in a variety of ways. In addition, having students work in partners means that they have someone who can help explain the concept and allows the teacher to check in more efficiently and to focus on the students who needs the most support.
Fractions, Decimals, and Percentages Worksheet

Fill in the chart below using the information given. Convert each fraction into a decimal and percent. The first problem has been done for you.

<table>
<thead>
<tr>
<th>Number of Coins</th>
<th>Fraction</th>
<th>Decimal</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 pennies</td>
<td>4/100 or 1/25</td>
<td>0.25</td>
<td>25%</td>
</tr>
<tr>
<td>3 dimes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 quarter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 nickels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 pennies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 dimes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 quarters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 nickels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 pennies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 dimes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 nickels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 nickels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 quarters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37 pennies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 nickels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 dimes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 penny</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 quarters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 dimes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 nickels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 pennies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sample Lesson Plan for 8th Grade Mathematics

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

California State Standards, Grades 8 Through 12: Algebra

8.0 Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.

How do these goals provide systematic and multiple instructional opportunities for teaching:

➢ English second language learners?
   Using a hands-on approach to the concept will help English language learners understand the ideas of parallel and perpendicular lines. Working with a partner will also provide support.

➢ Students with special needs?
   Students with special needs will also benefit from working with a partner and using hands-on activities to understand slope.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will be able to calculate the slope of various lines.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

Students will be able to determine the slope of various lines. They will be evaluated upon correct answers to given problems.
2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. Into
Focus/motivation: How will you capture the learner’s attention?
Challenge two students to mirror each other without touching. After watching for
a while (or having a few different partners try), discuss the meaning of “parallel.”

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it
important/relevant? How will you make it relevant to them?

Parallel lines, perpendicular lines, and slope are all building blocks for geometry.
These concepts are frequently used in later math. Slope is important because it
predicts a path.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What
monitoring and adjusting techniques will be necessary? How will you model what you want the
students to do? List all the steps necessary to present the lesson. This should be a mini-script of
the lesson. You may want to attach a separate sheet. Through

1. Start with students mirroring each other. Discuss the concept of “parallel.”
   Parallel lines go on indefinitely without ever intersecting.
2. Talk about the meaning of “perpendicular.” Some easy examples are roads or
   (often) the lines in classrooms. Perpendicular lines intersect at a 90-degree
   angle, meaning they will only meet once.
3. Discuss “slope” with students. A visual on the board or overhead will help
   reinforce the idea. A line that starts lower on the left side and raises toward
   the right has a positive slope. A line that starts higher on the left side and
   lowers toward the right has a negative slope.
4. Have students break into partnerships or small groups. Provide each group
   with yarn, a large grid (preferably laminated), and a worksheet.
5. In groups, students will fill out the worksheet. This should have columns for
   the starting point, ending point, number of boxes between the points on the
   vertical access (rise), number of boxes between the points on the horizontal
   access (run), and slope (rise divided by run). Remind students that the rise
   will be negative if the line goes down. The yarn becomes the measurement
   between the two points.
6. Have students investigate parallel lines. What do they discover about the
   slope? (The slope will be the same for parallel lines.)
7. Have students investigate perpendicular lines. What do they discover about
   the slope? (The slope is the opposite; for example, -1 and 1.)
8. Using the information they discovered, provide some follow-up questions. Give students linear equations and ask them to predict three points that will end up on that line. Provide equations and ask for an equation of a line that is parallel and one that is perpendicular. This follow-up could be a section of the worksheet, whole group review, or a challenge (points to the first team to come up with the answer).

9. Return to whole group instruction to summarize and check for understanding.

**Connection to prior knowledge:** How does this lesson/skill/concept connect to other learning experiences? Students have knowledge of lines. Draw on their understanding of parallel and perpendicular lines in terms of streets, basketball and four square courts, etc. They will instinctively possess quite a bit of knowledge about the concepts already.

**Share the learner outcome:** State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Today’s focus is understanding the slope of the line and how the slopes of parallel and perpendicular lines relate.

**Closure:** Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Bring students back to whole group instruction. This will provide a final check for understanding. Students can compare patterns and summarize their findings.

---

**3. REFLECT**

**OTHER FACTORS TO CONSIDER:** What are your plans to include? Critical thinking, cooperative learning activities, social skills:

Students will work together to complete the worksheet and compare ideas to find patterns. This draws upon both critical thinking and positive social skills.

**Different learning modalities:**

Students will be able to explore math concepts in a hands-on fashion. Seeing material visually, discussing it orally, and interacting with peers allows students take in information in many ways.
**Students with special needs:**
Students with special needs are supported both in the hands-on approach and in having peer support during the activity.

**Expansion activities/early finishers:**
Students who finish early can look to determine a formula that works to find the points on a line \(y = mx + b\). If the line-slope formula has not already been covered in class, you may challenge them to find it or offer extra points to someone who can. You may also choose to give them the equation and have them predict what “b” means.

---

**4. APPLY**

**EXPANSION/APPLICATION (**BEYOND**):** How will you help students practice new learning and apply it in new situations?

Slope is used throughout algebra. This is a building block in mathematical problems that will follow during the rest of the year. For review, you could have students walking toward each other from different directions on a particular slope and determine when their paths will intersect.

**MEETING THE NEEDS OF ALL STUDENTS:** What strategies will you use to meet the learning needs of all students?

Information is presented in a number of ways. Students have peer support, as well. During work time, the teacher has the ability to circulate and check in with students individually.
Calculating Slope

Find the given beginning and ending points for each problem then connect them with the piece of yarn. Count the number of squares for both rise and run and calculate the slope. The first problem is done for you.

