Visual Learning and the At-Risk Student

White Paper

By

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To know in America, particularly in American schools, is to be able to put something into words. This belief has skewed the curriculum in such a way that important forms of understanding are omitted, or neglected entirely, biasing the criteria through which human competency are appraised.

—*What We Believe and Why,* a 1977 document released by the National Art Education Association (NAEA).

Though the NAEA released the report cited above more than 30 years ago, it wasn't until Howard Gardner published his seminal work, *The Theory of Multiple Intelligences*, six years later, that the world of education finally began to sit up and take notice. Gardner's theory supported the NAEA's earlier finding that evaluating competency strictly by linguistic measurements was narrow and exclusive. He also expanded on that idea by positing that intelligences fall into eight areas: bodily-kinesthetic; interpersonal; verbal-linguistic; logical-mathematical; naturalistic; intrapersonal; visual-spatial; and musical.

Gardner's theory challenged long-held beliefs in education and cognitive science, and opened new doors to reaching disenfranchised students whose strengths lay outside the traditional approaches to instruction.

Visual-Spatial Learners Predominate

Of the eight categories of intelligences, research suggests that visual-spatial learning is the most predominant. A Gifted Development Center study of fourth, fifth and sixth graders representing a range of socio-economic, cultural, intellectual and rural/urban populations concludes that "…more than 60% of the students in a regular classroom learn best with visual-spatial presentations…"

The Center, a sister organization to The Visual-Spatial Resource Web site, has been studying visual-spatial learners for more than two decades and backs their finding with "high confidence."

Reaching Urban Students

Among the primary K-12 student populations with a low success rate in traditional instruction have been youth from high-poverty urban areas across the nation. A 2006 University of North Carolina study, *Responding to the Needs of At-Risk Students in Poverty*, details major obstacles to success these learners must overcome. "Students attending urban, high-poverty schools are faced with multiple challenges: concentrated poverty, violence, victimization, family instability, and the perils of collective socialization."

The study goes on to reference "significant contributors" that place students at risk, including behavior, coping skills, language development, retention, and attendance.

Cultural Awareness and Diversity

The North Carolina study emphasizes that urban teaching best practices must "take into account" the particular conditions that many urban students face, and integrate cultural references familiar to them. Additionally, virtually every professional education organization today advocates diversifying instruction and assessment to ensure the needs of all learners are met. And for the urban student in particular, an instructional approach that appeals to a range of learning styles can directly address the problems of language development, retention, behavior and other elements contributing to an at-risk status.

Visual Learning in the 21st Century

It is broadly recognized that digital technologies have greatly impacted the way today's student learns—both in urban areas and across other regions and circumstances. The sheer volume of information now instantly available via the Internet has made scanning and evaluating information a key literacy. The "quick read" of visuals, such as graphs, charts, and photographs, has become crucial to understanding and retaining information. In a 2009 article, "The Power of Visual Learning in Secondary Mathematics Education," author and visual learning specialist Stuart J. Murphy provides a perspective of today's "digital native" student and his/her relationship to visuals. "Comfortable online, well-versed in video games, eager consumers of graphic novels, young adults have become naturally reliant on the language of visuals to transmit and convey information."

Adds the NAEA, "…the ubiquity of images…has created a demand for new skills to enable all young people to make sense of the visual world."

The issue of equity also comes into consideration around the topic of visual learning in schools. Noting that students uneducated in visual literacy share the same disadvantage as students who haven't mastered the traditional core skills of reading or math, Murphy plays out the scenario by saying that students must have visual literacy skills "…to enable them to participate equitably in society." Additionally, he reminds us of the power of visual language to transcend vocabulary and language barriers to equalize knowledge acquisition for English Language Learners and others challenged by language.

Modifying Lessons

When a teacher can train him or herself to think like a visual learner, a kinesthetic learner and other types of learners, modifying instruction need not be a daunting task. Some fairly straightforward tweaks in instructional approach can support learners across the spectrum in core curricular areas and beyond.

Math

In the teaching of mathematics, words and numbers alone are not sufficient. Instead, words, numbers, and pictures should come together to clearly demonstrate what's taking place. …Mental images enable students to interact with mathematical concepts, process information, observe changes, reflect on their experiences, modify their thinking, and draw conclusions.

—Stuart J. Murphy

The National Council of Teachers of Math's (NCTM) Web site offers a host of math activities for students across all grade levels that target auditory, visual and kinesthetic and other types of learners. For example, one pattern activity for elementary-level students describes how the lesson can be "translated from one modality (auditory, visual, and kinesthetic) to another." Lesson author Grace M. Burton recommends students copy patterns using shapes they create themselves or create pattern blocks with animal noises corresponding to each color and then have students make the noises that match the pattern. Another hands-on visual, kinesthetic and auditory lesson suggested in the NCTM resources area includes having students create familiar objects, sorting these objects and then form linear patterns from the sorted objects.

