

Part III

Learning and Teaching



Breakthrough
COLLABORATIVE

Objective


By the end of the section, readers will be able to (RWBAT):

1. Apply Bloom's Taxonomy to objectives and classroom instruction.
2. Utilize theories of multiple intelligences and learning modalities to reach all students.
3. Explain the influence of physical, socio-emotional, and cognitive development on adolescents.

The Breakthrough Challenge: Your challenge is to maintain an awareness of your students' learning preferences, strengths, needs, and developmental issues both in the classroom and while designing your lessons. You must translate the theory into practice, as you support the students in their personal and academic achievement.

Learning Theory

Breakthrough believes in the capability of all children to learn and achieve at high levels. We also believe children can make significant gains in short periods of time, given the right instruction and opportunities. In order to support our students in these endeavors, teachers must design instruction around individual students' strengths while working to motivate every student.

Learning theory delineates what we know about how children learn best and why. Based on accumulated research in fields including neuroscience, cognition, and child development, the theories described below are the basis for best practices in classroom instruction, some of which are described in the toolkit  or in later sections. In order to benefit all students, teachers should devise lessons around the knowledge of how individuals learn best.

The research on learning differences has produced a shift in classroom instruction towards a learner-centered approach. Gone is the old, white-haired teacher lecturing from behind his or her desk; here to stay is the teacher ready to engage his or her students in doing, talking, seeing, and thinking. It is an incredible challenge to provide instruction designed to reach every student, but the result is a richer classroom environment, replete with opportunities to learn.

Bloom's Taxonomy

Not only is the teacher's challenge to impart knowledge about content areas, but also to teach a student how to think and learn independently. Students must be able to manipulate information in different ways. Critical thinking skills are essential to this process, yet can be overlooked in the classroom where there is a focus on facts and figures. Bloom's Taxonomy, created by Benjamin Bloom in the 1950s, is a guide to help teachers coach students on cognitive skills, providing skills which students can use in future classes as well as outside the classroom.

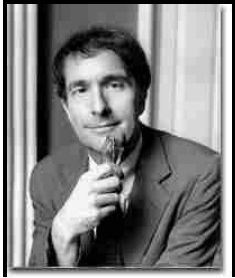
Bloom's Taxonomy, described in the chart on the following page, organizes cognitive functions into a structure used to assure classroom instruction reaches higher order thinking skills. The taxonomy can prevent common pitfalls like only teaching the


definition of a concept, instead of how or when to use the concept. It is imperative that students participate in activities and discussions distributed over all six levels of the taxonomy throughout the class period, week, and year. Teachers may choose to incorporate Bloom’s into the classroom by explaining how it is organized and how classroom activities and questions fit into the classification system. This encourages metacognition, or “thinking about thought,” which also strengthens students’ critical thinking skills.

The chart below explains each of the levels of the taxonomy and correlated verbs which describe related activities and can be used to design objectives (further explained in *Lesson Development & Presentation*).

Bloom’s Taxonomy			
Level and Definition	Action Verbs for Objectives		
I. KNOWLEDGE Recalling and recognizing factual information.	list	match	identify
	state	examine	show
	name	describe	label
	tabulate	choose	collect
	quote	define	
II. COMPREHENSION Translating and interpreting ideas.	represent	show	paraphrase
	examine	select	calculate
	illustrate	explain	summarize
III. APPLICATION Generalizing and applying knowledge to new situations.	modify	construct	rearrange
	predict	combine	demonstrate
	solve	integrate	compute
IV. ANALYSIS Break into parts to understand connections.	classify	distinguish	compare
	categorize	separate	contrast
V. SYNTHESIS Combine elements into a new format.	design	create	hypothesize
	develop	invent	infer
	compose	formulate	
VI. EVALUATION Develop judgments and opinions according to criteria.	recommend	appraise	criticize
	prioritize	justify	defend
	assess	judge	

