



## *Kansas Effective Practices Instructional Toolkit*

Implementing Research and Resources Into Action  
Essential Educational Components: Brain Research

### **Optimizing Learning**

(exerpts from *Growing Up Gifted* by Barbara Clark, 7<sup>th</sup> Edition)

**Step One: Understand brain development as the basis for learning:** By the environment we provide, we change more than just the behavior of children; we change them at the cellular level.

The Environment	Therefore:
<ul style="list-style-type: none"> <li>Development of intelligence depends on the interaction between biological inheritance and environmental opportunities to use this inheritance.</li> </ul>	<ul style="list-style-type: none"> <li>The environment must be stimulating and include appropriate challenges that encourage curiosity and exploration.</li> </ul>
<ul style="list-style-type: none"> <li>Attention and concentration rely on the impact of the environment on the brain.</li> </ul>	<ul style="list-style-type: none"> <li>The classroom must be organized as a responsive learning environment that includes: access to a variety and range of materials and activities; psychological safety of all students; and support for exploration, choice, and the meeting student needs.</li> </ul>
<ul style="list-style-type: none"> <li>Stress produces biochemistry from the adrenal cortex that dampens cerebral cortical function.</li> </ul>	<ul style="list-style-type: none"> <li>Fear, threat, anxiety, and tension must be minimized in the learning environment and not be allowed to overwhelm the teaching process.</li> </ul>
The Instruction	Therefore:
<ul style="list-style-type: none"> <li>The brain responds to novelty, to the unexpected and to discrepant information.</li> </ul>	<ul style="list-style-type: none"> <li>Novelty should be used to motivate and enhance the process of learning. When asked to repeat, drill, or do repetitive activities, the brain habituates, that is, responds automatically without thought. While useful for learning some skills, such as times tables, these practices may be counterproductive to higher-level learning.</li> </ul>
<ul style="list-style-type: none"> <li>The potential of brain development is essentially unlimited for most individuals and the dynamic nature of the brain allows intellectual growth to progress or regress, not remain static.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous progress from the student's level of mastery must be available and encouraged for all learners.</li> </ul>
<ul style="list-style-type: none"> <li>How intelligence is expressed will depend on the individual's genetic pattern and anatomical structure in interaction with the support and opportunities provided by the environment.</li> </ul>	<ul style="list-style-type: none"> <li>Differentiated and individualized instructional planning and teaching is strongly indicated because each person responds uniquely.</li> </ul>
<ul style="list-style-type: none"> <li>The brain integrates information and builds memory and predictions and generates models of reality. Students' minds do not just record what is taught; the brain makes inferences and predictions. Bright minds require complexity and need exposure to patterns and relationships.</li> </ul>	<ul style="list-style-type: none"> <li>Single goals or objectives involving limited subject matter or isolated events must give way to interdisciplinary teaching across time and space.</li> </ul>
<ul style="list-style-type: none"> <li>The brain does not just process information or amplify thought, it constructs meaning.</li> </ul>	<ul style="list-style-type: none"> <li>Didactic teaching alone is no longer justifiable. Teachers must create problems to solve and work toward in-depth understanding of the concepts being taught. Integrative, multidisciplinary teaching will prevent the limits to knowledge and understanding brought about by teaching each discipline only as a separate specialization.</li> </ul>
<ul style="list-style-type: none"> <li>The brain attaches emotional significance to information; good learning derives from exciting teaching, as emotional responses are often more important in making cognitive decisions than are our rational processes.</li> </ul>	<ul style="list-style-type: none"> <li>Teaching with positive enthusiasm must be seen as highly valuable in the learning process.</li> </ul>

<ul style="list-style-type: none"> <li>Optimal learning requires the active involvement of the learner.</li> </ul>	<ul style="list-style-type: none"> <li>The learner must be actively involved in both elementary and secondary classrooms with concrete experiences and sensory stimulation. Use of texts and workbooks alone is not appropriate to teach abstract concepts.</li> </ul>
<ul style="list-style-type: none"> <li>The processes and content of both specializations of the right and left hemispheres of the cortex need to be included in curriculum planning to take advantage of their complementary nature.</li> </ul>	<ul style="list-style-type: none"> <li>Opportunities must be given for integrative and alternative modes of learning and expression so that the cortex is used holistically for effective learning.</li> </ul>
<ul style="list-style-type: none"> <li>Intelligence is developed and supported by experiences that associate and integrate information from the different areas of function in the brain (i.e., cognitive, affective, physical/sensing, and intuitive).</li> </ul>	<ul style="list-style-type: none"> <li>Learning opportunities must include experiences from all areas of brain function whenever possible.</li> </ul>
<ul style="list-style-type: none"> <li>The brain constantly uses feedback to create connections, store information, and develop intelligence.</li> </ul>	<ul style="list-style-type: none"> <li>The teaching process must include feedback that synthesizes and interconnects information at more complex and abstract levels for the learner frequently, consistently, and in a timely way.</li> </ul>

