

going GLOBAL

From the Editor...

Say “global” these days and one immediately thinks of a curriculum through which students learn to see how all the world’s people are interconnected. The concern that often arises is that in going wider, our content gets shallower. There is another meaning to global - one that not only more accurately points to the “global” content of the articles that follow, but implies that wider can also be deeper. “Global” refers to wholes, as in the “whole mind” Kevin Yaley’ referred to in his article on Dan Pink’s book, or as in how a whole elementary school learns a whole new way of thinking about math, like Lisa Drew and Denise Gideon tell it.

The whole middle school may not have been directly involved in the “murder” investigation that Sara Mohr, Sarah McIntyre, and Morgan Bailey describe in their project combining a forensics unit in science and a U.S. justice system unit in English/history, but it was darn close. The students acquired skills outside of the normal range taught, and even engaged in “sophisticated metacognition.” Many faculty, in addition to the project designers, became involved in the collaborative project. The result was some metacognition of their own - centered around teaching strategies.

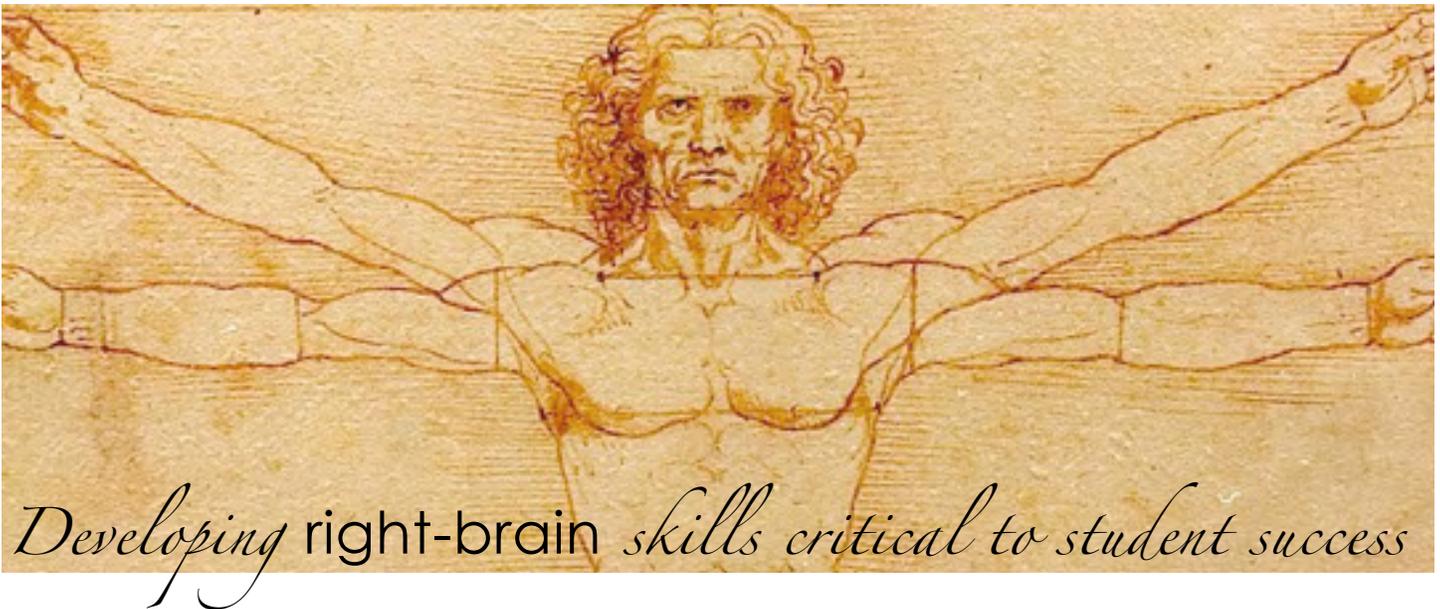
History teacher, Heather Pang, got a new perspective on American history by studying it in England, and Kathleen Jalalpour combined her experience teaching math in Germany and the U.S. with the strategies of Singapore Math. Veteran dance teacher, Julianne De Sal, discovers a whole new - and eager - body of dance students amongst her faculty and staff colleagues.

Paradoxically, as our world gets “flatter,” and “smaller” our perspectives potentially grow larger and more inclusive. Traditional schooling that favors left-brain skills shifts to include skills of the right brain resulting in collaborative and innovative lesson planning. Shifting the way we define a discipline like math can inspire whole faculties to see the connections between preschool lessons on basic shapes and geometry problems in pre-algebra. Learning what strategies work best for the brain to turn information into knowledge can, as Judy Willis tell us, “help you differentiate teaching for particular learning activities depending on your goals, students’ needs, the type of lesson, or the subject matter.” Kevin Yaley reminds us that a common mission of our independent school is education of the whole student. What follows are some great examples that take us deeper into our content, pedagogy, and collegial relationships. **Enjoy!**

- Sandee Mirell

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Developing right-brain skills critical to student success

WHOLE-BRAIN FUTURE: Reconsidering the Arts

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What is the role of the arts in education? Dan Pink, best-selling author of *A Whole New Mind*, contends that if schools are to successfully prepare students for the future, then we must take a whole new look at how we educate our students, and, in doing so, reconsider the traditional role of the arts in education.

According to Pink, the two most common arguments for the arts in education are what he calls the fundamental argument and the instrumental argument. The fundamental argument states that the arts are widely accepted as an integral part of a well-rounded education. Put another way, the arts are a key ingredient in educating the whole child.

The instrumental argument claims that the real value in the arts lies in its ability to enhance a student's understanding of and performance in core academics classes. In its simplest form, this argument claims that the pay off in taking a stone-carving course comes as it boosts a student's understanding of and, subsequently, performance in geometry.

While both of these arguments have merit, Dan Pink posits a third argument for the inclusion of the arts in education – what he calls the "fundamental-instrumental" argument. Pink's contention is that the arts teach essential qualities, or human abilities, which in and of themselves are indispensable in preparing our students for success. Specifically, it is through the arts that students develop six important capabilities – design, story, symphony, empathy, play, and meaning – the mastery of which is essential to the future success and personal fulfillment of our students.