Multiple Intelligences



Multiple Intelligence theory, developed by Howard Gardner (left), has had significant implications for how educators expect students to learn. Gardner's theory divides human intelligence into seven categories. The number of categories is flexible and additional intelligences have been suggested, yet not formalized. Although Gardner believes every individual possesses all intelligences, most people tend to have stronger and weaker intelligences. Keeping in mind intelligences are not fixed and may shift over the course of a lifetime, especially from childhood to adulthood, you may use Identifying Multiple Intelligence, Learning Styles: A Multiple Intelligence Approach and Multiple Intelligences: Strengths & Traits from the toolkit to determine your own or your students' strengths. 

Learning Modalities

Most of us have preferred methods of learning new information. For instance, a person with a strong spatial intelligence might be a visual learner, meaning they learn best when diagrams and pictures are used in instruction. Many students can utilize all modalities, but may take longer to incorporate the data when it is presented in a manner not in synch with their primary modality. While auditory, visual, and kinesthetic are probably the most often cited learning modalities, theorists and researchers have presented many other categories to organize alternate aspects of learning. Two such theories presented below discuss differences in learning style and the implications for classroom teachers.

Learning Style Continuum

In addition to preferences for how one receives information (visual, auditory, kinesthetic, etc.), students may also prefer certain ways of interacting with or analyzing information. Some people prefer firsthand experiences to theoretical discussions, while others prefer to think through their ideas instead of testing or acting on them. One method of categorizing these interactional learning styles is on a four-point continuum incorporating the following characteristics:

1. Concrete Experience: being involved in a new experience
2. Reflective Observation: watching others or developing observations about one's own experience
3. Abstract Conceptualization: creating theories to explain observations
4. Active Experimentation: using theories to solve problems and make decisions

These four styles suggest a variety of teaching strategies to best fit each area on the continuum. The concrete student would want to witness the example first hand in laboratories, fieldwork, or observations. As a worker involved in building a house, this student would want to start working and learn on the job. The reflective student would need opportunities to reflect and process the knowledge in their own way by using logs and journals or brainstorming. This house builder would watch the more experienced workers to gain an understanding of the best techniques. The abstract student is able to process and develop theoretical ideas and enjoys lectures, papers, and analogies. In this case, the individual would read a book about house building before arriving at the work site and perhaps draw some diagrams to test his or her understanding. The active student needs to participate in the learning process and enjoys simulations, case studies, and independent practice. Finally, this builder would apprentice herself or himself to a master builder and work alongside the builder constantly questioning to understand the reasons behind the choices made in the process.

While these methods overlap and anyone may use multiple strategies to gain skills or understanding, they each have distinct implications for classroom instruction. The teacher holds the responsibility for providing a multitude of different opportunities to interact with new material. A lesson might involve a teacher demonstration, an opportunity for student questions, a situation where the student must try out the skill, and an opportunity for the student to articulate his or her knowledge and ask questions of other students and the teacher.

Learning Stimuli

Each student's ideal learning conditions will not necessarily coincide; they will have different preferences, but as the teacher you must help students utilize their environment to their advantage. Various stimuli may have a positive or negative effect on the learning process. Here the stimuli are grouped into five areas: environmental,

emotional, sociological, physiological, and psychological preferences. This theory illuminates just how many factors affect our learning processes. While it may be impossible to control all conditions at times, being aware of and teaching students to be aware of and to control the factors may give them more agency over their learning environments.

Environmental

People have different preferences for levels of light, temperature, noise, and location or position while learning.

Emotional

Learners vary in their ideal amount of support and guidance, location of motivation (internal-self vs. external-teacher/parent), and pace throughout a project.

Sociological

Students may have diverse abilities in multi-tasking, relationships to authority, and grouping preferences (alone, in small groups, etc.).


Physiological

Individual energy levels, attention spans, needs for food or drink, and preferences of visual, auditory, kinesthetic, or tactile interaction with information vary.