<table>
<thead>
<tr>
<th>Start point</th>
<th>End point</th>
<th>Rise</th>
<th>Run</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0, 0)</td>
<td>(3, 5)</td>
<td>3</td>
<td>5</td>
<td>3/5</td>
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<td>(5, 5)</td>
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<td></td>
</tr>
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<td>(-4, 2)</td>
<td>(-2, 4)</td>
<td></td>
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<td></td>
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<tr>
<td>(2, -4)</td>
<td>(4, -2)</td>
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<td></td>
</tr>
<tr>
<td>(3, 7)</td>
<td>(5, 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-5, -3)</td>
<td>(-1, -10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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<tr>
<td>(2, 0)</td>
<td>(7, 0)</td>
<td></td>
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<tr>
<td>(3, 2)</td>
<td>(4, 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6, 5)</td>
<td>(7, 4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-1, -1)</td>
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<td></td>
</tr>
<tr>
<td>(-2, 0)</td>
<td>(0, 4)</td>
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<tr>
<td>(6, 2)</td>
<td>(7, 5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-3, 3)</td>
<td>(3, -3)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(0, 0)</td>
<td>(2, -5)</td>
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<td>(2, -2)</td>
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<td></td>
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<td>(5, -4)</td>
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<td>(4, 6)</td>
<td>(6, 6)</td>
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<td></td>
</tr>
<tr>
<td>(I, 3)</td>
<td>(I, 5)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

Grade 7 California Science Standards: Cell Biology

1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:
   a. Students know cells function similarly in all living organisms
   b. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.

Students will know the basic parts of animal cells and will be able to explain their purpose in the cell.

How do these goals provide systematic and multiple instructional opportunities for teaching:

➢ English second language learners?
   ELL students will benefit from expanding their academic language. The activity supports students in connecting new learning to prior knowledge in order to remember the content.

➢ Students with special needs?
   Students with special needs will also benefit from the ability to make their own connections to the material. Since students will create a personal analogy, special needs students (whether GATE or learning disabilities) will be able to perform at their own level and still be successful in the activity.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will create a metaphor for the cell, demonstrating that they understand both the parts of the cell and how they function together.
ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

Achievement will be evaluated based on the cell metaphor the student creates and his or her accompanying explanation.

2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO
Focus/motivation: How will you capture the learner’s attention?

Use examples to get the students thinking. If there are no examples from the previous years, ask questions of the students such as, “How could a cell be like a…?” Giving a variety of possibilities will lead to creativity.

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

Knowledge of the structures in an animal cell and how they function is an important building block for biology. It can be made relevant because students’ own bodies contain these cells, so the processes taking place in the cells illustrate what occurs inside the students.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Ask students to recall what they remember about structures within animal cells. Since this should not be an introductory lesson, they should possess prior knowledge. Include the “jobs” these structures have.
2. Introduce the concept of a metaphor. This should also connect to prior knowledge as it is a standard in language arts. Brainstorm ideas with the students.
3. Provide project guidelines for the students. They are to create their own metaphor for an animal cell. This should include individual metaphors for the various structures within the animal cell. The overall metaphor needs to illustrate an understanding of how the structures work together within the cell.
For example, the animal cell could become a medieval manor with the cell membrane becoming the outer wall. The nucleus may be the inner tower where the lord lives and controls what happens within the manor. You can choose to make this as specific or general as you want depending on how many structures you want the students to identify.

4. Have students begin brainstorming in class. This may be assisted with a worksheet listing the structures you want them to include and a space for them to write in the metaphor for each. It would also help to have them write a summary paragraph on the brainstorming to explain why the metaphor they chose is appropriate – brainstorming before entering the project phase will help them organize their thoughts rather than making connections forced. The goal is to make this a meaningful activity that will help students understand the cell in terms of their own personal connections. Circulate around the classroom during this time to check for understanding individually. Allowing discussion between students will assist them in their critical thinking and personal interactions.

5. There are many directions you can take depending on the amount of time you want to dedicate to the activity. You could collect the brainstorming and check the ideas to approve before heading into a final phase. You could also check while circulating the classroom. Perhaps the worksheet will be the only part of the project you want to have students complete. Adjust plans as necessary to fit your unit plan.

6. If extending the project, have students create a visual to accompany their metaphor. This could be done in poster format or could even require a three-dimensional model. You could either provide class time or make the assignment homework.

7. Have students present their ideas. This allows them to take credit for their accomplishment and also provides the class with multiple ideas and connections to which they may relate.

8. Use metaphoric ideas in continued discussion of the cell structures and their roles. This accesses prior knowledge and strengthens the connections in the brain.

Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

This lesson builds upon prior lessons about animal cells and their structures. It extends understanding of the concepts by helping students create their own meaningful connections.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.
This lesson helps students (you) create meaningful connections explaining how each of the structures in the animal cell works together.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Have students share their metaphors. Discussion could be as much or as little as desired. This may include a class consensus on the strongest overall metaphor or the individual metaphors they liked best for representing the structures in the cell.

3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include? Critical thinking, cooperative learning activities, social skills:
The activity requires critical thinking as students work to make the metaphor fit the actual functions of the cell structures. When students are allowed to discuss together (all having individual projects but helping each other during discussion), they strengthen their social skills and also provide insight to their peers.

Different learning modalities:
Information is presented both visually and orally. Students display understanding of the concept through writing, artistic presentation, and orally.

Students with special needs:
Students with special needs are able to individualize their projects; each will make connections with something meaningful in his or her life. There are a variety of correct answers, so there is the ability to be creative without the pressure of being “wrong.”

Expansion activities/early finishers:
The project can be as easy or as complicated as the teacher desires. Early finishers could do more detailed sketches or presentations of the individual parts of the cell. They could also work with their peers as either support or to discuss in small group their ideas.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?