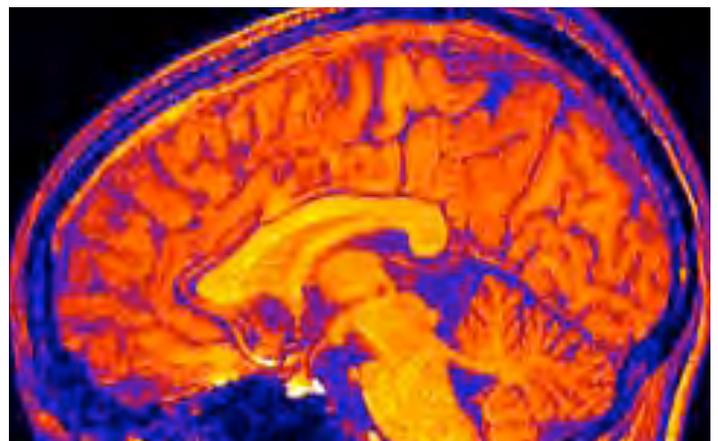
The basis of Mr. Pink's "fundamental-instrumental" argument is grounded in his claim that our future belongs to a

different kind of person with a different kind of mind. In his book, *A Whole New Mind*, Dan Pink lays out a map to where we need to be heading in the future:

Today the defining skills of the previous era – the "left brain" capabilities that powered the Information Age – are necessary but no longer sufficient. And the capabilities we once disdained or thought frivolous – the "right-brain" qualities of inventiveness, empathy, joyfulness and meaning – increasingly will determine who flourishes and who flounders. For individuals, families, and organizations, professional success and personal fulfillment now require a whole new mind. (Pink, 3)

Drawing on research, and relying on the art of story-telling, Pink suggests that our culture has taught from cradle to college that success comes to those who are able to effectively demonstrate a mastery of the left-brain capabilities – logical, sequential, linear, analytical thinking. We have come to believe, and justifiably so, that these essential skills give us the best chance of successfully navigating our way down the path toward opportunity and achievement, accepting potentially lucrative work in areas such as computer-programming, finance, and law.

Certainly, these capabilities are and will always, remain vital to our success. However, Pink's suggestion is that they alone will not sustain us if we are going to succeed in a future – a future



The Six Senses

Use these exercises to develop your “high-touch” and “high-concept” senses

Design

- Keep a design notebook - when you see a great design, jot it down.
- Redesign a household item that you find annoying.
- Read design magazines.

Story

- Write a short story that has beginning, middle and end - but is only 50 words long.
- Grab a recorder, sit a friend or family member down and ask questions about his or her life.
- Select a photo and create a whole story based on that photo.

Symphony

- Listen to a symphony by Beethoven, Mozart, Tchaikovsky.
- Make an inspiration board - include anything you find uplifting.
- Look for negative space - look beyond what’s prominent, you might be surprised at what you see.

Empathy

- Take an empathy quotient test online.
- Listen to a conversation without looking at the speakers - guess their age, ethnicity, clothing, etc. then turn around.
- Volunteer at a homeless shelter.

Play

- Create new captions for a cartoon in a magazine or paper.
- Play a video game - not all video games are designed for kids.
- Visit an interactive children’s museum.

Meaning

- At the same time each day, think of one thing for which you’re thankful.
- Ask yourself - would you still be doing what you’re doing now if you had \$20 million, or ten years to live?
- Picture yourself at 90 - what have you accomplished, what are your regrets?

that is very different than the one you and I may have imagined while growing up. Capabilities that were once considered a lock for opportunity and success can no longer stand on their own. Instead, a new kind of mind is in demand, one that combines a mastery of the left-brain capabilities with those of our right-brain – holistic, inventive, empathetic, big-picture thinking.

Why the shift? According to Pink, the short answer lies in our changing social and economic landscape. Society has reached the point where today’s excess and abundance have left many searching for meaning as much as for material gain; skills that were once the cornerstone of our education and upbringing are being outsourced and displaced, leaving many looking for new skills for success; and white-collar jobs that were once considered solid careers guaranteeing the good life, are being lost to a better, faster, cheaper competitor – the computer - leaving the future in the hands of those who are able to approach it using the whole mind.

What are we at independent schools to do? The simplest answer is to stay true to our mission. An honest look at independent schools shows that we are doing a pretty good job of educating the whole mind already. Most would agree that the idea of giving full attention to the development of both the left-brain and right-brain capacities is one of the features that distinguish independent education. The challenge for us is to bravely lead the charge of granting right-brain activities a more prominent role in our education. In doing so, we acknowledge the vital role that the arts play in the development of the six essential qualities – design, story, symphony, empathy, play and meaning – which Pink refers to as high-concept, high-touch senses (adapted from *A Whole New Mind*, 65-66):

Design – Rather than creating a product, service or functional experience, we must develop the capacity to create things that are also beautiful, whimsical and emotionally engaging.

Story – It is no longer sufficient to simply relay information. Instead, we

must nurture the arts of persuasion, communication and narration.

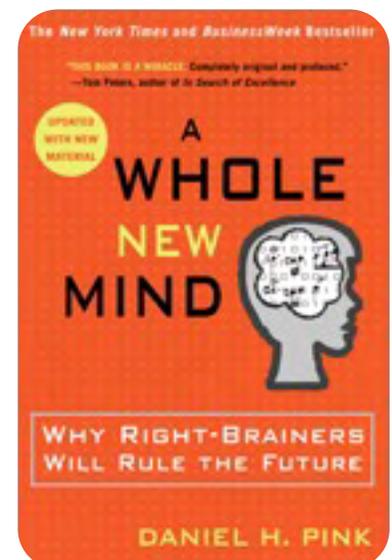
Symphony – This is the ability to take a group of seemingly disparate pieces and see the connection between them, cross boundaries, look at the big-picture, and synthesize ideas.

Empathy – In our evolving world of information exchange, logic alone will not suffice. The need to listen, forge relationships, and understand what makes another tick is essential for communication and connection.

Play – While there is a time for seriousness, a growing body of evidence points to the personal and professional benefits of laughter, lightheartedness and humor.

Meaning – Even in a world of material plenty, there remains a need in most to pursue a life of purpose, transcendence, and personal fulfillment.

Dan Pink’s message will resonate with many in the independent school world - a validation for some, a call to action for others. Either way, the challenge for each is to continue to take seriously the responsibility of preparing our students for their future. Rather than standing still, we must forge ahead, achieve new heights, and embrace what is to come with a whole new mind. ■





TEACHER AND NEUROSCIENTIST SHARES STRATEGIES FOR BYPASSING BRAIN FILTERS AND TURNING INFORMATION INTO KNOWLEDGE

RAD TEACHING: Increase Student Engagement, Motivation, and Memory Using RAD Strategies

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Everything we learn comes to the brain through our senses, and is processed, stored, and activated through a series of electrical and chemical events. However, the brain is not equipped to process the millions of bits of sensory information that bombard it every second. There are obstacles to this sensory information intake in the form of filters that protect the brain from input overload, and focus attention on the sensory data most critical to survival. How children's brains respond to the sensory data from their environments determines what information gets their attention. Teachers can use brain-friendly strategies such as novelty, surprise, prediction, positive anticipation, connecting learning to interests, and other techniques to increase students' focus on what they need to see, hear, and remember.