Tip:
With the VariQuest® Cutout Maker, students can create a variety of shapes and colors to be used in sorting and pattern-making activities. Students might work in groups to create cutouts of shapes around particular themes, such as animals, food items, or sports equipment. Each group can sort their cutouts with certain sub-groups, such as domestic versus wild animals, dairy products versus poultry, or different kinds of game balls versus safety equipment. Each group can then use the VariQuest® Poster Maker to create a linear pattern of their sorted objects. Each element may have a certain sound or movement associated with it. Students can then present their patterns to the class, including all visual, sound and kinesthetic elements.

Murphy cites pioneering cognitive theorist Jean Piaget and his emphasis on the key role of observation in both basic understanding and higher order thinking skills. "Charts let us see relationships instantly. Understanding shapes and lines and angles are dependent on a student's ability to see, recognize, interpret, and reproduce visual data. …Mental images enable students to interact with mathematical concepts, process information, observe changes, reflect on their experiences, modify their thinking, and draw conclusions" (Rowan & Bourne, 1994).

Tip:
Using the VariQuest Cutout Maker, students can create a variety of mathematics manipulatives and visuals that reinforce the recognition and processing of information. Shape comparison activities, for instance, might include creating cutouts of triangles, squares, and other shapes in different sizes. Students can then compare the size of like shapes, predicting degrees of difference before measuring to find the answer.

Tip:
Using the VariQuest Poster Maker, students can reinforce geometric concepts by displaying angles of different degrees side by side and having the class predict the degree of each angle. Students can also create posters displaying lines of different lengths and have classmates guess the difference and then compare line lengths to yardsticks, baseball bats and other familiar objects.

Additional poster visuals might represent and explain fraction concepts, or compare number-based data, such as a week's weather highs and lows, or for older students, stock market activity over a given period.

In a 2004 online chat, Cathy Seeley, former President of NCTM, talked about the power of visual learning to help level the playing field when it comes to students understanding the abstract concepts of algebra. "…a student who thinks geometrically or visually may benefit from a more visual approach to algebra. This is one of the most exciting advances in the teaching of secondary mathematics—that we can represent situations in multiple ways and can approach the solving of problems in different ways. …There is no reason why any person who is reasonably successful in other content areas cannot be successful in mathematics if we offer multiple avenues toward mathematical understanding."

Tip:
The VariQuest Poster Maker can help students visually express abstract concepts via graphs and tables that reach across curricular areas. For instance, students might work in groups to study and graph "real world" migration patterns or study news sources to plot the progress of conflicts around the globe.

Murphy suggests that sketching should be a part of math note-taking. "Drawing out a concept and visualizing how it works leads to comprehension (Armstrong, 1994). A good way to assess understanding is to ask a student to demonstrate a mathematical concept without using words—or numbers."

Tip:
In the secondary-level classroom, the VariQuest Cutout Maker and Poster Maker can facilitate higher order thinking by providing the tools for student cooperative groups to take on the open-ended challenge of demonstrating a concept without words or numbers. Student groups might then conduct oral classroom quizzes to gauge their classmates' understanding of the concept presented.

Language Arts

In *The Standards for English Language Arts*, the National Council of Teachers of English (NCTE) and the International Reading Association recommend that educators consider how 21st century technologies "…can make artists, musicians, and designers of students not traditionally considered talented in those fields." Additionally, their 21st Century Assessment guidelines open up new avenues and methods for evaluation, suggesting that educators consider the "…tools or media that most effectively communicate the intention of the product."

Among the broad selection of suggested activities on the NCTE Web site that combine instructional approaches that draw in students across a range of learning styles is the Bio-Graph, where students interview and write biographies of family members.

Tip:
Using the VariQuest Poster Maker, students might take this activity a step beyond the written biography to create a timeline highlighting the major events in that relative's life. This timeline can then be a visual to accompany the reading aloud of the biographical piece.

Language Arts classes have also traditionally been the place to read and act out plays. For a unit on drama, students might use the VariQuest Cutout Maker to recreate and stage the elements of a scene from the play. A more in-depth activity might have students create and build a set from an original play or story they write.

In the 2004 book, *Student Successes with Thinking Maps: School-Based Research, Results and Models for Achievement Using Visual Tools*, the issue of making instruction responsive to the needs of urban children in particular is discussed. In the section "Bridging the Gap Between Teachers and Students in Urban Settings," Yvette Jackson, a member of the National Urban Alliance for Effective Education advocates for thinking maps as tools to "provide a language about thinking that allows teachers and students to communicate with precision."