The metaphors will be used throughout the year as discussion continues with animal and plant cells. Depending on time, students could create another
metaphor for plant cells and compare the similarities and differences between the two types of cells.

**MEETING THE NEEDS OF ALL STUDENTS:** What strategies will you use to meet the learning needs of all students?

Group discussion includes peer support, but the project is an individual component. Information is presented in a variety of ways, addressing all learning modalities. Circulating during work time allows the teacher to check in individually with students to make sure they understand the concepts.
Sample Lesson Plan for 8th Grade Science

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

8th Grade California State Standards for Science:
b. Students know that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
c. Students know how to solve problems involving distance, time, and average speed.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- English second language learners?
  English language learners are supported during group/partner work time. They are learning a scientific concept with the support of peers and hands-on activities.

- Students with special needs?
  Students with special needs are also supported by the group work and ability to contribute with a specific job. The hands-on learning makes the concept more relevant.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will calculate the average speed of various objects. They will also be able to calculate the problems in reverse to find distance and time.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

Students will complete a worksheet with mathematical calculations to show they understand how to find average speed, distance, and time.
2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO

Focus/motivation: How will you capture the learner’s attention?

Ask students about the state of their throwing arms – this should get them interested.

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

The ability to calculate speed, distance, and time is important in both math and science. Students will be able to solve problems based on their calculations. In a real world application, these problems will let students know how long it will take to get somewhere at various speeds, something very useful for road trips!

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Challenge students with some problems they should be able to solve fairly easily (For example, if you’re driving 30 mph, how long will it take you to go 15 miles?). When they come up with the correct answers, ask them to explain how they solved the problem.

2. Give students the equation distance = rate x time. Discuss why this works, using the earlier examples. How fast you travel multiplied by how long you travel will give the total distance you travel. Do a few more sample problems to make sure students understand the concept. Also show students how to use the equation to show that rate = distance/time and time = distance/rate.

3. Divide students into teams of at least three. This will provide for a “mover,” a timer, and a recorder. Teams may be larger if necessary, but the smaller the team, the more each member will participate.

4. If possible, go outside to an area set up for the activity. This could be done inside but on a smaller scale. Give students a variety of items to either throw or roll and a marked out distance. This may be ten feet, ten yards, half a basketball court, or some other area available to you. The important part is that it is easily accessible and uniform for all students. Be consistent in whether items are rolled or thrown. This may include various balls, Frisbees, hula hoops, etc.

5. Have students record the time for each item to get from the start line to the finish line. The distance should be uniform for all items. They can then calculate the average speed by dividing the distance by the time. Be clear in
what measurements you want – feet/second, yards/second, miles/hour, etc. For sake of more accurate results, you may want to have students do three to five trials for each object and average the results.

6. For an added challenge, you may want to have students race across the distance and then calculate their speeds, as well.

7. Return to the classroom to finish number crunching. Compare results from each group. What was the fastest item? What was the slowest? Did that depend on each group’s delivery? (For example, perhaps one group had a softball pitcher who threw a baseball fast but who could not throw a Frisbee well.)

8. Depending on time, you have the ability to do a number of expansion activities. You may want to provide a distance and ask how long it would take (at the average speed) for various items to cover the distance. You could provide time and ask how far the item could travel. Make sure to work the formula in three different ways so that students can plug in information they know to calculate the missing variable.

9. To close, provide an example with driving. Provide a variety of speeds and distances. For example, someone driving 55 mph would cover 10 miles in slightly under 11 minutes. Someone driving 70 mph would cover 10 miles in about 8 minutes, 34 seconds. If you consider getting a ticket for breaking the speed limit, is saving 2.5 minutes worth it? How much time can you actually save by speeding, and what are the potential costs?

Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

Students will likely have knowledge of either road trips or traveling. They know that different forms of transportation have different speeds. They could use that experience to determine how long it takes to get somewhere by bike or by car.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Today you’ll be calculating the speeds of various items and determining how long it will take to cover a certain distance.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Discuss real-world applications of average speed, distance, and time. Why would scientists need to know this? When would it matter? Help the students determine relevance.
3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include?

Critical thinking, cooperative learning activities, social skills:
Students work together to record times and calculate average speeds. Working together provides peer support and also encourages positive social interactions.

Different learning modalities:
There are many pieces to this lesson – visual presentation, oral discussion, physical experimentation, and mathematical calculations. Working together, each group should be able to draw upon its members strengths so that everybody has the opportunity to contribute and to be successful.

Students with special needs:
Students with special needs can provide support from their peers. In addition, with the separation of different tasks, they will be in charge of one piece of the activity. There are many levels of difficulty, so they should be able to succeed within their groups.

Expansion activities/early finishers:
Early finishers can calculate more specifics or come up with other examples. They also can run more trials and work on averaging results.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?

Calculating distance, rate, and time is important with other physics-related concepts such as velocity and momentum. Students will continue to use the formula to solve other word problems.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?

During group testing, there is time for the teacher to check in with individual groups to make sure that all students understand the concepts. Information is provided using a variety of approaches, so students will have multiple ways to take in the concepts.
Sample Lesson Plan for 7th Grade Social Studies

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

7th H-SS 7.2 Students will analyze the geographic, political, economic, religious, and social structures of the civilizations of Islam in the Middle Ages.

ELD 2.1 Students will prepare and deliver short presentations on ideas, premises, or images from a variety of common sources.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- English second language learners?
  ELL students are supported by the review of materials, group work, and presentation. They are developing both academic language and basic interpersonal communication skills.

- Students with special needs?
  Students with special needs are also supported by the review and group work. They have the opportunity to demonstrate their understanding through a hands-on project rather than a traditional method such as a worksheet.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

Students will create a mosque out of the provided materials. The mosque must meet the requirements given on the grading sheet (labeling of features, correct shape, etc.)

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?