How well children store the sensory input that makes it through their brain filters is greatly influenced by their emotional state at the time they hear, or see the information. We can best help children keep their filters working optimally when their

stress levels are down. This is when the most valuable cognitive information is selected to pass through the filters into memory. Understanding how information becomes knowledge, and makes it to long-term memory can be a powerful tool for enriching our students' academic success. Brain-friendly strategies empower students to respond to the best sensory input (information) from their environment, and turn that data into retained knowledge.

There are three main brain systems I refer to as RAD that are keys to building better brains. RAD is short for:

- R:** Reticular Activating System (RAS)
- A:** Amygdala
- D:** Dopamine

Reticular Activating System (RAS)

Information entering the brain as sensory data must first pass through the reticular activating system (RAS), and later through the limbic system, to be acknowledged, recognized, coded into patterns - and ultimately stored in long-term memory.

The RAS is the attention activation switching system located at the lower back of the brain (brainstem). It receives input from the sensory nerves of the body that converge into the spinal cord from sensory response nerve endings in the arms, legs, trunk, head, neck, and internal organs. These sensory messages must pass through RAS either to gain entry to the higher, thinking brain, or be sent directly to the automatic response centers. The RAS sets the state of arousal and vigilance of the rest of the brain. In animals, it is the RAS that selectively alerts the brain to

changes in the animal's environment – sounds, sights, smells that may indicate danger, or opportunities to find food, mates, or shelter.

In humans, the RAS has evolved to be responsive to more than the basic needs for survival in the wild, but it is still a filter that is most attentive to changes in our environments as perceived by the senses. The RAS in humans is key to arousing, or “turning on” the brain's level of response and alertness. Response to the sensory information the RAS receives determines the speed, content, and type of information available to the “higher” brain. Every waking second millions of bits of sensory data bombard the RAS, and this filter limits access to approximately 2000 of these bits per second.

The goal in successful teaching is to control the flow of information through students' RAS, so that the most useful information, that which can become knowledge, reaches the higher cognitive networks in their prefrontal lobes. We can help students pay attention to important information by getting the attention of their RAS. Since the RAS looks for changes in the environment, surprise and novelty can be incorporated into learning through variations in sensory stimuli (voice pitch, volume, rhythm, visual changes in color, movement, size, and other tactile changes) that call attention to the information on which students need to focus.

It is even more important for children with ADHD, LD, or sensory processing difficulties to have learning activities planned so the important sensory information passes through their RAS. If students are already challenged by the task of sorting through the multitude of environmental sensory input, the goal is to focus their attention on the sensory input that is most valuable and important to attend to at the moment.

For example, creating colorful sketches about new information, or using manipulatives to match number words with number symbols are more interesting to the brain than the sounds of traffic outside, or the coins in their

pockets, so the learning during those activities passes through the RAS. Listening to lectures, and doing drills and worksheets are not novel experiences, so do not have the sensory excitement to power information through the RAS brain filters. You can control where students' focus goes in the classroom, and what information gets through the RAS by incorporating novelty, multi-sensory learning, goal-motivated attention, and creativity with learning activities.

The Limbic System – Where Heart Meets Mind

The brain is a pleasure-seeking and self-protective organ. It is emotional response to sensory information that stimulates the sensory intake centers of students' brains beyond the RAS. These specialized brain regions, such as the amygdala (A), have been studied by neuro-imaging and brain mapping done while subjects are engaged in various learning tasks.

The sensory data that makes it through the RAS must now pass through the brain's emotional core, the limbic system - especially the amygdala and hippocampus - where emotional significance is linked to the information (sour taste is yummy when it is in lemon sherbet, but distasteful when it is in unsweetened lemon juice). On receiving the sensory data, these emotional filters evaluate its survival and pleasure values. That “decision” determines if the information is given further access to the higher brain, and if so, where the data will go.

When the brain perceives threat, or the student feels stressed, the limbic system filter in the amygdala goes into survival mode, and diverts the sensory data away from the thinking brain into the automatic centers (fight/flight/freeze). Because there are usually no tigers in our classrooms, students really don't need the same threat filter response their mammalian predecessors did. Yet, those filters still exist in human brains, and will be activated by stresses children experience in school like confusion from overly challenging material, boredom from repetition of subject matter they already know, or

social stresses from bullying to exclusive cliques. However, if learning experiences are associated with pleasure, connected to topics of interest, related to satisfying goal-achievement, and other positive experiences, this sensory data will be considered valuable and permitted entry into the higher, thinking brain.

A for Amygdala

The “A” in RAD is the amygdala, often referred to as the center of the brain's emotion relays in the limbic system. The amygdala was once considered a center responsive to threat and fear, but further investigation has found that this deep brain center also strengthens the long-term memory potential of information that is accompanied by positive emotion.

fMRI and PET scans demonstrate that when the amygdala is highly activated in response to stress there is a drop in brain activity in the higher cognitive centers where thinking and reasoning take place. This lower metabolic activity is evident because during these scans less oxygen, or less glucose is used in these regions. For example, when a student is frustrated because she is confused by the difficult vocabulary words in the story the class is reading, her amygdala's affective filters respond to the stress by taking up higher amounts of the brain's available nutrients and oxygen. The brain is now in survival mode. The high activity in the amygdala blocks entry of input to the thinking brain, so the information being presented will never make it to memory storage.

The RAS and affective filters can also be used in positive ways. With learning activities planned to sustain attention and interest without producing frustration, confusion, or boredom, these filters can help the brain focus on the sensory information of the learning activity. Information passing through the amygdala and associated with positive emotion is enhanced to facilitate its long-term memory storage.

Next to the amygdala in the limbic system is the hippocampus. It is in this consolidation center that new sensory input is linked to previous knowledge, and to memories of past experiences

RAD Teaching: Turning Information into KNOWLEDGE

Reticular Activating System

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Amygdala

The amygdala is the center of the brain's emotion relays in the limbic system and it also strengthens the long-term memory potential of information that enters accompanied by positive emotion. With low-risk, low-stress, positive learning activities, the RAS and amygdala can help the brain focus on the sensory information of the learning activity.

Dopamine

Dopamine is one of the brain's most important neurotransmitters, proteins that carry information across spaces between nerve endings. When you can incorporate pleasurable learning experiences and activities into lessons, the dopamine released is then available to increase pleasure, attention, and memory.

retrieved from memory storage. PET scans show that when children are given new information their brains activate their stored memory banks. Their brains seek relationships, or connections between the new information and stored memories of past knowledge or experience. The newly coded relational memory comprised of the new data linked to the existing memories is now ready for processing in the frontal lobes, and for storage in neural networks throughout the cerebral cortex (gray matter) as long-lasting memory available for future use.

