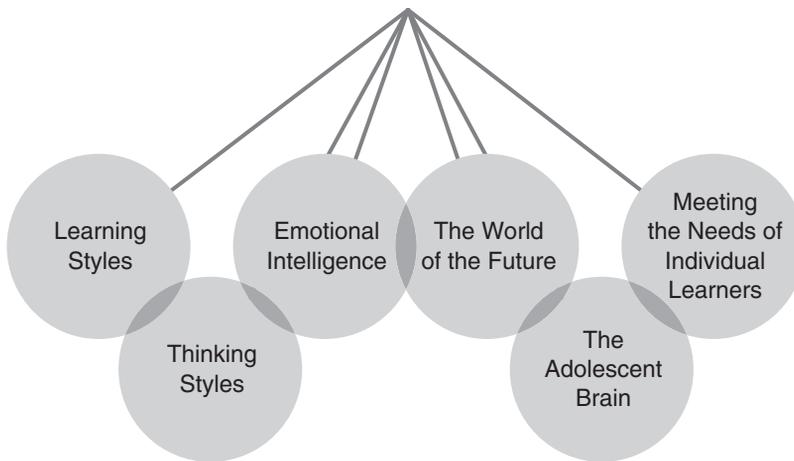


2 Who Are the Learners?



What is the reality of the young adolescent in the digital millennium?

What is the contextual environment of these learners?

What do we know about their brains and expectations for success?

All human beings, regardless of age, race, or space, need certain conditions to thrive. They must feel as though they

- belong and are included.
- have some worth and value.
- are safe in all aspects: physically, emotionally, and cognitively.
- have some choice and freedom related to their environment and activities.
- can be successful.
- are appreciated for who they are.

In classrooms, schools, and playgrounds, these expectations need to be met so that students may thrive and succeed.

Cognitive research tells us that every brain is unique. Even children born into the same family with the same nature (genes) and nurture (environment) do not look or act alike. Each has formed dendrite connections based on experiences and circumstances. Each has a preferred learning style and will thrive better in a visual, auditory, tactile, or kinesthetic environment. Some like natural light, some a musical background, some a quiet space. Some students need hands-on, “being-there” experience, while others appreciate analogy. Some need movement and activity and collaboration, while some need quiet time for contemplation and reflection. Most brains are naturally curious and seek understanding and meaning.

The anonymous poem “Children Are Like Trees” captures these differences.

Children Are Like Trees

Children are very much like trees,
They differ in kind and form.
Some have grown in the open with lots of space to expand,
The crowded forest around them has affected others.
Some have been tied to sticks to keep them straight,
While others have been allowed to develop naturally with a minimum of pruning.
Some children are made of hard wood; others, of soft.
Like trees which may be best for shade, or fruit, or decoration,
Children have their best uses.
Some are better to look at; some are better in groups;
Others are better standing alone.
Some grow strong and sturdy; others need protection from the elements, but every wood, every tree, and every child has a unique and different value.
We may try to graft the characteristics of a child onto another, but we know we cannot make a palm tree into an oak or vice versa.
The best we can do is to accept the tree as it is, to feed it, to give it light, and to prune it gently to its natural shape.
And we need to remember that in working with children, as well as in working with wood . . .
For best results, always sand with the grain.

—Author Unknown

Many researchers, behaviorists, and physiologists have theories to support these differences.

LEARNING STYLES

Ken and Rita Dunn (1987) suggested one learning-styles model that classifies personal styles as auditory, visual, tactile, and kinesthetic.

Auditory Learners

Auditory learners appreciate spoken and heard material and like to be involved in aural questioning rather than reading materials. They engage and absorb more through discussion and interaction. They prefer listening to lectures, stories, and songs, and they enjoy variation such as voice inflection and intonational pitch. They like to discuss their learning with other students. They not only like to hear ideas but enjoy the sound of their own voice as well.