Students will be assessed based on the grading sheet provided to them. One component of the grade is the ability to answer questions, so the teacher is able to check for understanding individually, as well.
INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO

Focus/motivation: How will you capture the learner’s attention?
Having strange bags full of materials is one way to catch students’ attention. In addition, several days prior to the activity you may ask students to begin collecting materials without telling them the final product.

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?
Islam and the culture of the Muslim world is a state standard in 7th grade social studies in California. It is important to show students the relevance of Islam in our world today. That may be done by sharing current news articles and discussing Islam’s role in the modern world. This lesson is the culmination of many others, so students should already possess an understanding of the roots of Islam and the importance of the mosque.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Review the mosque. Students should have notes taken from previous days and visual memories from the video (Nightline: The Hajj).
2. Divide students into groups. Choose the method that you believe will be most effective for group formation.
3. Give each group the paperwork needed – grading sheet, Arabic calligraphy, and mosque notes (optional: additional support for special needs). Go over the grading requirements and remind students to self-assess frequently to make sure they are on the right track.
4. Provide each group with a bag of materials (toilet paper rolls, thin cardboard, paper scraps, masking tape, markers, scissors, etc.). Students are limited to the materials in the bag!
5. Set a certain period of time for completion. Depending on the class, approximately 35-40 minutes will be needed. You can reserve the right to adjust the time based on students’ progress during the activity. Make sure to leave plenty of time (at least five minutes) for cleaning up.
6. Circulate among the groups during work time. You may ask them about their progress on the grade sheet or clarify their design. This is the time to support their learning rather than allowing them to complete the project incorrectly. Provide time reminders so they know exactly how long they have left.
7. Stop all work and have groups clean up their areas. Unused materials may be
sorted or returned to the bag (unless you allowed students to use it in their building). If you scheduled presentations for the same day, have groups keep their mosque at their area. If not, have a safe place for storing the mosques until the next day.

8. Have each group present. Before beginning, they must provide their scoring guide for evaluation purposes. Every group member must contribute during the presentation. Ask specific questions to evaluate understanding.

9. Return to whole group instruction. Ask students how the features of a mosque are similar to or different from synagogues, churches, temples, or other religious buildings with which they may be familiar.

**Connection to prior knowledge:** How does this lesson/skill/concept connect to other learning experiences?

Students are extending their knowledge of the Islamic culture through this activity. They already have completed lessons on Islam’s roots and teachings.

**Share the learner outcome:** State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Today, you will demonstrate an understanding of the features of a mosque and have the ability to explain why these features are important in the Muslim culture.

**Closure: Lesson summation.** How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Have students make connections between the mosque and other religious buildings such as churches and synagogues. Look for similarities and differences; this will help connect to prior knowledge later in the year when studying Christianity.

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3. **REFLECT**

**OTHER FACTORS TO CONSIDER:** What are your plans to include?

**Critical thinking, cooperative learning activities, social skills:**

Students will be challenged to create a three-dimensional architectural structure out of basic craft materials. You can manipulate the level of challenge based on what materials are provided. If it is too easy, students will not need to think critically and problem-solve. If it is too difficult, students become frustrated. The building of the mosque allows for social interaction and provides a common goal for the group.

**Different learning modalities:**

Students have information from their notes, a video, and prior lessons. The
review at the beginning of the lesson provides whole group instruction. Requiring a sketch of a mosque in earlier lessons gives a visual cue for learning. The construction of the mosque addresses kinesthetic learners. Social interaction helps interpersonal skills and auditory learning. Finally, the presentation requires verbal skills and the ability to synthesize information.

Students with special needs:
The activity can be modified on many levels. Students are supported by peers. They may also be provided with notes from the teacher for use. Due to the nature of the activity, all students may participate equally because there are a variety of tasks.

Expansion activities/early finishers:
Students may go above and beyond the requirements, adding details or landscaping to the structure. They may research more about their chosen city or may create a story to accompany their presentation based on the information they already possess.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?
The social interactions and problem solving are more easily applied to new situations than the specifics about the mosque, although that information is reviewed throughout the year. Students learn strategies to complete group assignments (dividing tasks, cooperating with each other, and synthesizing information for group presentation). In addition, students are put into different groups later in the year to build a cathedral when studying Christianity. At that point, it is evident the growth that students have made and how they apply their earlier learning to a new situation.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?
The lesson allows for personalization and creativity. All groups have the ability to take a unique approach in completing the building. The activity can be modified to be more or less challenging. The group work supports both interaction and individualized tasks.
Create-a-Mosque Assignment

Names of group members: ____________________________________________________

Assignment: You are to build a three-dimensional mosque from paper and craft scraps, and you are to complete it within one period. You can refer to pictures from the textbook. You may also refer to your notes. All members of your group must be equally involved in the building of this project. Your mosque must include the following items:

- Correct mosque shape with parts labeled
- Pillars in some way demonstrating and explaining the Five Pillars of Islam (this is just for this assignment; they aren’t typical of a mosque)
- Arabic calligraphy – look at the samples given. Remember, there are no pictures or idols in a mosque.
- At least three outside architectural details appropriate to a mosque.
- A logical city in which to find a mosque with a city sign showing this. Do not use Mecca.
- At least three interior details found in a mosque.
- A compass rose showing that the mosque is facing in the correct direction.
- A clock showing a logical time the mosque would be used for prayer.

These are not pieces of art – your grade is based on the process of making it, including all necessary elements, and group effort.

When your group has completed the mosque, bring this sheet and the project up to me for grading. Every member of your group should be able to answer any question I ask about the project. In other words, make sure that your whole group is knowledgeable about this project.