D for Dopamine

Dopamine, the "D" in RAD, is one of the brain's most important neurotransmitters. Neurotransmitters are brain proteins that carry information across the spaces (synapses) formed when one nerve ending connects with another.

A 1998 report, "Evidence for Striatal Dopamine Release during a Video Game," published in the journal *Nature*, described a PET scan study in which British researchers found that video game playing changes the chemistry in the brain by increasing the activity of dopamine. The authors described the infusion of dopamine as being "similar to that observed following intravenous injection of amphetamine or methylphenidate." They suggested that children who play video games "submit their developing brains to a pleasurable chemical reaction similar to an amphetamine drug injection, and the

more often they play the more likely they are to become hooked on the feeling."

How can this powerful dopamine pleasure response be used constructively to influence learning? When the brain releases dopamine during a pleasurable experience, it builds strong memories of the experience such that it subsequently releases dopamine in expectation of the pleasurable experience that initially resulted in the dopamine surge.

This dopamine reward and anticipation cycle has several advantages. Dopamine increases in the limbic system, especially in the hippocampus, and facilitates the consolidation of new information and prior knowledge into relational memories. Dopamine circulation to frontal lobes increases the release of another neurotransmitter, acetylcholine, which increases attentive focus.

For example, you can introduce a new way of learning, or reviewing vocabulary words by writing a list of the words on the board and pantomiming the words as students say which word they think you are pantomiming. This is low in threat, high in pleasure, and associated with dopamine release. As a result, when your students see "vocabulary lesson" written on the board the next time their brains will release dopamine in anticipation of the positive experience. The dopamine will increase focus with the potential to consolidate, and store the new words in long-term memory.

Classroom activities can use this dopamine effect to hook students to

pleasurable learning. Studies of activities, or experiences associated with increased brain levels of dopamine include physical movement, personal interest connections, social contacts, music, novelty, sense of achievement, intrinsic reward, choice, play, and humor. When you can incorporate these experiences and activities into lessons, the dopamine released is then available to increase pleasure, attention, and memory.

Prediction is RAD

One example of a classroom activity that is RAD is prediction. Successful prediction occurs when the brain has enough information in an existing memory category that it can find familiar patterns in new information, and predict which prior knowledge fits the new sensory input. This results in recognition and consolidation of new relational memories into the brain's patterned memory bank. As children grow, their brains learn more and more about the world through observation. They construct more patterns with which to interpret sensory input from their world, and they are able to make more and more accurate predictions.

Prediction is often the characteristic measured in intelligence tests, especially in questions about patterns and sequences. Successful prediction is one of the best problem-solving strategies the brain has. For example, if you see the number sequence 3,6,9,12..... you predict the next number will be 15 because you recognize the pattern of counting by threes. If you hear a song on

a familiar CD, your prediction-pattern lets you remember what song will come next even before it starts. The brain builds patterns of knowledge, and uses them to make predictions. Prediction is involved in developing appropriate social interactions, academic skills in reading, calculating, test taking, and in goal-setting.

Prediction activities in class include asking students to predict what a book will be about based on the cover, what science phenomenon is at work in a demonstration they observe, and what a social studies unit might cover after examining artifacts and photos of that period in history. Just as placing a small wager on a sporting event increases emotional investment for some viewers, so does prediction tune the RAS of students to pick up information during the lesson.

Starting a unit with an activity in which students make predictions will prime their first filter (RAS) to seek and admit the information you want them to learn. The strength of their focus becomes even greater when they write down, or pair-share their predictions because their “investment” in the outcome is even greater.

The amygdala (A) comes into the act because the prediction activity is a low risk/low stress/emotionally positive experience. Because the prediction is a type of guess, there is no risk or anxiety about being wrong, as there might be if students are asked about information they had already received in class. If their predictions are correct, there is the added amygdala memory boost that accompanies information input associated with positive emotional feelings. If their predictions are incorrect, because they had nothing to lose, there is the positive “a-ha” moment of discovering something they didn’t know before.

Dopamine (D) release follows when the prediction activity is enjoyable. For example, students enjoy writing predictions on white boards with dry erase pens. It is also pleasurable to write down all “correct” answers on their final prediction papers (which become their notes for the lesson). In the pair-share activity, students make their predictions

on scrap paper, or share them verbally with a partner. Then, when the correct answer is revealed, students enjoy the positive experience of filling in all answers correctly on a handout you prepare with blank spaces for missing words (intrinsic reinforcement). Even if

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some of their predictions are wrong, it is pleasurable to see their final papers with all correct answers. Right or wrong in original prediction, there is pleasure in writing down an answer they know is correct. The handout becomes a study guide, and because the activity of creating it was pleasurable, dopamine is released when they return to the notes because of the positive association with the pleasurable classroom prediction activity.

RAD Lesson Planning

One of the best parts of RAD lesson planning is that you already have all the tools you need to incorporate the RAS, amygdala, and dopamine into your lessons. These are the strategies you already know, and probably use, in your classroom. The difference is that knowing why the strategies work in the brain empowers you to modify and select strategies with the brain in mind. Thinking RAD can help you differentiate teaching for particular learning activities depending on your goals, students’ needs, the type of lesson, or the subject matter.

Sometimes a boost of novelty is what you need when students are learning challenging math concept in order to stimulate passage through the RAS (R), and you can create it by playing a popular song with lyrics with some relation to number letting the students

predict the relationship. Perhaps the class is stressed after a test, and you want to boost their spirits and open their amygdalas (A) to the next lesson. This is when you can add the positive emotional experience of a simulated quiz show where students work in teams to make up questions for the other team about the upcoming social studies topic. Students have fun, preview the learning, and you can assess prior knowledge with their amygdalas wide open to learning. Maybe it’s the day before presidents’ weekend, and students are more focused on the upcoming break than the last lesson of the day. If you suddenly tape a one and a five-dollar bill to the board, their attention and focus will perk up to the pleasure of seeing something that they like, and the anticipation of reward will release dopamine (D) improving attention and focus further.

It is not the expectation of receiving the money that promotes the dopamine surge, but the knowledge that when you do something unusual in class, there soon follows an enjoyable learning activity. In fact, with those bills up there the students can first predict their purpose (some might recognize the presidents as those whose birthdays are about to be honored). Depending on the lesson you would like to teach, you could go into presidential history, the economics of money, or a math lesson seeing how many numbers students can create (working individually or with partners) using the numbers one and five - each only once and any mathematical process they know (from addition to exponents).