Applications

Suggestions for auditory learners include the following:

- Have students read out loud to each other as partners and in small groups that are safe and supportive.
- Ask students to paraphrase what they have heard before answering a question.
- Use audiotapes, CDs, and DVDs to explain concepts. Have students create their own.
- Use stories that give examples or illustrations.
- Use “Say and Switch,” “Think-Pair-Share,” and “Turn and Talk.”
- Have students verbalize directions while performing a task.
- Create raps, rhymes, or mnemonics to support memory of key points.
- Have students form cooperative groups where they can explain ideas, test hypotheses, make creative suggestions, and debate ideas.

Visual Learners

Visual learners appreciate and learn from information that they see or read. They create and seek illustrations, pictures, and diagrams. Graphic organizers are useful tools for visual learners, as they help them to construct meaning visually. Color has an impact on their learning. Visual stimuli help them make memories “in the mind’s eye,” and they can often easily recall ideas, concepts, and ideas that have been presented in a visual way or for which they have created symbolic or pictorial representation.

Applications

Suggestions for visual learners include the following:

- Use descriptive language as well as metaphors and analogies.
- Use presentation materials that are bright and engaging.
- Use SMART boards, DVDs, and television.
- Have students work with objects and other materials that can be examined.
- Use directed observation.
- Decorate classrooms in colorful and appealing ways.
- Evoke guided imagery (e.g., “Picture this . . .”).

Tactile Learners

Tactile learners appreciate best the handling of materials, writing, drawing, and being involved with concrete experiences. When they ask to see something, their hands are out ready to examine the resource fully. These are often the students who are tapping pencils, doodling, and so forth, as their hands need to be busy to engage their minds. They are “mild” kinesthetic learners.

Applications

Suggestions for tactile learners include the following:

- Use manipulatives.
- Evoke the sense of touch.
- Provide opportunities to learn through touching and feeling.
- Provide opportunities to fiddle with materials and handle and examine them.
- Use models and dioramas.
- Engage students in learning through active practice.
- Allow students to create collections related to the topic.

Kinesthetic Learners

Kinesthetic learners appreciate best the opportunities to learn by doing and moving; that is, by becoming physically involved in learning activities that are meaningful and relevant in their lives. Creating models and constructing samples and examples allow their muscles to “make memories.”

Applications

Suggestions for kinesthetic learners include the following:

- These students remember what is done rather than what is said.
- Engage them in role-playing and simulations.
- Take field trips.
- Have students work with others to create meaning.
- Allow for the spontaneous application of new ideas and concepts.
- Have students create representations of understanding through concrete materials.

Tactile/kinesthetic learners want to be physically involved in the learning process. They appreciate role-playing and simulations and like the freedom and opportunity to move about the classroom. “Sitting and getting” frustrates these learners, and they will become disengaged or distracted when their needs aren’t met. Such stress can cause the release of adrenaline and cortisol in the bloodstream, which if present continuously is harmful to the cardiovascular system. Movement helps reduce the adrenaline, cortisol, and sodium in the bloodstream.

Applications

Suggestions for tactile/kinesthetic learners include the following:

- Have students engage in imitation and repetition.
- Ensure that learning involves more than “sit and get.”
- Allow students opportunity for movement and change of “scenery.”
- Provide a variety of learning environments.

In a differentiated block of time, all types of learners may have time to engage in their preferred mode of learning. More important than labeling students is that when we are planning, we build into our instruction multiple interactions that will at some point satisfy the different styles of learners.

So we ask ourselves as planners for diverse learners, Are there opportunities for

- discussion and listening?
- creating or using pictures, video, SMART boards, charts, diagrams, and split-sheet note taking?

- hands-on examination of materials and manipulatives?
- role-playing, stations and centers, and physical movement?

Figure 2.1 lists some products that might appeal to the various types of learners. For more ideas, check out www.learningabledkids.com.