Grade:

_____ / 1  Correct shape
_____ / 2  Parts correctly labeled
_____ / 5  Five Pillars are visible and clearly show what they represent
_____ / 3  At least three outside architectural details shown
_____ / 1  Logical city chosen
_____ / 3  At least three interior details are shown
_____ / 1  A compass rose is set to show that the mosque is oriented in the correct direction
_____ / 1  A clock shows a logical time for the mosque to be used for prayer
_____ / 3  Group members were able to answer questions about the project
_____ / 20  Total Points
_____ / 1  Extra items added to the mosque
_____  Any minus items – area not clean, not all group members worked, too loud, etc.
_____ / 20  Revised total

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Sample Lesson Plan for 8th Grade Social Studies

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of the lesson?

Students will understand the key economic concepts of capitalism and mercantilism.

8th Grade Social Studies California State Standard 8.1: Students understand the major events preceding the founding of the nation and relate their significance to the development of American constitutional democracy.

How do these goals provide systematic and multiple instructional opportunities for teaching:

- English second language learners?
  ELL students benefit from the role-playing regarding mercantilism, including academic language in a skit to help explain the concept.

- Students with special needs?
  Students with special needs also benefit from the role-playing. New concepts are introduced in a way that makes sense rather than relying solely on the textbook.

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show they have achieved the goal? Must be observable and measurable.

The student will be able to explain the basics of capitalism and mercantilism and the differences between the two, as well as why these economic systems were important in leading up to the American Revolution. This will come through class discussion, although a summary paragraph or key notes written on a door pass would insure understanding by every student.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s level of achievement of lesson outcome? How do you plan to ensure that learning has occurred? What evaluation measures will you use?
The check for understanding in today’s lesson will come in the form of a class discussion. If there is a need for more individualized accountability, students can write a summary paragraph or record key points on a door pass to insure that all students understand the concepts.

2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the lesson. INTO

Focus/motivation: How will you capture the learner’s attention?

This lesson accompanies Prentice Hall’s A History of Our Nation Chapter 1 Section 3 lesson on the economics of the colonies. To begin the lesson, do a quick review of the key concepts from sections 1 and 2. Starting class with a review reactivates the neural pathways and sets the stage so that students can connect to prior knowledge. Review that is done quickly feels competitive; also, calling on students at random keeps all students on task.

Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

The American Revolution is the start of our history as a nation. In order to understand why the 13 original colonies decided to start a revolution, it is necessary to understand the underpinnings of society at that point, including the economy. The entire system of mercantilism illustrates how the colonies were viewed by Britain and certain conflicts that would have bothered them and led them to rebel.

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1. Do a quick review of Chapter 1 Sections 1 and 2. This should include questions about influences on American society (Greece, Rome, Judaism, Christianity, and Britain) and early exploration (Columbus, Jamestown, Plymouth, and Bartolome de las Casas).
2. Introduce students to today’s topic: the economy of the colonies. Remind them that they will be required to take an entire semester on economics in high school! Ask them to brainstorm what they already know (or think they know) about why the British colonies decided to fight for their freedom.
3. Read Chapter 1 Section 3 together. This works well in “popcorn” style where one student reads anywhere from one paragraph to one section and then chooses the next student to read. Remember, the student who is reading out loud will not comprehend what he or she is reading. It is important to stop at the end of each section (or more often, if necessary) to summarize the information covered, see if students have any questions, or ask questions to check for understanding.

4. After reading the section on mercantilism, choose three volunteers. There are many variations for the following activity, so feel free to adapt as necessary.

5. One volunteer is the monarch who sits in front of the class. Another volunteer is the explorer/merchant. The final volunteer is the colonist.

6. Start telling a story with your chosen product. An easy choice is the “pencilé.” The pencilé is an extremely useful writing implement. However, it is created from the pencilé tree that is rare in (insert name of created country, usually named for the monarch). The monarch sends out an explorer who finds a new land (table at the back of the classroom?) rich in pencilés. The explorer returns to the parent country with news of the discovery and brings the colonist to the “colony” to cultivate the pencilés.

7. At each step, have the students act out and participate in the story. The next step is to have the colonist realize that, although the land is rich in pencilés, there are no “factories” to allow for their production. (Moving electric pencil sharpeners to the front of the room near the monarch drives the point home.) The merchant brings some pencilés back to the parent country for processing and returns to sell them to the colonist. The trade should reflect that the raw materials are not worth as much as the processed materials. (For example, the merchant may trade one finished pencilé for three raw pencilés.) The wealth is presented to the monarch who also gives the merchant a percentage for his or her role in the process.

8. At the end of the story, ask each volunteer how he or she feels. Begin with the monarch, then the merchant, then the colonist. Remind the students that the role of the colonies is to provide wealth to the parent country. If the colonist is unhappy with the arrangement, ask for alternatives. (Usually students will suggest making their own factories, saving money, or selling to other countries for higher profit. Discuss why these may or may not be reasonable solutions.) Finally, close the discussion with the idea of revolution and why that may be necessary given the situation.

9. Check for understanding through discussion. If you want a more tangible assessment, have students write a paragraph describing how mercantilism works or write a few key points on a door pass before leaving class.
Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

Students have some knowledge of the American Revolution from fifth grade social studies. In addition, much information connects to seventh grade social studies, particularly ideas that came from the Enlightenment.

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Today’s lesson covers the further development of mercantilism and begins to show why the British colonies may have started thinking about revolution.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

Finish with either discussion or a door pass. Have students predict what will come next in terms of leading to the American Revolution. Tie the new learning into what they remember from previous years.

3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include?

Critical thinking, cooperative learning activities, social skills:
Students need to apply their new learning to a situation involving inequities but the basic guidelines of the economic system. They need to understand the system of mercantilism from the points of view of both the parent country and the colonies. Using role-playing activities keeps students interested and emotionally-invested.