**Step Two: Create a responsive learning environment**: Establishing a classroom environment that is flexible and responsive and that allows all students to learn at their own pace and pursue their own achievement level is a necessary foundation for bringing gifted education into the classroom. All students benefit from an environment that is cognitively, physically, socially, and emotionally responsive to them.

Data collected over several decades confirm that optimal learning will occur when the environment allows students to:

- Assume some responsibility for their own learning.
- Develop the skills for independent learning.
- Learn at their own pace.
- Learn with material at their own level.
- Learn with strategies that offer multiple modalities.
- Receive timely feedback and be graded in terms of their own achievement.
- Experience a sense of perceived control, achievement, and self-esteem.

The learning environment can influence at least three major conditions for learning:

- differences in learning style, pace and level** - that the brain data indicate are evident in all learners;
- motivation** - that can be enhanced as a result of choice in the learning process, participation, and shared responsibility;
- challenge and stimulation** - both of which are necessary for optimal learning.

<b>Responsive Learning Environment</b>
<b>You will know that the physical environment is responsive when:</b>
<ul style="list-style-type: none"> <li>There is space for students to simultaneously participate in a variety of activities.</li> <li>Students have access to materials with a range of levels and topics.</li> <li>There is space for the students to engage in a variety of instructional groupings, and flexible grouping is used.</li> <li>There are areas supportive of student self-management, including self-evaluation.</li> <li>Desks are not individually owned.</li> <li>The classroom has a comfortable, inviting ambience supportive of exploration, application, and personal construction of knowledge.</li> </ul>
<b>You will know that the social-emotional environment is responsive when:</b>
<ul style="list-style-type: none"> <li>The emotional climate is warm and accepting.</li> <li>The class operates within clearly stated agreements decided upon cooperatively.</li> <li>Instruction is based on each individual student's assessed needs and interests.</li> <li>Student activities, products, and ideas are reflected around the classroom.</li> <li>Student choice is evident in planning, instruction, and products of evaluation.</li> <li>Building and practicing affective skills are a consistent and valued part of the curriculum and of each teaching day.</li> <li>Students and teachers show evidence of shared responsibility for learning.</li> <li>Empowering language is evident between teacher and student and among students.</li> <li>Students show evidence of becoming independent learners with skills of inquiry and self-evaluation.</li> </ul>
<b>You will know that the instructional environment is responsive when:</b>
<ul style="list-style-type: none"> <li>The atmosphere is free of undue pressure and stress.</li> <li>The lessons present novel challenges appropriate for the student's stage of development.</li> <li>Stimulation to all of the senses is involved in the lessons.</li> </ul>

- Students have exposure to a broad range of skills and interests.
- There is social interaction among intellectual peers.
- Choices and the opportunity to choose are evident.
- Exploration is an on-going part of the students' learning.

**Step Three: Integrate the intellectual processes** : Connectedness, interrelatedness, and integration are common themes found in many fields of study. Education must take advantage of new information from other fields on how human learning may be optimized through the use of the emotional, cognitive, physical, and intuitive functions of the brain.