Figure 2.1 Approaches to Engaging Different Learners

<i>Auditory</i>	<i>Visual</i>	<i>Bodily/Kinesthetic</i>
<ul style="list-style-type: none"> • Dialogue • Presentations • Auditory recording • Song lyrics • Oral report • Press conference • Interviews • Cooperative learning • Literature circle • Debate or panel • Speech • Travelogue 	<ul style="list-style-type: none"> • Poster • Advertisement • Brochure • Collage • Comic strip • Bulletin board • Graphic organizer • Computer program • Magazines • Photo essay • Pamphlet with illustrations • Cartoons • Photographs • Slide show • Video web 	<ul style="list-style-type: none"> • Role-play • Simulations • Collections • Dance • Mime • Tableau • Exhibits • Model • Learning center • Play or skit • Puppet show • Rap or rhyme • Photography • Experiments

THINKING STYLES

Anthony Gregorc (1985) of the University of Connecticut developed a theory of thinking styles based on two variables: our view of the world (whether we see the world in an abstract or concrete way) and how we order the world (in a sequential or random order). Gregorc combined these variables to create four styles of thinking:



The Beach Balls: Concrete Random Thinkers

These thinkers, who enjoy experimentation, are also known as divergent thinkers. They are eager to take intuitive leaps in order to create. They have a need to find alternate ways of doing things. Thus in the

classroom, these types of thinkers need opportunities to make choices about their learning and about how they demonstrate understandings. They enjoy creating new models and practical things that result from their new learning and concepts they develop.



The Clipboards: Concrete Sequential Thinkers

These thinkers are based in the physical world as identified through their senses. They are detail oriented, appreciate order, and don't particularly like "out of the ordinary" in the classroom. They appreciate structure, frameworks, timelines, and organization to their learning. They like lecture and teacher-directed activities. Randomness unnerves them.



The Microscopes: Abstract Sequential Thinkers

These thinkers appreciate being in the world of theory and abstract thought. Their thinking processes are rational, logical, and intellectual. They are happiest when involved with their own work and investigation. These learners need to have the time to examine fully the new ideas, concepts, and theories that have been presented. They seek out support for the new information by investigating and analyzing so that the learning makes sense and has real meaning for them.



The Puppies: Abstract Random Thinkers

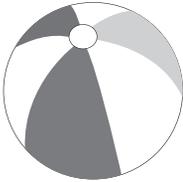
These thinkers make sense of information through sharing and discussing. They live in a world of feelings and emotion and learn best when they can personalize information. These learners like to discuss and interact with others as they learn. Cooperative group learning, centers or stations, and partner work facilitate their understanding.

Figure 2.2 shows the four styles of thinking, their characteristics, and implications for the classroom.

Applying the Four Thinking Styles in the Classroom

To identify the thinking styles present in the classroom, a teacher might have students rank the four styles or symbols from 1 to 4, based on their understanding of themselves. Teachers can point out that we all have some

Figure 2.2 Different Thinking Styles: Characteristics and Applications

<i>Thinking Style</i>	<i>Characteristics of Learners</i>	<i>Implications for the Classroom</i>
Concrete Random 	<p>Have an experimental attitude and behavior; are intuitive; are divergent thinkers; enjoy finding alternate ways of solving problems.</p>	<p>These learners need opportunities to make choices about their learning and how they will demonstrate understanding. They like independent work without teacher intervention. They respond to a rich environment.</p>
Concrete Sequential 	<p>Derive information through hands-on experience; are based in the physical world as identified through their senses; prefer concrete materials.</p>	<p>These learners require structure, frameworks, timelines, and organization to their learning. They like lecture and teacher-directed activities with step-by-step procedures.</p>
Abstract Sequential 	<p>Prefer to decode written, verbal, and image symbols; delight in theory and abstract thought; thinking processes are rational, logical, and intellectual.</p>	<p>These learners prefer presentations and lectures that have substance and are rational and sequential in nature. They defer to authority. They have low tolerance for distractions</p>
Abstract Random 	<p>Live in a world of feelings and emotion; associate the medium with the message; evaluate learning experience as a whole; organize information through sharing and discussing.</p>	<p>These learners prefer to receive information in group discussion. They gather information and delay their reaction to it. They organize material through reflection. Cooperative groups, partners, learning centers, and stations facilitate learning.</p>

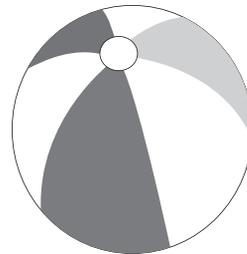
characteristics of each type but that students' top two choices show the way they would prefer to learn and the types of activities that would be most comfortable for them.