Once you start thinking about how to include RAD in your lessons, you’ll find that the planning doesn’t take any more time. It actually becomes more pleasurable as your own RAS is on the alert for novel ways to start lessons, your amygdala attaches positive emotion to lessons you plan with enthusiasm and creativity, and your dopamine surges with expectation because you look forward to your students’ enthusiastic response to the pleasure they derive from your RAD lessons. ■

THE GIFT OF DANCE

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Dancing is for everybody. That is what I believe. That is what I have been teaching for the past thirty-four years. I'm talking about solid dance—technique in both modern and classic forms, floor work, combinations, and, most importantly, the realization that dance is a higher aesthetic that should be part of our consciousness as human beings and members of a greater society.

If that is the case, then who gets to dance? Does the privilege belong to the wispy waifs who have graced miles of ballet *barres* since they first cut teeth? Or rather, are the dancers the teenagers who can move their bodies through gyrating contortions while holding up their trousers? The answer is yes to each, and no to both. The question is always, how do we draw more people into the serious study of dance, convince them that the achievements are individual, and the benefits personal?

I am fortunate in that I am the chair of a dance and theater department in which middle and high school students are allowed to pursue and develop their interests in dance with classes based in the curriculum, as well as through an advanced conservatory program which takes place after regular school hours, and comprises the performing company of the school. Some students come to us with extensive training and experience; others are neophytes whom we initiate into this art and philosophy of living one's life. Students perform service-learning projects that bring the art of dance to the larger community, and engage students who may not otherwise ever see a performance or take a dance class. They attend performances, enjoy master classes, and work as mentors to younger dancers.

I always have felt confident that between my work in the classroom, and my fierce commitment to outside service in dance, I had been doing all I could to promote dance as an artistic activity for all aspects of society. Last year I began an activity that showed me how many more people could benefit from dance, and it continues to affect my sensibilities greatly. After fielding many requests from colleagues over the years, I finally decided to offer an adult class for the faculty, administration, and staff of my school.

I wasn't sure where this would lead me, or even if anyone would show up. Indeed, I withstood a bit of teasing going through the process of attaining approval for a class that was to be free of charge, and open to adults of all ages and levels of physical acuity. Once the notice went out to our community, the response was staggering. The staff members who spearheaded the addition of the class were the first to sign up. So many people, many of whom I know had never set foot into a dance studio, joined on. Several told me that they haven't danced in twenty years, but were ready to begin again now. Others said that they had always wanted to try a dance class, but were afraid. Still others e-mailed me to say they could not participate this time, but if I ever offered another session to be sure to contact them. Even my male colleagues were slightly curious, and asked what, exactly, I might be doing in this class.

It began in the summer, offered at a time when every human being who wanted to participate could be available. I stood before the class, seeing a collection of colorful costumes and exercise wear. *Do*

Dance teacher finds grateful students - and insight - from leading faculty dance class



Then the most amazing thing happened. We began class. A hush fell over the studio as this group of educators peered into the mirrors, saw their collective reflections, and began to dance

we need shoes? Are these pants okay? I can't really stretch my leg because I fell a long time ago. "My God, they sound just like the kids!" I thought. It made me smile. Then the most amazing thing happened. We began class. A hush fell over the studio as this group of educators peered into the mirrors, saw

their collective reflections, and began to dance.

We went through a standard, if gentler than usual, warm up, moved on to technique, center floor work, stretching, and finally, a lyrical modern combination sequence to soft jazz by Keiko Matsui. I watched as arms lifted, hands pushed away air, feet struggled to do the right thing, and torsos moved with a beauty unparalleled by younger dancers. I told them that this class was for them, that it was not about how they thought they looked in the mirror, or who was more flexible, but rather about how this made them feel as human beings - this business of achieving the benefits a dancer's body, at any age, through exercise.

I also was reminded, as I watched their eyes riveted upon my example, of how much dance is a process of *see/do*. It is not necessarily about what you say, but rather about what you, the teacher, can present to others by clear, uncluttered and selfless example, by taking your attention off yourself and putting it on them. I tell my student dancers before they go on stage that they must always be genuine and generous in performance. Through these simple and unfettered adult classes, I am learning what it means to be genuine, generous, and humble in the classroom.

Perhaps the most meaningful part of each class comes at its end. Each person is warm and flushed with an excitement

that supersedes middle age discomforts. Everyone basically has accomplished the combination, although they would argue with me stoically on this point. I finish each session the same way I conclude my student classes. We take a moment to be still, bow to each other, and then I say, *Thank you for your work today*. My students answer in return, *Thank you for this class*. However, with this amazing group of students, who spend their days endlessly enhancing and nurturing the lives of children, the gratitude is overwhelming. That someone would give to them, in this small way, the focused care and attention that they so professionally and unselfishly give to others, is cause for euphoria. I think, too, of how enlightened my school is to agree to provide a source of fitness and well being for my colleagues, not to mention an occasion for community beyond the discussion of students and curriculum.

My class continues this year on Thursday evenings at 5:00 p.m. It happens at the end of my long day, and at the end of their equally challenging days. Each week I greet the same faces, and welcome some new ones. Each week I learn something new about what it means to give the gift of dance. More importantly, each week I am reminded of why it is I was called to teach after all. ■

Instructor De Sal (seated) and her students.



The class works on traditional floor technique, learning to find their center and develop strength and placement and a dancer's body through the exercises of dance.



PROJECT-BASED LEARNING AND AUTHENTIC ASSESSMENT BENEFIT FACULTY AS WELL AS STUDENTS

CSI: MIDDLE SCHOOL

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Imagine a Monday morning that begins with students discovering the bloodied, bludgeoned “body” of the middle school copy machine repairman in a well-traveled school hallway. Following the brutal discovery, scheduled classes visit the scene, take photographs, and gather physical evidence for later lab testing. During one of these visits, gasps of surprise from onlookers meet administrators as they come to retrieve a student for questioning about evidence found at the scene. Though this “suspect” is in on it, none of his peers is aware of the artifice until he is taken away. Word spreads quickly. With the buzz around campus heightening, suspicions forming, and the evidence rapidly growing, we instruct students to request depositions and subsequent warrants in preparation for a trial.

Such was our first interdisciplinary CSI curriculum, which evolved from combining two formerly separate seventh grade units: forensics in science, and the U.S. justice system in core, an integrated English/history class. In the forensics unit, students studied how to gather, record, and analyze evidence from an imaginary crime scene. In the justice system unit, students explored the structure of the courts, with a focus on landmark Supreme Court cases. Teachers had designed their respective lessons to focus on the tenets of scientific investigation, the use of evidence in the justice system, the rights of the individual, and the process by which legal decisions are made.