Different learning modalities:
Information is provided visually in the text, in auditory form from reading out loud, and kinesthetically through role-playing an example. Using students in the class connects with students who have strong interpersonal relationships.

Students with special needs:
The academic content is discussed within a story, making it more accessible.
Expansion activities/early finishers:
Students can write about mercantilism from various viewpoints including those of the parent country, merchants, colonists, and/or other countries.

4. APPLY

EXPANSION/APPLICATION (BEYOND): How will you help students practice new learning and apply it in new situations?

The basic economic concepts are important when discussing other events leading to the American Revolution. Tying new situations to the economic system of mercantilism helps explain motivation.

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?
Information is presented in a number of ways. The lesson allows for discussion and participation by many students.
LESSON PLAN FORMAT

Name ___________________________________________  Date ____________________________

Subject & Grade level __________________________________________________________

1. PLAN

GOALS & OBJECTIVES
What broad ideas/concepts will the students know/understand/learn at the end of
the lesson?

How do these goals provide systematic and multiple instructional opportunities
for teaching:

➢ English second language learners?

➢ Students with special needs?

LEARNER OUTCOME:
Lesson objective: What specific behaviors will the students demonstrate to show
they have achieved the goal? Must be observable and measurable.

ASSESSMENT
Align with learner outcome. How will you check for understanding and learner’s
level of achievement of lesson outcome? How do you plan to ensure that learning
has occurred? What evaluation measures will you use?

2. TEACH

INTRODUCTION: The purpose of the introduction is to set the stage for the
lesson. INTO
Focus/motivation: How will you capture the learner’s attention?
Purpose of the lesson: Why does the learner need to know this concept or skill? Why is it important/relevant? How will you make it relevant to them?

PROCEDURES: Teaching procedures and student activities. Small group/lecture? What monitoring and adjusting techniques will be necessary? How will you model what you want the students to do? List all the steps necessary to present the lesson. This should be a mini-script of the lesson. You may want to attach a separate sheet. THROUGH

1.

Connection to prior knowledge: How does this lesson/skill/concept connect to other learning experiences?

Share the learner outcome: State the learner outcome to the students so that they are clear about the purpose/intent of the lesson.

Closure: Lesson summation. How will you close the lesson? Review the main points of the lesson. Connect to learner outcome.

3. REFLECT

OTHER FACTORS TO CONSIDER: What are your plans to include? Critical thinking, cooperative learning activities, social skills:

Different learning modalities:

Students with special needs:

Expansion activities/early finishers:
4. APPLY

EXPANSION/APPLICATION (*BEYOND*): How will you help students practice new learning and apply it in new situations?

MEETING THE NEEDS OF ALL STUDENTS: What strategies will you use to meet the learning needs of all students?
Additional Resources

Books:


Simon’s book provides large, colorful images of the brain. This is a good resource to use during the introductory unit on the brain.


This book is as close as we’ll come to recommending a “must-have” for professional development regarding the brain. Wolfe provides basics on the brain and learning and then applies those concepts to the classroom. The final chapters provide practical approaches to improving instruction with the brain in mind.

*Do Hard Things: A Teenage Rebellion Against Low Expectations* by Alex and Brett Harris (2005).

Chapter 3 includes a history of “teenagers” and challenges adolescents to challenge themselves and exceed the low expectations society has for teens. This book is written for teens and has a heavy focus on Christianity in the later chapters, so it may or may not work with your school culture. Still, the ideas of the Harris brothers are interesting and provide an alternate perspective for students.


Healy’s book looks at the impact of technology on children’s growing brains. She discusses when children should be exposed to technology and how it affects their education. There is also discussion about television and video games.


This book provides information and visual support on brain basics. It’s appropriate for use within the classroom and answers many questions that students may have during or after the introductory unit.

*Yes, Your Teen is Crazy!: Loving Your Kid Without Losing Your Mind* by Michael J. Bradley (2003).

This book takes a humorous look at many of the very serious issues facing today’s adolescents. Although it is written for parents, teachers also benefit from Bradley’s insight into what is occurring in our students’ lives. The writing style is easy to read, and Bradley draws upon his experience as a psychologist to provide real-world examples.

The same ideas included in Bradley’s guide for parents are back, but this time he writes for teens to help them through the turbulent period of adolescence.

Video:


This video is available as both a DVD and for online viewing. It provides valuable background for educators in areas of changes in the teen brain, the importance of sleep, teen behavior, etc. Students also benefit from watching either the full program or certain sections. The video includes interviews with Dr. Jay Giedd and Dr. Deborah Yurgelun-Todd.

Scientific American Frontiers with Alan Alda
“Changing Your Mind” first premiered in November 2000. This episode focuses on the brain’s ability to change in response to various stimuli.
“Make Up Your Mind” premiered in October 2002. This episode looks at the frontal lobe as the area of the brain that controls personality.

The Scientific American Frontiers episodes are fascinating because of their documentation of scientific research. The examples given clearly illustrate how amazing the brain is and help students understand the miracle in their skulls.

Websites:

This website includes access to the full-length show as well as interviews and other activities. Information focuses on changes occurring in the teenage brain and how that affects academic performance, interpersonal relationships, and behavior.

“NIDA for Teens” by the National Institute on Drug Abuse. http://teens.drugabuse.gov/
This website provides information to teenagers about a variety of substances and their effects on the body as well as the brain. It is extremely useful for both teachers and students when trying to understand the science of substance abuse.

This website (used in the brain unit) provides information written for students about the basic workings of their brains.
APPENDIX C

Website for Students
Home page located at http://theteenbrain.bravehost.com

The Teenage Brain:
A website for adolescents (and maybe even their parents!)