Dr. Robert Sternberg, in his book *Successful Intelligence* (1996), suggested that intelligent people who will be successful in life are able to use information or knowledge in practical, analytical, and creative ways. Learners with different styles bring their natural ability to be practical, analytical, and creative to the group. Thus, it is valuable to organize learning so that a variety of students' strengths are working together. Different ways of thinking are not a detriment to group interaction but rather a gift when different perspectives are represented and shared.

Teachers may want to take time to examine what each of the four style preferences would appreciate in the classroom. For example, Beach Balls want to keep moving, be creative, and be free to go where they wish. Therefore, in a classroom, they want choice and options in their learning and the opportunity to be creative and move freely, using centers and so forth. One group of teachers generated the following list of what they thought the four types would value in the classroom:

Beach Ball

- Variety of resources
- Adaptive environment
- Various manipulatives
- Choice of activities
- Spontaneity
- Extensions to activities
- Personal freedom



Clipboard

- Organization
- Structure
- Visual directions
- Clear closure
- Sequential learning
- Clear procedures
- Consistent routines
- Clear expectations



Microscope

- Investigative learning
- Critical thinking
- Verifying information
- Analyzing concepts
- Deep exploration
- Discussions
- Focus on details
- Ownership



Puppy

- Comfortable environment
- Encouraging atmosphere
- Supportive grouping
- Safe climate
- Respectful colleagues
- Empathic listeners
- Sensitive peers



Which style delineator a teacher uses is not as important as the teacher's recognizing that different students have different preferences and designing learning so that the diverse clientele in the classroom have their needs satisfied at some point (see Figure 2.3).

Figure 2.4 is an example of how all four objects can relate to a unit on the Great Depression. Not only do the activities appeal to the different learning styles, but they also facilitate thinking at a variety of levels, from recall to application.

EMOTIONAL INTELLIGENCES

Another distinguishing characteristic that makes brains unique is emotional intelligence (Goleman, 1995), or the ability to use one's emotions intelligently. Emotion intelligence includes five domains (see Figure 2.5). Students differ dramatically with respect to demonstrating competencies in each of these domains.

Self-Awareness

Self-awareness is the ability to recognize a feeling as it happens. Our feelings influence our personal decision making. "People with greater certainty about their feelings are better pilots of their lives" (Goleman, 1995, p. 43). In

Figure 2.3

Lesson-Planning Checklist: Have You Done Your Best to Know Every Learner in Your Classroom?

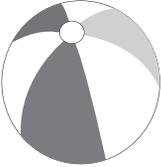
<p>Considering Beach Balls</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Have a chance to make choices. <input type="checkbox"/> Are able to be self-directed for some time. <input type="checkbox"/> Are in a competitive situation on occasion. <input type="checkbox"/> Are allowed to experiment through trial and error. <input type="checkbox"/> Get a chance to brainstorm and deal with open-ended options. <input type="checkbox"/> Engage in hands-on activities. <input type="checkbox"/> Are encouraged to create and use their imagination.
<p>Considering Clipboards</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Receive clear directions and expectations. <input type="checkbox"/> Environment is orderly, consistent, and efficient. <input type="checkbox"/> Timeline of assignments and grading guidelines are shared clearly and accurately. <input type="checkbox"/> Materials are available; models or samples are shown. <input type="checkbox"/> Real experiences invoked; genuine need for learning established. <input type="checkbox"/> Concrete examples, not theories, used. <input type="checkbox"/> Thrive with procedures, routines, and predictable situations. <input type="checkbox"/> Access practical, hands-on applications. <input type="checkbox"/> Engage in guided practice for successful results.
<p>Considering Microscopes</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Have expert and ample references and sources. <input type="checkbox"/> Feel confident and comfortable. <input type="checkbox"/> Can work alone part of the time. <input type="checkbox"/> Have time for thorough investigation. <input type="checkbox"/> Can write analytically. <input type="checkbox"/> Can learn from lecture and reading. <input type="checkbox"/> Can think in abstract terms and language. <input type="checkbox"/> Get a chance to delve into interest areas important to them.
<p>Considering Puppies</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Have opportunities to work with others. <input type="checkbox"/> Time provided for self-reflection. <input type="checkbox"/> Receive feedback; connect with teacher and other learners. <input type="checkbox"/> Have a rationale for the learning. <input type="checkbox"/> Feel included and get some personal attention and support. <input type="checkbox"/> Environment is safe for taking risks and is mostly noncompetitive. <input type="checkbox"/> Open communication exists; their ideas are accepted.