Upon realizing that both departments were working on similar themes, our science and core faculty got together to interweave the lessons for a more exciting, in-depth and consequently more meaningful examination of material already in the curriculum. We discussed the importance of experiential learning as key for greater comprehension as well as creating a

lasting impact on middle schoolers’ life-long learning. We noted that we weren’t reinventing the wheel; rather, we were building a better mousetrap.

After the two-week investigation phase, students spent the subsequent two weeks preparing for the trial. To do so, they assumed various roles within the court system. Acting as lawyers, students met with the presiding judge played by the school librarian (who, happily, happens to have her J.D.). Witnesses were prepped. Scientific experts reviewed admissible evidence. Judges’ assistants researched case precedent for suppression hearings. All students engaged in role-playing during the two-hour trial.

As the descriptions imply, collaborative projects are inherently “messy,” and require considerable planning and oversight. At the same time, these hands-on experiences evolve organically through student inquiry and inspire passionate



The scene of the crime. A bloodied, bludgeoned “body” of the copy machine repair man was found in a well-traveled middle school hallway.



Evidence found in the right glove of the victim.

student responses. It is this very atmosphere that makes such projects successful.

Students responded enthusiastically to the curriculum. Since they authentically experienced the investigation and trial, they got to involve themselves in the professional as well as social aspects of criminal investigation. This resulted in an eye-opening recognition that outcomes of our legal system can greatly depend upon the people and personalities involved. They learned about various vocations in the related fields. They learned that an immense amount of work goes into preparing a case. Additionally, students gained an awareness that science benefits society as a whole. Academically, students acquired skills ranging from time management to problem solving within a defined process. Perhaps most importantly, students engaged in sophisticated metacognition.

Further, excitement over the project was not limited to students. Faculty saw this as an opportunity to foster professional growth. When reflecting on the process, we felt a renewed enthusiasm about curriculum goals. Collaborating with faculty outside of our own departments provided a unique insight into our individual teaching strategies. We reaped the benefits of shared responsibility in assessing student work. Students were delighted that their assignments counted in both subjects. In the end, we had seamlessly

designed a successful and authentic assessment. We also had the chance to perform research on successful teaching methods, and to discuss various approaches to interdisciplinary teaching with colleagues. Equally important, if not more so, we as teachers acquired a greater understanding of the students' overarching academic experience in seventh grade.

In a larger sense, the project benefited the entire school community. It enabled faculty and staff to interact with our seventh graders. We were able to actively involve the school librarian as the presiding judge, and the athletic department staff as key witnesses to the crime. Since the project was discussed at faculty meetings, it spurred other middle school faculty to seek out possible collaborative projects for use in their own classrooms. Our crime took place in a public space on campus where the school community could witness firsthand the students' learning process. The attractive nature of the project imbued the rising grade levels with a sense of anticipation. Alumni of the CSI experience even sought out teachers to ask how they might be of assistance during the current version of the project. Parents called about the project to express excitement at seeing their children so engaged in school, and uncharacteristically conversant at home.

As all the benefits imply, despite their sometimes ungainly and awkward unfolding as organic teaching, collaborative projects are well worth the time, energy, and effort. Much like the middle school students our project was created for, this interdisciplinary undertaking worked because through interaction it provided multiple entry points for students to access understanding and to use skills. We know that students this age often do their best work when they are able to move around and construct meaning from varied sources. Simply put, the collaborative process proves an effective teaching strategy. It builds on the idea of students as individuals who learn best through the various modalities of multiple intelligences and authentic assessment. While traditional teaching methods have their place collaborative projects, such as the CSI unit, provide a

depth of experience that is more readily accessible to all students.

So, in short what does it take to make an interdisciplinary, authentic educational experience work? The first step is to closely examine your school's curricula by department looking for similar themes and concepts that can be connected. Learning in greater depth about what your colleagues teach will strengthen your students' experience regardless of the connections you find. Next, think of real life situations, or multifaceted assignments that can be used to teach the skills and content across more than one subject. These situations will give the students the chance to do the material, rather than just hear about it second hand. And let's face it, most life experiences involve pulling knowledge, skills, and experience from several school subjects. Once you have your scenario, or project idea in place, begin meeting regularly with all the departments participating in the new curriculum. Be sure that you start by clarifying your goals for the students at the end of the project, and creating an appropriate way to assess them throughout the process. Finally, prepare yourself for the unfolding of a truly refreshing learning process.

Learning in greater depth about what your colleagues teach will strengthen your students' experience regardless of the connections you find.

Oh, and as for the student suspect in the crime? Turns out he was vindicated in the trial. In a surprise turn of events in a dramatic courtroom revelation coming on the heels of the measured process of justice, the perpetrator turned out to be the imbalanced rogue of an 8th grade science teacher fed up with the inconvenience of an unreliable copy machine. Seems he took it out on the repair technician. ■

Teacher finds ways to balance national history in an international context



STUDYING AMERICAN HISTORY IN ENGLAND

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Last summer, I had the opportunity to go back to graduate school, or at least to go back to the parts of it that were the most precious to me. I attended the Oxbridge Teachers Seminar in Cambridge, England with two goals in mind. First, I was reworking my 8th grade US history curriculum. We had adopted a new textbook, and Castilleja School is growing its global program, so I wanted to rework the logistics of the course while also giving it a more global perspective.

The second goal was more personal; I wanted to be a student again—to think, reflect, talk about history, visit other schools, hear experts from a wide range of disciplines, and talk to teachers from many different types of schools and communities. The webpage for the seminar had put it best, “participants in the Cambridge Teacher Seminar have the opportunity to take part in the ancient traditions of academic discovery and creative endeavor that have made Cambridge one of the greatest centers of intellectual excellence and achievement in the world.” As I enjoyed the variety of the seminar, getting to know the other participants, and spending my days really thinking, learning, writing, and exploring, not only did I recommitted to my own subject, but also to the process of lifelong learning, for myself, for my department, and for my students.

Oxbridge Academic Programs (www.oxbridgeprograms.com) organizes student summer study programs in Oxford, Cambridge, Paris, and Barcelona. What I saw of the Cambridge programs made me wish every American student could have such opportunities. Most of the programs are for middle school and high school students, but a few are for teachers. There were two formal components to the teacher seminar. The first was a series of lectures, activities, trips, and school visits. We wandered through the history of science, the power of abolitionist poetry, Oliver Cromwell, criminology, Virginia Woolf, the history of Cambridge, and the experience of taking, rather than teaching, a math lesson. We visited Ely Cathedral, the Cromwell museum, the Whipple Museum of the History of Science, two local area schools, Choral Evensong at King’s College, and a college garden performance of *Hamlet*. We even had a special reading and discussion session with Britain’s poet laureate, Andrew Motion, which, for many of us, was the highlight of the program.