This website is intended to be used as support for an educational unit on the teenage brain. Each of the five major topics is important in understanding how adolescents are different from adults based on their brain development and how students can be successful in both academic and non-academic settings.

Website Authors: Brooke Blake and Meghan Salter, Union Hill School
APPENDIX D

Parent Education Night

1. Parent Education Night Flyer
2. Parent Participation Consent Letter
3. Teen Brain PowerPoint Presentation
4. Parent Night Evaluation
Union Hill School  
Parent Education Workshop  
"The Teenage Brain"  

- 7th & 8th graders are encouraged to attend with their parents -  

Thursday, October 8, 2009  
Union Hill District Board Room  
Optional no-cost dinner and childcare available  
5:45 p.m. Baked Potato Dinner  
6:00 - 7:30 p.m. Presentation  

Join junior high teachers Brooke Blake and Meghan Salter to find out what is going on inside the teenage brain. The presentation will discuss how the brain develops and how this affects a student’s "executive functioning" skills. Learn strategies to help students and parents make the most of this exciting time!  

To reserve your free dinner or childcare, please call the Bearcat Discovery Center, 273-6832, by Wednesday, October 7.
2. Parent Participation Consent Letter

8 October 2009

Dear Parents and Students:

Thank you for attending our presentation on “The Teen Brain.” In addition to our discussion this evening, we hope you will consider participating in a survey and follow-up on the topic.

Currently, we are enrolled at CSU, Sacramento, pursuing a Master’s degree in Education (Curriculum and Instruction). For our thesis project, we are analyzing the impact that knowledge of the teenage brain may potentially have on students’ academic performance and on adolescent/parent/teacher relationships. We hope to discover what information is most helpful in tonight’s presentation so that we can better format curriculum related to the topic. Ideally, we want to help parents, teenagers, and teachers understand the physiological changes going on in the teenage brain and how this impacts learning.

If you are agreeable to participating in our study, please sign and return this letter to us before leaving tonight. Involvement will include this evening’s anonymous survey as well as a later anonymous follow-up survey. If you choose to participate, you have the right to discontinue participation at any point in the process with no questions asked. Once our information is compiled, we will be happy to provide you with a summary of the feedback we received.

Thank you, as always, for your support in this process. Please feel free to contact us if you have any additional questions.

Sincerely,

Brooke Blake       Meghan Salter

Parent/Guardian’s name: _________________________________________________________

Child’s name: __________________________________________________________________

Child _____ may _____ may not participate in the surveys.

I would prefer to receive the follow-up survey by:

_____ email (address: ____________________________________________________________)

_____ mail (address: ____________________________________________________________)

_____ sent home with child

*We will provide an unmarked envelope for you to use when returning your survey to insure anonymity.*
3. Teen Brain PowerPoint Presentation

**What's Going on in There?**

Things every parent (and teenager) needs to know about the teenage brain.

**Why are you here?**

Well, we have some guesses...

- Parents:
  - "I don't understand what's going on with my child. He/she was never like this before!"
  - "Are the teen years really the hardest?"
  - "You mean their brain is different?"

- Teenagers:
  - "I don't know what's wrong with me!"
  - "They made me come!"

- Our Goal: Increased understanding by both parents and children about the changes taking place in the teenage brain and what can be done during this time to support the adolescent.

**What does the "executive dysfunction" part of the teen brain look like in action?**

- "I'd rather talk to my friends than do work!"
- "What are we supposed to do?"
- "I will in a minute..."
- "Homework? What homework?"
- "It's in my cubby/backpack somewhere."
- "Was I supposed to bring my book?"
- "I have a big project due tomorrow."
- "I'm so mad I just can't stand it!"

**Common Parent Comments**

- "What is going on with my child?"
- "He always tells me he has no homework!"
- "Her grades never used to be like this!"
- "It seems like he just doesn't care about anything other than sports and friends!"
- "I can't trust her to tell me the truth anymore."
- "I just don't know what to do."

**A student isn't lying if he or she doesn't know what the truth is.**

- Parents and teachers may think the child is lying.
- Power struggles and punishments are common during this time.
- The child may lose things or be unorganized.
- He may have trouble independently generating ideas and self-monitoring.
- She may be unable to set priorities.
- **RELAX! This is normal...**
Free Poem, 7th Grade Student

I know what's coming,
"Why did you forget?"
"Why can't you focus?"

I've already asked myself the same questions.
Again.
And again.
And again.

I really, really hate it when they ask why my work isn't done.
And I don't know what to say.
Because I don't really know the answer to that question.

I have a problem.
And I'm not sure how I'll get out of it.
But I know somehow,
it'll all be okay.

It'll be better.
(Really, I don't have a chance).

Sound familiar?
So, what's really going on?

A Mini-Lesson on the Brain

Meet the frontal lobe, the amygdala, and the hippocampus

Important Players

- The Frontal Lobe: The CEO of the brain
- The Amygdala: The Security Chief
- The Hippocampus: Executive Secretary

The Frontal Lobe (CEO)

- Decides what is worth attention.
- Modulates/controls behavior.
- Monitors, evaluates, and adjusts.
- Connects with other cortical and subcortical regions.
- This is where critical thinking occurs - it's one of the reasons why humans are more developed than other mammals.

Amygdala (Security Chief)

- "Mammalian" or "emotional" brain.
- Fight-or-flight response.
- Screens for danger.
- Problems escalate when discipline occurs in fight-or-flight mode.
- If the amygdala is in control, you're not.
Hippocampus (Executive Secretary)
- Three types of memory: working (short-term), declarative (long-term), and procedural (skills memory)
- Hippocampus files memories in the appropriate place (deciding where to keep them). If information doesn’t make it through the hippocampus, it’s not in there!
- So, what does this mean for learning? Your hippocampus helps you get information into your brain to stay.