Psychological

Global thinkers prefer to approach a topic from a holistic perspective, while analytic thinkers prefer to break the topic into parts and work sequentially. Impulsive workers tend to draw quick conclusions and move swiftly through an assignment, while reflective thinkers may move more slowly and methodically.

An awareness of your students' intelligences and learning modalities, as well as your own, is essential to developing curriculum to best meet the needs of the learner. Often we tend to present information to others in the way we, ourselves, are most comfortable learning it. This is just one of many areas, however, in which teachers must rise above normal human tendencies. The children are your audience and your consumer. You must cater to them by using multiple methods to present material and by designing activities to allow them to demonstrate knowledge in multiple ways. Not

only should teachers play to their students' strengths, but also engage them in less familiar and comfortable activities to expand their skills and comfort level. This can be done either by structuring multiple learning experiences, each aimed at a different modality, or by following a project-based model during which students engage in learning experiences incorporating multiple modalities. For specific techniques and projects, please see *Instructional Strategies for Multiple Intelligences* in the toolkit. 

Breaking it Down:

Multiple Intelligences & Learning Modalities

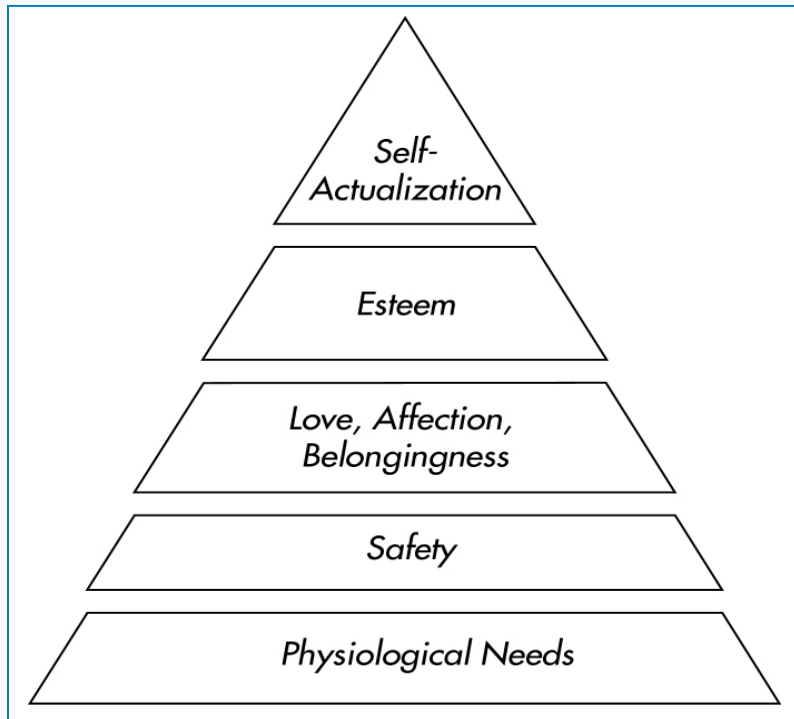
At Breakthrough, since classes are small, you will have the luxury of getting to know your students well; take advantage of this opportunity to observe differences in how your students learn and act on them. Although you may think diagrams represent information most clearly, some students may need to get up and physically move through a process. A timeline can come alive when students dramatically portray events, instead of just writing them down on paper. Because you will be able to work one-on-one with your students, you can present information using multiple methods. If fractions are an enigma to one student, you can cut an apple into eighths, draw pictures on graph paper, or divide the classroom into quarters with masking tape. Student motivation will increase as you develop a range of presentation methods to reach all students.

You also have a responsibility help your students understand their own optimal conditions for learning and studying. Use the diagnostics and discuss them in class. Once students can articulate how they learn best, they can adapt their strategies during the summer and school year. Partner with families to develop a support network at home; families can help to create study spaces or rearrange chores so study time becomes more productive.