Figure 2.4 Sample Differentiated Lesson on the Great Depression

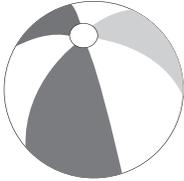
<p>For the Beach Balls . . .</p>  <p>Do something interesting with the content.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Create a role-play to depict the political situation during the Depression. <input type="checkbox"/> Create a role-play to depict the social ramifications of the Depression. <input type="checkbox"/> Create a role-play to depict some of the Depression's major events. <input type="checkbox"/> Create a visual to show how people lived during the Depression.
<p>For the Clipboards . . .</p>  <p>Work with concrete information.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Describe the political and social situation during the Depression. What were the contributing factors? <input type="checkbox"/> List the causes of the Depression in rank order from your perspective. Have a rationale for your ranking.
<p>For the Microscopes . . .</p>  <p>Connect with the deeper meanings of the topic.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> What was life like for people during the Depression? <input type="checkbox"/> Why did the Depression occur? How might it have been avoided? <input type="checkbox"/> If the Depression happened today, how would people react? How would they spend their time?
<p>For the Puppies . . .</p>  <p>Connect with the personal aspects of the topic.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> How do you think people felt during the Depression? <input type="checkbox"/> What was done to raise the spirits of those who were struggling? <input type="checkbox"/> Interview three or four people who lived through the Depression. Prepare at least 10 questions, from narrow to broad, for the interview.

Figure 2.5 Five Domains of Emotional Intelligence

Self-Awareness	One's ability to recognize one's own emotions
Managing Emotions	One's ability to express and control emotions as the situation dictates
Self-Motivation	One's ability to persist in the face of setbacks or obstacles
Empathy	One's ability to recognize emotions in others and to feel with others
Social Skills	One's ability to deal with and manage the emotions of others

Source: Adapted from Salovey, in Goleman (1995).

In addition to recognizing their feelings, those with a well-developed sense of self-awareness can describe those feelings in their own words. They also possess strategies to manage moods. For example, if they are in a bad mood, they have several ways to deal with that mood—perhaps exercising, talking with a friend, or listening to music. Teachers who can articulate their feelings and encourage students to do the same help build students' emotional vocabulary. Helping students identify a range of emotions, such as anxious, depressed, angry, excited, and joyful, helps them expand their emotional language beyond sad, mad, glad, and bad.

Managing Emotions

The skill of managing emotions follows self-awareness. Managing emotions is a capacity to deal with feelings so that they are appropriate in a particular circumstance. This domain of emotional intelligence includes the ability to soothe or calm oneself, control anger, deal with irritability or failure, and dispel feelings of anxiety. Teachers report that many students have not had experience managing emotions or seen this skill modeled. One teacher organized several lessons around this domain. She showed popular videos with scenes in which individuals did either a good or poor job of managing their emotions. After viewing each clip, the class analyzed the decision making embedded in the scenario. When an actor “lost control,” the class discussed what alternatives might have been used and the possible consequences of each. The class then explored conflict resolution options. After identifying these methods and practicing them, class members were able to handle situations more skillfully.