<b>Components of Integrated Education</b>	
<b>Responsive Learning Environment</b>	<ul style="list-style-type: none"> <li>• Support for optimizing learning within social-emotional and physical environment.</li> </ul>
<b>Complex and Challenging Cognitive Activities</b>	<ul style="list-style-type: none"> <li>• Providing novelty, complexity, variety and challenge.</li> </ul>
<b>Empowering Language and Behavior</b>	<ul style="list-style-type: none"> <li>• Strategies to build community and positive interpersonal and intrapersonal communication.</li> </ul>
<b>Choice and Perceived Control</b>	<ul style="list-style-type: none"> <li>• Strategies that build skills of decision making, strengthen the ability to align personal and school goals, and foster alternative thinking and self-evaluation with the use of choice in the environment and learning experiences.</li> </ul>
<b>Relaxation and Tension Reduction</b>	<ul style="list-style-type: none"> <li>• The human brain processes more and retains information longer when tension is reduced.</li> </ul>
<b>Movement and Physical Encoding</b>	<ul style="list-style-type: none"> <li>• Physical/sensing function of the brain provides support for learning by increasing understanding and retention of concepts.</li> </ul>
<b>Intuition and Integration</b>	<ul style="list-style-type: none"> <li>• Intuition, future planning and creativity are brain processes considered essential to optimizing learning through multi-sensory, multidisciplinary, and integrative learning opportunities.</li> </ul>

**Step Four: Establish the continuum of learning** : What do I want my students to know, understand and be able to do as a result of being in my class? How will I know when the students understand or have mastered the concepts and skills?

<b>Continuum of Learning</b>	
<b>Content standards</b>	<ul style="list-style-type: none"> <li>• Establish knowledge and skills that should be achieved within a discipline or subject area.</li> </ul>
<b>Performance Standards</b>	<ul style="list-style-type: none"> <li>• Establish the degree or quality of student performance on the tasks selected to give evidence of competency on content standards</li> </ul>
<b>Use of Rubrics</b>	<ul style="list-style-type: none"> <li>• Define the levels of achievement possible for each demonstration or performance, identifying what is minimum, competent and exemplary</li> </ul>

**Step Five: Assess the student's level of mastery** : To appropriately modify the curriculum and instruction, determine each student's level of need by assessing the level of understanding and ability each student has already mastered. Assessment must be continued throughout the year for the educational program to be effective to monitor individual student progress.

<b>Non standardized or non-traditional tests</b>	
<b>Alternative assessment</b>	<ul style="list-style-type: none"> <li>• Any way of showing growth, finding out what a student can do, and informing instruction that differs from the standardized or traditional test.</li> </ul>
<b>Performance assessment</b>	<ul style="list-style-type: none"> <li>• Opportunities given to students that allow them to demonstrate and apply their knowledge and understanding of content and skills being taught.</li> </ul>
<b>Authentic assessment</b>	<ul style="list-style-type: none"> <li>• Requires that the knowledge and process of the content be demonstrated under the conditions in which the achievement would normally occur.</li> </ul>

**Step Six: Differentiate and individualize teaching and learning**: Differentiation involves the use of a variety of instructional approaches to modify curricular content, process, and/or products in response to learning readiness and interest of academically diverse students. Four major areas of need for higher achieving students to consider include:

- Acceleration in the pace of learning – student gives evidence of an accelerated pace of thought and/or learning, advanced comprehension, a high level of language development and/or verbal ability, an extraordinary quantity of information, unusual retentiveness, and/or a high level of visual and spatial ability
- Complexity of thought and its processing – student gives evidence of an unusual capacity for processing information, flexible thought processes, an ability to synthesize comprehensively, a heightened capacity for seeing unusual and diverse relationships and overall gestalts, an ability to generate original ideas and solutions, and/or an early ability to use and form conceptual frameworks
- Depth of understanding and level of mastery - student gives evidence of an unusual degree of curiosity; advanced cognitive and affective ability for conceptualizing and solving societal problems; an ability to delay closure; an ability to think in different patterns, in alternatives, and/or in abstract terms; and/or an ability to sense consequences make generalizations, and/or visualize solutions
- Novelty and uniqueness reflecting varied ways of learning and personal interests – student gives evidence of unusually varied interests; heightened self-awareness, sometimes accompanied by feelings of being different; creativity and risk-taking behavior in developing new ideas and theories; willingness to create personal interpretations of established ideas and theories; acceptance and expression of high levels of intuitive ability; early development of an inner locus of control and satisfaction; a keen and often unusual sense of humor; and/or openness to involvement and interest in intuitive knowing