The second, more focused, part of the seminar was a small group seminar on one of four topics. I had chosen this program specifically because of the seminar “American History in Transatlantic Perspective.” Our group leader was also the program director, Adam I. P. Smith, who teaches American history at University College London. In a format familiar to those of us who had been history graduate students, we tackled some of the big questions of American history in this seminar, with specific readings and questions for each of our six meetings. The teachers in this discussion group taught classes from 4th grade to AP, and each of us came to the topics with perspectives from our own teaching and education. But the most important thing was that we had the opportunity to think about big questions - not to plan specific lessons, but to consider what it is we do when we teach our own national history.

We started with the argument made by Thomas Bender in *A Nation Among Nations: America’s Place in World History* that American history is often taught in a vacuum, as if it took place outside of world history. If we spent less time thinking about how American history is exceptional, Bender contends, and more time thinking about how it is similar to other histories, we would deepen our understanding of America and the world, and prepare our students for a world where everything really is connected. I kept a blog about the trip for my family and friends, and this is what I wrote about the work as we progressed through the topics:

Our discussion group had its second meeting this afternoon. We were soon off on a lively discussion, complete with epistemological diversions (what is a revolution? What makes change revolutionary?) We started right back with nationalism, with questions like: “What is an American? Is Louis Hartz right, is America exceptional in its Lockian consensus? (the reading for today). Does studying or arguing for American exceptionalism make any sense without actually making the historical comparisons?” Tonight we are reading Turner’s “Frontier Thesis” (again, for most of us), for our discussion tomorrow. Many historians have taken Turner to task for overstating the importance of the frontier, but his argument is in many ways [sic] as much about exceptionalism as it is about the frontier, so it should be a lively discussion.

Again and again I asked myself how to bring some part of this discussion back into eighth grade history. In the end, I came up with a two-sided approach. The first is to watch the way we talk in class about America itself. To the extent that it is possible, I set out this year to think in terms of similarities rather than differences. We talked specifically about how to teach national history when national history is bound up in patriotism and love of country. It seems to me that a deeper understanding of national history is even more important than a sense of exceptionalism.

The second is to pick a few subjects - in particular, abolitionism, women’s rights, suffrage, and Progressive reform - that will be significantly enhanced by some comparative perspective. Without reforming every part of the curriculum, I can bring my students into a habit of comparative history as a balance to so much national history. Student understanding of the abolition movement in the United States can only be enriched by seeing the international context of the reform.

Seeing Alice Paul and the National Women’s Party turn to the British Suffragists will introduce students to a world of transatlantic communication and activism that will broaden their understanding of women’s place in the world of the early twentieth century. As students move today in a world that is, as Thomas Friedman has so ably argued, flat, or at least flatter, the ability to think across national boundaries will only become more important. And their need to see American history in the context of world history will only increase.



View from the author’s room.

One of greatest strengths of the program was the chance to spend time with so many teachers from different places and different subjects. Many were from the United States, but two teachers came from Raffles Institution, a secondary boys’ school in Singapore, and one English teacher came from Switzerland. When teachers come together and talk about their lives, their classrooms, their students, and their hopes for the future, there is much to discuss that can be disheartening. I heard from teachers who cannot teach evolution because parents object. I heard from history teachers who were supposed to help their students make sense of the world without teaching about any form of religion because someone might object. I also heard about teaching loads that make my job seem almost luxurious (something I need to keep reminding myself as I face another stack of papers to grade!). But meeting this fantastic group of teachers from independent and public schools around the world, and working with them for a fortnight, made me optimistic about the future. Although some face terrible obstacles while others worked in well-appointed schools, each one of these teachers came in with great programs for their students, and they have all gone home with more to bring back to their classrooms.

Through this summer program of study, and the work I have done since I returned, I have refreshed my acquaintance with the type of history study I have not enjoyed since graduate school in a setting much less stressful than graduate school ever was. I have thought about, and I will continue to think about, the project of teaching American history: why we do it, how we do it, and what we need to think about to improve the way we do it in order to help students see themselves in the world, not just in the nation. Every teacher should have the opportunity to think about poetry, philosophy, teaching, history, and all kinds of other subjects, connected and not, in one of the most beautiful places of learning in the world. ■

ADOPTING SINGAPORE MATH – A NARRATIVE

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How many of your school's fourth graders could answer this question?

Sara bought a bag of marbles. $\frac{1}{3}$ of the marbles were blue, $\frac{1}{6}$ of them were green, $\frac{1}{3}$ of the remainder were yellow. If there were 24 yellow marbles, how many marbles did Sara buy altogether?

Most of the fourth graders at my school could do so easily since we switched to the Singapore Math program a little over two years ago. The story of that switch is complex, and spans three continents.

After teaching fifth and sixth grade math for several years in Berlin, Germany, I returned to my native California twelve years ago, and was lucky enough to land in an open-minded independent school in Palo Alto. I was pleased with the small size of the school, the eager students and of course the Bay Area climate (compared to Germany — enough said...) What I liked best, though, was the freedom given teachers to develop and improve curriculum.