Self-Motivation

Motivation is the ability to “keep on, keeping on,” even in tough situations. Motivating oneself and delaying gratification are key skills that enable a student to focus, resist the urge to give up when the “going gets tough,” and pursue goals. These abilities often create a sense of optimism and future accomplishment. Goleman (1995) wrote about entering a “flow state”:

Being able to enter flow is emotional intelligence at its best; flow represents perhaps the ultimate in harnessing emotions in the service of performance and learning. . . . Flow is a state of self-forgetfulness. . . . People in flow are so absorbed in the task at hand that they lose all self-consciousness, dropping the small preoccupations. . . . In flow, people exhibit a masterly control of what they are doing, their responses perfectly attuned to the changing demands of the task. And although people perform at their peak while in flow, they are unconcerned with how they are doing, with thoughts of success or failure—the sheer pleasure of the act itself is what motivates them. (pp. 90–91)

One teacher asked students to bring in examples of people who were in a state of flow. Students identified artists, athletes, writers, musicians, and mechanics. Then she asked students to consider, “Have you ever experienced a flow state?” After some dialogue, students were asked to do a “quick write” about flow states they had encountered or imagined.

Empathy

Empathy—the ability to “walk a mile in another’s shoes”—is predicated on self-awareness. Violent criminals, such as murderers, rapists, child molesters, and psychopaths, seem to lack this domain. The Net Generation views many violent acts on television, on the Internet, and in video games, and some students have become desensitized to others’ feelings. Parents who are sensitive to others often foster empathy in children by asking how a person in a particular circumstance might feel. For example, if a child read a story in which a pet was hurt, the parent might ask how the pet feels, or if the child had a fight with his or her best friend, the parent might ask how the friend feels. These questions help children consider others and to change their perceptions. Teachers, with many standards focused on point of view

or perspective taking, can approach teaching empathy while simultaneously building critical competencies in language arts and reading.

Social Skills

Having social skills, or managing relationships, is the ability to handle emotions in other people. This is the ability to read body language and anticipate another individual's needs. Individuals who do this well are often described as "socially adept." They are popular and well liked. They are often charismatic. They are adept in leadership roles and frequently demonstrate the same in interpersonal relationships. In one class, students were asked to identify someone who they thought demonstrated exemplar social skills, and each student wrote a paragraph about why this particular individual was a model of this domain of emotional intelligence.

Applying the Five Emotional Domains in the Classroom

These domains can be both modeled and addressed in the classroom in a variety of ways. Figure 2.6 suggests ways to foster each of the emotional intelligence domains and strategies to apply in classroom activities to promote standards.

THE WORLD OF THE FUTURE

It has been said that parents and teachers prepare students for a world they will never know. It is a world unfamiliar. For example, Alvin Toffler, a well-known futurist, offered that the "literacy of the future" will not be the ability to read and write but rather the ability to learn, unlearn, and relearn. This prediction is based on the forecast that new information will emerge and transform rapidly. Other futurists tell us that a person under age 25 will be expected to change careers every 10 years and jobs every 4 years. The Secretary's Commission on Achieving Necessary Skills (1991) outlined five competencies that will be essential to thrive in the future. (The Conference Board of Canada [2000] identified similar employability skills.) The five competencies are an ability to

1. identify, organize, plan, and allocate resources.
2. work with others.