<b>Modifying Curricular Content, Process and/or Product</b>	
<b>Acceleration</b>	<ul style="list-style-type: none"> <li>• Early entry to schooling, kindergarten or college</li> <li>• Subject acceleration</li> <li>• Compacting curriculum - pre-testing a lesson or unit and teaching only what has not been learned</li> <li>• Self-paced programs of instruction – learning centers, individual learning packets</li> <li>• Self-paced instruction with the use of mentors or tutors, individual contracts, and/or independent study.</li> <li>• Use of flexible grouping and/or higher grade or age placement</li> <li>• Wide range of levels of materials and resources</li> </ul>
<b>Complexity &amp; Integration</b>	<ul style="list-style-type: none"> <li>• Develop skills in identifying data needs and in collecting, organizing, and evaluating data</li> <li>• Develop skills in decision making</li> <li>• Use curriculum with themes and interdisciplinary content focusing on patterns, relationships and connections.</li> <li>• Compare past, present and future events related to the study topic, including classics, philosophy and current events.</li> <li>• Plan and implement solutions to community problems</li> <li>• Develop original applications of knowledge and understandings, including hypothesizing and testing hypotheses.</li> </ul>
<b>Depth of Understanding</b>	<ul style="list-style-type: none"> <li>• Develop skills in research, hypothesizing and hypothesis testing</li> <li>• Find trends in events, past and present and use them to predict future events or accomplishments</li> <li>• Discover rules and ethics and their importance in theories, disciplines and areas of study.</li> <li>• Pursue ideas and unanswered questions and integrate new ideas without forced closure or products demanded</li> <li>• Pursue learning from the familiar to the unfamiliar, the concrete to the abstract, and the known to the unknown.</li> </ul>
<b>Novelty &amp; Uniqueness</b>	<ul style="list-style-type: none"> <li>• Identify and explore their own emotions, perceptual filters and defense systems and accept those of others</li> <li>• Communicate personal expressions and perceptions in a variety of ways</li> <li>• Have unstructured time to physically and mentally explore, examine, and/or alter patterns in existing theories, systems or areas of study</li> <li>• Integrate knowledge from various areas into new, divergent and/or convergent physical and mental structures</li> <li>• Develop original applications of knowledge and understandings, including hypothesizing and testing hypotheses.</li> <li>• Develop projects of choice that involve communication and exchange of opinions in a variety of ways.</li> </ul>

**Step Seven: Individualizing Instruction:** This is not one-on-one teaching, but rather instruction that uses the flexibility of the environment and the range of grouping patterns, materials, content, and strategies to deliver a curriculum that meets the assessed needs of the students. Increase motivation and empowerment by providing choice, ranging in degree of structure and freedom based on the extent of the student's ability and responsibility.

Varying degrees or levels of individualization are possible:

**Level 1:** The teacher assesses each student's needs, resulting in an individualized level and pace of instruction.

**Level 2:** Instruction becomes more personalized when, in addition to having an individualized level and pace, the student becomes involved in the selection of goals.

**Level 3:** Once levels 1 and 2 have been achieved, the student can begin to incorporate self-directed or independent study skills, as well as taking on the responsibility of self-selecting learning activities and materials.

**Level 4:** Total individualization allows the teacher and the student to cooperatively assess and select goals, learning materials, activities and instructional techniques. This also allows the student to self-pace, self-level, and self-evaluate, using the teacher as a consultant and resource.

<b>Individualized Instructional Strategies</b>	
<b>Programmed Learning</b>	<ul style="list-style-type: none"> <li>• Students move at their own pace through skill-level learning</li> <li>• Individual assessment</li> <li>• Continuous feedback on work done at their own level</li> <li>• Allows students to learn materials basic to higher learning or research by a self-checking procedure</li> </ul>
<b>Learning Activity Packages</b>	<ul style="list-style-type: none"> <li>• Students work individually or in small groups and take charge of their learning</li> <li>• Assessment or pre-test procedure to discover levels of need</li> <li>• Multi-sensory resources and activities</li> <li>• Self-evaluation or posttest component</li> <li>• Self-paced and allows students to correct mistakes prior to evaluation of learned information or skill</li> </ul>
<b>Learning Contract</b>	<ul style="list-style-type: none"> <li>• Simple to complex: Statement of need or intent by the student, a description of what will be needed to accomplish such a goal and the agreed-on evaluation procedures and criteria for deciding when the project or learning goal has been completed</li> <li>• Teacher and learner cooperate in negotiating the learning contract, may include parents</li> <li>• Contractual decisions should be made after substantial assessment has been completed and results have been discussed</li> <li>• Cooperative decision on goals, resources, possible activities, reporting alternatives and evaluation procedures for both self-assessment and teacher assessment</li> <li>• Contracts should always remain negotiable due to detours and side investigations</li> </ul>