Breakthrough strives to foster growth of a variety of skills, therefore, all-school meetings and club time also present opportunities to help students shine. When you consider your students' strengths, think beyond the classroom. All successes can transfer into the classroom because of a rise in self-confidence. One of the paramount lessons they can take away from Breakthrough is that intelligence is not fixed; they can improve and they can gain skills in all areas. Teach your children they can achieve.

Maslow's Hierarchy of Needs

Each person has a set of needs for survival. Maslow's Hierarchy of Needs organizes



these needs. In order to proceed to the pinnacle, self-actualization, each level of need must be fulfilled, beginning at the bottom. Society prevents progression up the triangle by introducing obstacles such as homelessness, poverty, and death of or betrayal by loved ones. It is important to maintain an awareness of the structure of needs and potential obstacles students may face inside or outside of the classroom. Not only must teachers maintain awareness, but

must seek to create a classroom environment to fulfill the needs below:

Self-Actualization: Need to fulfill a personal potential.

Esteem: Need for a stable, high level of self-respect, and respect from others.

Love, Affection and Belongingness: Need to overcome feelings of loneliness and alienation. Need to both give and receive love, affection, and the sense of belonging.

Safety: Need to feel secure.

Physiological: Need for oxygen, food, water, and a relatively constant body temperature.

The Brain and Stress

Another potential obstacle to student learning is stress, and specifically the effect it has on the brain. When a person experiences stress, the fight or flight response kicks into

action. The brain prompts the body to either confront the source of the conflict (fight) or remove itself (flight). Under significant stress, the fight or flight mechanism floods the brain with chemicals. While the brain is occupied with this response, abstract thought becomes very difficult; creativity and higher-order thinking skills are severely compromised under stress. Students in stressful classrooms or coming from stressful home situations may be preoccupied with the source of the stress. For instance, if one student regularly threatens another in class, the victim will be on guard constantly, and the brain will essentially divert energy to deal with the stress. That student will have a harder time concentrating, especially on complex tasks. Teachers can work to mediate this process by attempting to create a calm, organized classroom where students can trust the teacher and their classmates.

Breaking it Down:

Maslow's Hierarchy

Maslow's Hierarchy is a useful reminder of obstacles Breakthrough students may face. While some factors, like the summer temperatures and lack of air-conditioning may be out of your control, you are not completely powerless. You may be able to enlist your directors' help in getting referrals to social services. Additionally, you can help students understand personal situations put certain stresses on them, which they can overcome, but only with hard work. Above all, you can create an environment for your students where they feel safe at Breakthrough, which includes preventing bullying, helping students to discuss differences maturely, and fostering an atmosphere of respect and support. Creating dependable classroom procedures fosters a sense of security. Gains in esteem and progress toward self-actualization can be made within the supportive community of Breakthrough, despite challenges in other aspects of their lives.

Adolescent Development

Adolescents have a bad reputation; people may apologize to you when they discover you work with middle school students. The concatenation of these biological, socio-emotional, and cognitive transformations that unsettles people also represents a fascinating developmental process. While many shudder at the idea of being caught in a classroom of middle school students, others find the age group mesmerizing because of the potential to harness some of the wild energy and self-discovery.

Physical Development

Students in the same grade can differ in height by over a foot. Some may have begun to develop adult physical features, while others remain child-like in appearance. These physical changes are a result of puberty, which takes place during early adolescence and varies in onset. The production of growth hormones increases, resulting in the maturation of sex organs. In young women, the hormones stimulate the ovaries to create estrogen and progesterone and release ova. The menstruation cycle begins and reproduction becomes possible. In males, the hormones stimulate the testes and adrenal glands to create testosterone and the ability to create sperm. Facial hair begins to grow. Both genders experience a growth spurt and growth of underarm and pubic hair. The range in timing of the physical changes often results in competition for social prestige and a decrease in self-esteem. The stress of the physical changes is compounded by the social import of looking good and being cool. Being a teenager, as many will remember, is tough.