Figure 2.6 Fostering Emotional Intelligence in the Classroom

<i>Intelligence</i>	<i>How to Foster Emotional Intelligence</i>	<i>Strategies for Application</i>
<p>Self-Awareness One's ability to sense and name a feeling when it happens</p>	<ul style="list-style-type: none"> • Help students discuss their feelings in different situations. 	<ul style="list-style-type: none"> • Reflection • Logs and journals
<p>Managing Emotions Recognizing and labeling feelings, then dealing with them appropriately</p>	<ul style="list-style-type: none"> • Use “teachable moments” to help students learn to manage emotions. 	<ul style="list-style-type: none"> • Deep breathing • Counting to 10 • Time out • Physical movement
<p>Self-Motivation Competencies such as persistence, goal setting, and delaying gratification</p>	<ul style="list-style-type: none"> • Help students find their niche. Help them to persist in difficult or challenging situations. 	<ul style="list-style-type: none"> • Goal setting • Persistence strategies • Problem solving
<p>Empathy Ability to feel for another person</p>	<ul style="list-style-type: none"> • Encourage students to “stand in another’s shoes.” • Help students to think about another’s pain. 	<ul style="list-style-type: none"> • Modeling empathy • Discussing empathic responses to persons studied
<p>Social Skills Competencies that one uses to “read” and manage emotional interactions</p>	<ul style="list-style-type: none"> • Teach social skills explicitly. • Have students practice social skills while doing group tasks. 	<ul style="list-style-type: none"> • Modeling social skills • Using explicit language to describe behaviors so students can practice the skill

3. acquire and use information.
4. understand complex interrelationships (systems).
5. work with a variety of technologies.

Extended periods of instructional time provide opportunities for these life skills to be developed.

A national survey of what employers are looking for in entry-level workers found that specific technical skills are now less important than the underlying ability to learn on the job. After that, employers listed the following:

- Listening and oral communication
- Adaptability and creative responses to setbacks and obstacles

- Personal management, confidence, motivation to work toward goals, a sense of wanting to develop one's career and take pride in accomplishments
- Group and interpersonal effectiveness, cooperativeness and teamwork, skills at negotiating disagreements
- Effectiveness in the organization, wanting to make a contribution, leadership potential (Carnevale et al., as cited in Goleman, 1998, pp. 12–13)

As one reflects on workplace realities, it becomes apparent that rigorous academic standards have been designed to assist students in meeting future challenges. Some schools are recognizing that it will take unconventional means—like restructuring time and varying teaching methodology—to prepare students to meet these necessary ends.

Characteristics of the Digital Natives

Just as the world is changing, requiring different skill sets to survive and thrive, so are students changing. The students who are entering classrooms today have never known a world without e-communication. Technology is as natural to them as breathing. They also share a set of Net Generation norms (Tapscott, 2009).

Net Generation Norms

- Digital natives need their freedom, including of choice and expression. For example, they value having a choice of where and when they work, of job and career path, and of the way in which they express themselves.
- They require personalization and customization. They like to manipulate information and customize it to their needs and interests.
- They avail themselves of information, particularly from the Internet, to meet their needs.
- They examine potential employers for integrity and values similar to their own.
- They just “wanna have fun,” whether at work or play. About 87 percent of American children from the ages of 2 to 17 are regularly involved in video games. They are accustomed to interactive experiences and learning.
- They appreciate expediency, as they are used to rapid communication, such as during real-time chats.
- They are innovators who want the latest technology and consistently seek innovative ways to collaborate, entertain themselves, work, and learn.

Source: Tapscott, D. (2009). *Grown up digital: How the Net Generation is changing your world*. New York: McGraw Hill, pp. 34–36.

THE ADOLESCENT BRAIN

During the teen years, significant evolution occurs in the activity, neurochemistry, and anatomy of the brain. Neural pruning occurs in earnest in early childhood, as the brain makes connections and eliminates unused or designated neurons to increase brain efficiency. The brain picks up this process again through the adolescent years into the early 20s.

Change happens mainly in several areas of the brain.

Frontal Lobes

This area is found behind the forehead. Jay Giedd and colleagues at the National Institutes of Mental Health (NIMH) used functional magnetic resonance imaging (fMRI) to scan 1,000 healthy children and adolescents ages 3 to 18 and discovered that a huge spurt of brain development takes place from ages 9 to 10. Millions of new synapses that process information form. Then at 11 years of age, substantial pruning takes place, which then continues throughout the teen years (Spinks, 2002).