Ways Teen Brains are Different
- Brains develop from back to front
- “Myelination” means that the neurons receive a coating of myelin, a fatty material. This helps the connections function more efficiently.
- In teens, the emotional center develops before the front of the brain.
- In addition, this is the time when adolescents go through another round of neural pruning.

Neural Pruning
- “Use it or lose it”
- Connections that are used more often become more efficient
- Connections that aren’t used as much die off or are reassigned to other tasks
- Another time neural pruning occurs? Remember the “terrible twos”? It’s all becoming clear...

To summarize...
- The emotional center of the teen brain develops first.
- The frontal lobe doesn’t develop until later - some neurologists believe possibly as late as 25 or 30!
- Critical thinking skills won’t be completely developed until that point - that’s a lot to think about!

What Can We Do?
Knowledge, Motivation, and Support
Knowledge is Power

- Students who understand how their brains work also understand that learning is a process.
- There are strategies to improve memory and learning.
- The brain is "plastic," meaning that it can change. That's good news!

Motivation

- Students who understand that learning is a process show more motivation in school. (Dweck, 2007)
- Intelligence is NOT a limited quantity.
- The harder (and smarter) you work in school, the more your brain changes.
- The choices you make actually alter the structure of your brain - wow!

What is "executive dysfunction?"

- Currently no standard definition
- Dawson and Guare define it as "a neuropsychological concept referring to the cognitive processes required to plan and direct activities, including task initiation and follow-through, working memory, sustained attention, performance monitoring, inhibition of impulses, and goal-directed persistence."

Conditions Associated with Problems with Executive Functioning

- Attention Deficit Hyperactivity Disorder (ADHD)
- Bipolar Disorder
- Oppositional Defiant Disorder
- Pre-adolescence
- Autism/Aspergers Disorder
- Conduct disorders
- Information Processing problems
- Learning disabilities
- Seizure disorders, sleep disorders, head injury and other neurological conditions
- FAS and FAE
- Attachment issues

10 Areas of Executive Function

- Sustaining Attention
- Shifting Attention
- Inhibiting Impulses
- Initiating Activity
- Working Memory
- Emotional Control
- Planning and Organizing
- Organization of Materials
- Self-Monitoring
- Time Management
How do we know the student just isn’t trying?

- It is not human nature to choose to be unsuccessful.
- Does the student seem to want to do well?
- Does the student seem surprised when her/his has problems?
- Is the performance inconsistent?
- Do problems continue in spite of consequences?
- Does performance improve under adult supervision?

Quoted from Dr. Cobine’s presentation, “The Brain is Not Helping Students with Executive Functions.”

Brain Development vs. Performance

- Executive functioning skills rely upon the frontal lobe
- If the frontal lobe isn’t completely developed, there are real problems that can occur - it’s not just in your head! (Well, it is, but...) The teen brain isn’t an excuse - it’s a regular part of adolescence. There is hope!
- If you (or your child) just can’t seem to “pull things together,” there are strategies that can help. Don’t worry, the brain will eventually develop. This is just to help in the meantime.

General Strategies

- Keep it real
- Repetition
- Build habits and routines (30 days for normal students and 90 days for those with executive functioning problems)
- Developmental progression from external to internal

Sample Interventions

(or things that you can do to help your child...)

- Break up tasks and give breaks
- Do difficult tasks when most alert
- Model, assist, prompt, and finally monitor your child in breaking assignments into tasks and developing a work plan
- Provide cues of what to do instead of telling them what not to do

Interventions, continued...

- Work with child to complete the first portion of task, then fade your involvement
- Structure routines
- Provide written cues, then over time move to the child writing cues and having you double-check them
- Teach memory techniques of mnemonics, chunking, visualization, repeating information, using rhythms
Modeling an Intervention
- Provide the skill that is lacking
- Verbalize and model the skill that is lacking
- Verbalize and have the student do the skill
- Prompt student to self-prompt, then prompt to do the skill
- Prompt the student to self-prompt and do the skill
- Have the student do the skill, prompting as needed
- Fade prompting
- Occasionally check to see that student is maintaining
- Fade checking

Let's Try It!
How to clean out your backpack

Guidelines for the Student: Steps for Self-Monitoring
- Goal (What is my goal?)
- Plan (How can I do it?)
- Do (Am I using my plan?)
- Review (How did I do?)

Let's Try That, Too!
How to write an essay

In conclusion...
- Knowing how your brain works can help you make appropriate, informed decisions
- You don’t have to feel out of control; just remember what’s happening up in that skull and think about what you can do to help yourself!
- The adults in a teen’s life can make a big impact - it’s always a great time to be involved and supportive. Teens learn many decision-making skills from the adults in their lives who model those skills.
4. Parent Survey

Evaluation Form for Teenage Brain Workshop

Please circle one: Parent Student Other ________________________

Please rate the following statements by circling a response from 1 to 5, 1 being strongly disagree and 5 being strongly agree.

1. My understanding of the brain has increased.  
   1  2  3  4  5

2. I can explain how the teen brain is different from an adult brain.  
   1  2  3  4  5

3. I know some specific interventions that can help develop executive functions in the brain.  
   1  2  3  4  5

4. I feel more “in control” in dealing with my child/my own life.  
   1  2  3  4  5

5. I feel more able to support my child/myself in school.  
   1  2  3  4  5

If possible, please take a few moments to provide short answers to the following questions:

6. What things were most helpful in this workshop? _______________________

________________________________________________________________________

7. What would you want to cover more in-depth? ___________________________

________________________________________________________________________

8. What questions do you still have? _________________________________

________________________________________________________________________

9. Would you be interested in more “brain-based” workshops or information?  

________________________________________________________________________

10. Other comments? ____________________________________________________

________________________________________________________________________
REFERENCES