Breaking it Down:

Physical Development

Your students may be all over the map in terms of physical size, sexual development, and comfort with those differences. It will be your task as a teacher to make each student feel at ease. A compliment from a respected authority figure goes a long way to building self-confidence and pride. One must also be aware that some students will experience discomfort, mental and physical, in front of an audience partly because of their awareness of these differences. Again, it is your role to help them ease into roles where they become comfortable when attention is centered on them.

Socio-emotional Development

The physical transformations described above have social ramifications, which are often particularly frustrating because adolescents have no control over the changes. Relationships with family figures often alter as a result of the increase in emotional distance as adolescents attempt to establish independence by fighting for responsibility and against dependence. Parents or guardians and their children often engage in a struggle for control, creating increased friction in the home.

The peer group often replaces the family as the primary influence on adolescents as they begin to spend more time around peers. Loyalty, similar values, and intimacy are

primary determinants of friendships. Popularity becomes a predominant force in peer relationships, which in turn is often affected positively by higher socioeconomic status and negatively by higher academic achievement levels. Sexual relationships develop more frequently and rapidly and pressure increases to engage in sexual acts. Adolescents are faced with a long list of choices as they enter a more independent phase in social development: sex, drugs, alcohol, loyalty to unpopular friends, academic priorities, and family values. They are choosing who they want to become, but in the process they will try on different identities, friends, and values.

Many girls experience a self-esteem drop around the time of middle school, sometimes followed by a decrease in academic achievement, especially in math, as documented by the American Association on University Women's report *Shortchanging Girls, Shortchanging America*. Cultural stereotypes of women ingrained in teacher attitudes, curriculum materials, and media have a great impact on self-perception, often resulting in a change in girls' behavior. Because they feel they are not expected to succeed, girls begin to believe they will not. Teachers must counteract this through integration of examples contradictory of gender stereotypes and assistance in analyzing media and societal messages. Giving *all* students the tools to analyze their surroundings, as well as the effect society has on them as individuals will aid them in maintaining a sense of self independent of external pressures.

This time of great change poses many opportunities to support children in their quest for identity, which is why the presence of a solid role model at that age can make all the difference. Resilience theory proposes that despite risk factors, which endanger a child's ability to reach his or her full potential, protective factors exist which enable a child to overcome those risk factors. The most notable protective factor is the presence of a caring, sympathetic adult in the child's life. This adult acts as a support figure for the child and may provide him or her with encouragement, hope, a willingness to listen, or concrete support in the way of transportation, academic instruction, and connections to other supportive individuals. Teachers can fill that role to act as a buffer between the social demands of adolescence and the child.

Socio-Emotional Development

Breakthrough was designed to provide instruction to students during the precarious middle school years via teachers closer in age and perspective. High school and college students have recently spent time in middle school and can, hopefully, identify with the struggles of those years, and act as a role model for successful negotiation of the trials and tribulations of early adolescence. The students will look to you as a role model; they will watch how you interact with other teachers, with other students, and they will emulate you. They will want to be your friend. You must, however, remember you are their teacher, and you must set boundaries. They need a friend less than they need a role model and teacher.

Despite the shifting role of the family, the more you can enlist family members as positive influences in a student's education, the better the long-term effects. You can alter a family's perception of a child, as they can alter yours by sharing positive feedback with each other. Inviting the family to participate in their child's educational process may open new doors for them. Listening to what the family has to say about their child may open doors for you.

Students will also need opportunities to express themselves on topics ranging from personal crises to war. You must structure class time to allow student to test out their ideas by voicing them through discussion and reflection. Embed academic skills in these activities, so students can develop their identities while practicing writing or debating skills or learning content about historical trends or scientific advances.