Says Jackson**, "**Students need to be able to define and generalize concepts or themes; describe, identify, characterize and organize details; compare and contrast; sequence; identify cause and effect; analyze parts of a whole; and understand analogies."

Tip:
The VariQuest Poster Maker and Cutout Maker can help students visualize such concepts and themes in the Language Arts classroom. Students might map out the plot of a book—including conflicts, characters, climax, resolution and so forth—on a piece of paper, and then work in small groups to share and flesh out details, which can then be recreated as a large thinking map poster. Cause and effect can also be examined by creating a large timeline on a poster and using that poster as a central focus of discussion in a large group presentation.

<u>Science</u>
As observation is a key tenet of the scientific process of inquiry, visual elements have been traditionally more at home in science than in any other core curricular area. The National Science Teachers Association (NSTA) has gathered a broad selection of resources to help teachers ensure that even very young students sharpen their powers of observation.

In a chapter of the book *Activities Linking Science With Math, K-4,* John Eichinger offers activities that help youngsters gain skills in observing and recreating natural elements. Tasks include examining and sketching objects, and analyzing the sketches for relationships such as shapes and patterns. An extension activity has students create paintings from patterns and shapes discovered in the activity.

Tip:
The VariQuest Cutout Maker helps students become better observers and analysts of natural elements. Students can use their sketches of leaves and other objects from the field to craft three-dimensional shapes of those objects for closer study and comparison. Then they can use pencils or markers to reproduce the patterns from their sketches on the objects. Finally, they can use these manipulatives to sort and classify shapes and patterns from their observations.

The instant read of sketches also applies to other forms of visuals used in science. Murphy references statistician and Yale University professor Edward Tufte, pointing out that "…multiple forms of discourse—verbal, numeric, and visual—are required to communicate evidence about questions of any complexity." He notes that "a quarter of the information in modern scientific research comes in the form of charts, tables, diagrams, and images."

NSTA's January, 2009 *Science Scope* magazine provides a range of best practice, hands-on activities for helping students "visualize" concepts across all areas of science. These include teaching estimation, conceptualizing moon phases, documenting seasonal changes in local parks, and creating molecular models to analyze the difference between physical and chemical changes.

Tip:
The VariQuest Poster Maker allows students to design and develop large graphical displays that help support observational and research skills reinforced in the instruction of the above concepts and a variety of others. Students can observe, measure and chart the growth of a plant from the park or their garden. They might also create sketches of the moon in its different phases and display these, along with explanatory captions, on a comparison chart. Using the VariQuest Cutout Maker, students can also create three-dimensional models of molecular structures, which they can then observe and analyze from a 360-degree perspective.

In another lesson from the January 2009 *Science Scope*, "From Aristotle to Today: Making the History and Nature of Science Relevant," Donna R. Sterling offers a different approach to making sense of science. In an activity designed to help students appreciate the human side of the discipline, she has the class study different scientists and their discoveries about the solar system, noting the controversies surrounding the process of accepting new explanations within the context of their times. Students create timelines of scientific discoveries, charting the changes in thought over time.

Tip:
The VariQuest Poster Maker is an excellent way for students to create large-scale timelines of scientific discoveries, including detailed contextual information about the times and places in history within which each new discovery was made. Highlighted areas might provide "time capsules" detailing the major controversies surrounding the scientific discoveries.

Transcending Barriers with Visual Learning

Whether in the core curricular areas, cross-curricular applications or specialized subjects such as art, math or performing arts, visual learning can offer an array of deep and rich learning experiences for students with strengths in each of the eight areas of intelligence identified by Gardner.

Visual—and other sensory—approaches to learning can transcend the barriers of language and culture, create a common language to bridge the generational gaps between educators and students and open up new opportunities for societal and job equity for those students traditionally disenfranchised by the formal education system.

For such at-risk students, the majority of whom reside in our nation's high-poverty, inner-city environments, visual approaches to learning—in concert with high quality teacher professional development—can help overcome historical language and knowledge retention barriers. It also goes a long way toward solving the behavior, coping and attendance issues that contribute to that population's high dropout rate.

As 26 years ago Howard Gardner opened the door to helping learners of all intelligences have their needs met in our nation's classrooms, so must it be our mandate today to ensure we are maximizing every resource at our command to promote the engagement, achievement and joy in learning that is the right of every student.

Resources

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Teaching Today**:** http://teachingtoday.glencoe.com/howtoarticles/differentiating-science-instruction
Visual-Spatial Resource Web site: http://www.visualspatial.org/VSI/research.htm
What We Believe and Why, 1977. National Art Education Association: http://alumniconnections.com/olc/filelib/NAEA/cpages/9004/Library/Aspen%20Bio%20Pics/1977%20NAEA%20Statement.pdf

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