Axon Myelination

Myelination is the coating of the axons of the brain cells with a fatty material called myelin. The myelin sheath winds around the axons of the neurons (brain cells) and allows for faster and more efficient transport of electrical impulses. Any action or thinking process repeated habitually is strengthened by myelination to a higher level of maturity. Brain scans of the frontal lobes of teens ages 12–16 show considerably less myelination than those of young adults ages 23–30 (Spinks, 2002).

Executive Control

The prefrontal cortex (immediately behind the forehead) is often referred to as the “CEO of the brain.” It is responsible for

- making sound judgments;
- goal setting and prioritization;
- organization and planning of tasks;
- controlling impulses; and
- controlling emotions.

Young adolescents seem to be lacking these executive control functions. This is probably due to a huge number of unpruned synapses and incomplete myelination of axons. Their brains are simply not finished preparing for these complex decisions.

Emotional Thinking

In the limbic system, the small almond-shaped structure called the amygdala supports emergency responses. The amygdala was responsible for the survival of the species on the savannah. Giving a threatening signal, the amygdala immediately short-circuited the thinking response to “flight or fight” to save the individual. Adolescents for the most part are using this method of response rather than making decisions with logic and reason and the considered weighing of consequences, all of which would take place in the prefrontal lobes. At Harvard’s McLean Hospital, Dr. Deborah Yurgelun-Todd and her team used fMRI to compare how teens and adult brains reacted to emotion. Teens repeatedly had more activity in the amygdala, while adult brains showed more in the frontal lobes (Spinks, 2002).

The results of this study also showed that adolescents

- are not as adept at reading facial expressions and body language; and
- make poor choices, reacting from an emotional rather than rational stance.

Circadian Rhythms and Sleep Patterns

Dr. Mary Carskadon (2002) at Brown University’s Bradley Hospital has found that adolescents need at least nine and a quarter hours of sleep a night, while prepuberty children need 10 hours. This becomes a challenge when their circadian clock changes and they no longer become sleepy in time to get enough rest without sleeping in in the morning. Given all the societal demands of homework, part-time jobs, sports, and family commitments, plus the media draw of television, computer, e-communication, and so forth, they can’t seem to get to bed at an hour that would allow them to get nine and a quarter hours of sleep each night. Teachers of early classes note that students are there in body but not in mind.

Continuous lack of sleep has an effect on the amount of deep, rapid eye movement (REM) sleep that is necessary for the consolidation of new

learning in the neocortex and students' ability to be attentive to and absorb new information and skills.

Many districts are rethinking their daily schedules in middle and high schools to accommodate the circadian rhythms of young adolescents. They are starting later in the morning and rotating periods so that students don't always have the same subject during their sleepest time of day.

Applications

Although we can't change the biology of the brain, the National Sleep Foundation (n.d.) suggests adolescents do the following:

- Avoid caffeine and nicotine in the afternoon.
- Stop using the TV and computer and stop heavy studying right before bed so the brain has a chance to slow synaptic firing and activity.
- Make sure the bedroom is dark and quiet at bedtime but open the blinds/ draperies and turn on the lights in the morning to start the body's wakening cycle.
- Keep weekend sleeping like that on weeknights as much as possible to avoid confusing the brain's circadian rhythms.

MEETING THE NEEDS OF INDIVIDUAL LEARNERS

Planning to meet individual needs requires that lesson plans be flexible and incorporate strategies that differentiate instruction. Not only must teachers decide upon specific strategies they could use for teaching the content, but they must build into the lesson plans key elements that will focus on meeting the needs of students. Listed are examples of these key elements.

- Environment
- Pre-assessments
- Curriculum compacting
- Grouping strategies
- Choice boards
- Differentiated assessments
- Multiple intelligences
- Bloom's taxonomy

With all we now know about styles, the way people think, and the physiological realities of the youthful brain, we are challenged to facilitate their opportunities to learn in optimal ways. Let's proceed to examine differentiated ways to provide learning for diverse learners within a block schedule. We'll begin in the next chapter by looking at how to plan for differentiated instruction in the block schedule.