Cognitive Development

As children move from middle childhood into adolescence, the transition not only affects them physically and emotionally, but cognitively as well. Thought processes evolve to reach new heights, allowing students to access a different level of analysis. Daniel Keating's five characteristics distinguishing adolescent from middle childhood thinking are:

1. Hypothesis: ability to generate and consider consequences
2. Metacognition: ability to think about one's own thought processes
3. Future planning: ability to plan systematically

4. Consideration of possibilities: ability to contemplate alternatives
5. Thinking beyond conventional limits: ability to reflect on various aspects of fundamental issues and the difference between ideals and reality

They want to test their own boundaries and others' boundaries, one of the most resented qualities of this age group. The best classrooms for adolescents provide structure within which they can explore themselves and the world around them.



Jean Piaget

Piaget believed adolescents began to master Formal Operational Thought, an ability to systematically examine the logic within a problem while focusing on abstract ideals and meta-cognition. During this stage, adolescents think more analytically about others, become aware of ethical principals, and evaluate how people are judged. The shift in thought processes with an eye towards scientific and mathematical thinking is described below:²

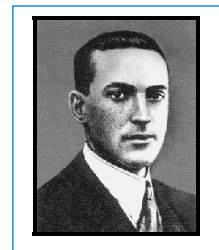
Students shift from:

- Reasoning about the observable to reasoning about abstract ideas.
- Testing a single hypotheses to evaluating multiple hypotheses for a single event or result.
- An inability to isolate variables to an ability to hold all variables but one constant during tests.
- A lack of understanding of proportions to effective use of proportions.

Teachers must support students during this shift. Students will not all transition independently, nor will they shift at the same time or rate, so teachers must develop lessons to guide students in the process, simultaneously supporting a range of levels.

Lev Vygotsky

While not limited to adolescence, Vygotsky's Zone of Proximal Development has great relevance to adolescent cognitive development. Vygotsky believed children were capable of greater




and more rapid growth when exposed to others with more advanced skills, including adults and peers. A child can make a certain amount of progress independently, but the competency of others helps to vault their achievement to a different level. Adolescents continue to need exposure to skills they hope to acquire, both from teachers and more advanced peers. Collaborative work, described further in *Lesson Development & Presentation*, promotes access to the zone of proximal development.



Erik Erikson

Erikson's theory of adolescent identity formation explains the social struggle at this age. He posits adolescents' challenge is to integrate social and sexual demands into a coherent and healthy personality. As they shift from childhood to adulthood, adolescents attempt to develop a healthy self-concept, the alternative being deviance.

Adolescents call into question all aspects of their identity at this time.

For a list of normal adolescent behaviors and feelings relating to this identity crisis, see *Normal Adolescent Development: Middle School and Early High School Years* in the toolkit. 

Cognitive Development

As with physical development, your students' cognitive development may vary broadly. Some students may be ready to write a literary analysis essay, while some won't be able to put together a paragraph. Again, the merits of a small class include the ability to differentiate instruction, or give different instruction, to students depending on their needs. Students with more advanced skills will need access to more challenging tasks, while struggling students will need coaching to fulfill the original assignment. The onset of abstract thought, results in constant questioning of the surrounding world; capitalize on their curiosity, keeping in mind not all students will be at the same stage in development. Breakthrough is a wonderful opportunity for students to explore and test their new capabilities.

With middle school students, you have to repeat. **A lot.** Since so much changes for them at this age, habit formulation, which requires a lot of repetition, can assist them to develop productive practices. Spiraling, or returning to a concept again and again in the context of more demanding tasks, will also help students maintain and develop their skills. In addition, goal setting can help both student and teacher to clarify where the student is headed and how she or he will get there. Middle school students benefit from goal setting because of their increased ability to plan for the future and to understand and evaluate potential consequences.

Conclusion

While the variance in physical, socio-emotional, and cognitive development at this age can astound and perplex, adolescence is also one of the most fascinating age levels to teach. Firecrackers explode in brains all around you; children awaken to new ideas and abilities every day. The teachers must rise to the challenges the adolescent presents and seize the moment to entice them to move even closer to their personal goals. While every child may learn in different ways, they are all capable of learning from each other and from their teacher when given the right tools.