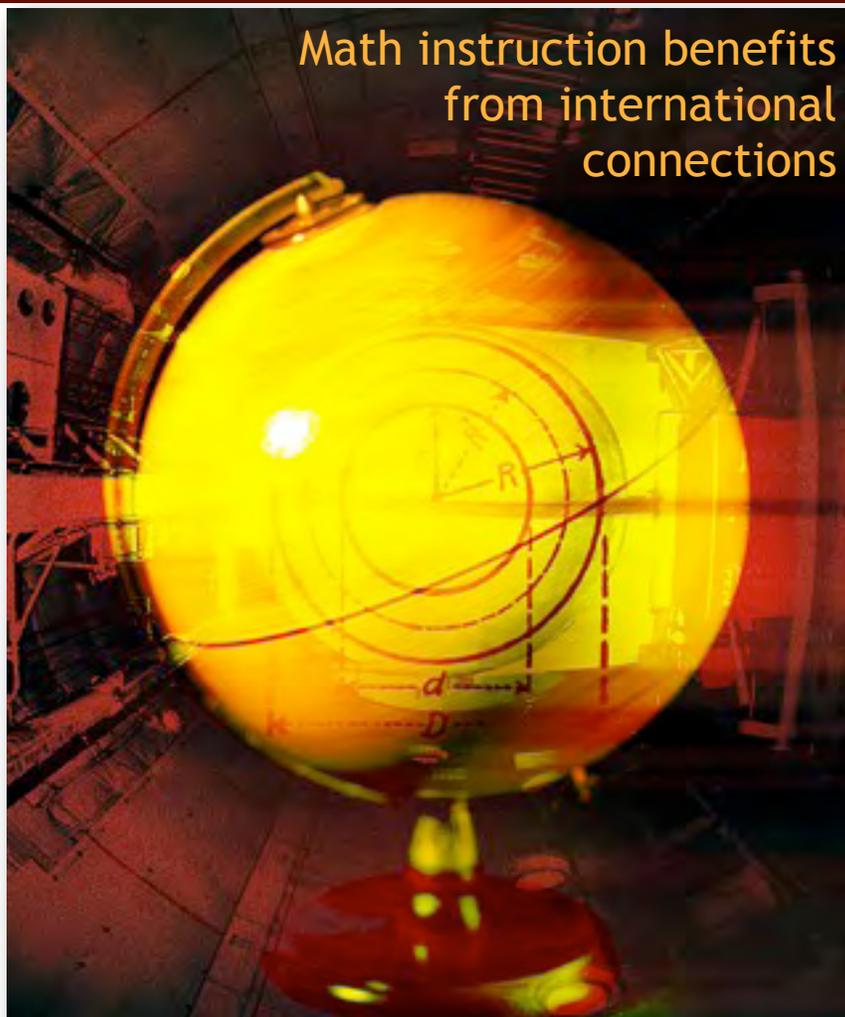
As in most independent schools, our teachers view this freedom as both a blessing and a curse. In my case, it has definitely ended up as a blessing, in spite of the years I spent cursing the paucity of good math programs to choose from, and the hundreds of hours I put into developing my own.

When I first arrived in California, I was aghast at the whole spectrum of American math textbooks I tried out. The old, traditional textbooks were too algorithmic, too heavy, and too fractured — a “mile wide and an inch deep”, to use TIMSS (Trends in International Mathematics and Science Studies) coordinator William Schmidt's analogy. Students moved from topic to topic, memorizing definitions and formulas they did not understand. California's public schools still test this kind of rote learning.

The new “manipulative”-based textbooks of the 90's, on the other hand, suffered from the opposite weakness - lots of concrete understanding, but not enough abstract development of concepts. Students mastered pizza fraction math, for example, without then developing the pencil-and-paper algorithm so necessary to the study of rational equations in high school algebra. I was afraid we would grow a whole generation of students who “love math,” but aren't able to really *do* any.

I had been trained to see math as *both* concrete *and* abstract. It is an abstract language used to describe phenomena of the real, concrete world. So, I ended up developing my own

Math instruction benefits from international connections



middle school curriculum, based loosely on the German curriculum I was familiar with, but incorporating what I began to see as the best of American math teaching: games, manipulatives, and projects.

After limping along like this for years, a parent happened to bring me some new textbooks about four years ago. I had heard of Singapore Math, but did not realize that it is written in English, and always has been! The 1st -6th grade math series, “Primary Mathematics” is available on the web at reasonable prices, and is currently being used by over 100 schools in the US, mostly on the East Coast, with widespread reports of success.

Singapore gained world-wide respect starting in the late 90's for repeatedly scoring first place in the TIMSS studies, causing educators to more closely examine the approach being used there.

Teachers and administrators at my school researched the program, and made the decision to adopt the Singapore curriculum in the first through sixth grades; we are now in our third year of its implementation. We are still working out the kinks, but are genuinely pleased with our accomplishment.

In my opinion, there are several strong reasons for the success of the Singapore Math program:

- Fewer, longer units, lasting 3-4 weeks each, much like the curriculum I was used to in Europe. This encourages

depth and mastery, in contrast to the cursory two or three days spent on spiraling concepts in traditional US textbooks.

- A common approach through all six grades, in which students learn concepts in sequential units, using

Students mastered pizza fraction math, for example, without then developing the pencil-and-paper algorithm so necessary to the study of rational equations in high school algebra. I was afraid we would grow a whole generation of students who "love math," but aren't able to really do any.

uniform language.

- An approach that is grounded in the *visual*. Complex word problems are taught using rectangles that represent the elements of the problem.
- All the basic operations are taught using the same visual approach, which also lends itself to fractions, decimals and percents. This makes math accessible to students who struggle with the traditional, left-brained approach to math. Since adopting this program, we have found that students at our school who previously disliked and feared math now understand concepts, and feel greater confidence. It is noteworthy that 8th grade girls in Singapore outperformed boys in TIMSS 2003, and many of them reported a preference for the visual approach to word problems. Conceptual development does not stop at

the visual, however. Each concept is carefully transferred to the abstract, and then reviewed in numerous configurations.

- Enrichment problems. The math series offers a plethora of additional books with complex and thorny word problems, allowing teachers to truly challenge their fastest (not "brightest," but fastest!) students during the standard multi-week units, without having to move those students ahead of their class. Left-brained, traditionally successful math students benefit from Singapore Math's visual approach by building a even more solid basis of understanding than they would otherwise have had by rushing eagerly through abstract concepts.
- A daily mental math component that gives students an agility and confidence in computation that, interestingly, translates to greater success in the more advanced high school math classes.

We did find that we had to adapt the program, adding in the elements of American math education that work best. We use more manipulatives at the beginning of each unit than they do in Singapore, gradually phasing them out as the unit moves toward the abstract. We also use what we see as the strongest pillars of US pedagogy: games, projects, stations, and group work.

Although the textbooks stop at 6th grade, I use Singapore Math's visual models as we move into pre-algebra in 7th grade, and find it provides an excellent transition to American textbooks. All of our 8th graders do a traditional Algebra I, or an Honors Algebra I course in 8th grade, and report success as they move on to high school math. When they comment that algebra is just "arithmetic with letters instead of numbers," and word problems are easy to translate from English to "Math," I feel great satisfaction in the thinking skills they have developed.

In the common goal of educational excellence, I can highly recommend this import from a small country in Southeast Asia that so successfully rounded out my own background in German and American education. ■

Actual 4th grade questions from the 2006 California Star Test:

1. Which fraction represents the largest part of a whole?

- A. $\frac{1}{6}$
- B. $\frac{1}{4}$
- C. $\frac{1}{3}$
- D. $\frac{1}{2}$

2. $5894 - 2608 =$

- A. 3276
- B. 3286
- C. 3294
- D. 3296

Solution to the opening question

Sara bought a bag of marbles. $\frac{1}{3}$ of the marbles were blue, $\frac{1}{6}$ of them were green, $\frac{1}{3}$ of the remainder were yellow. If there were 24 yellow marbles, how many marbles did Sara buy altogether?

Divide the marble bag into 12ths:



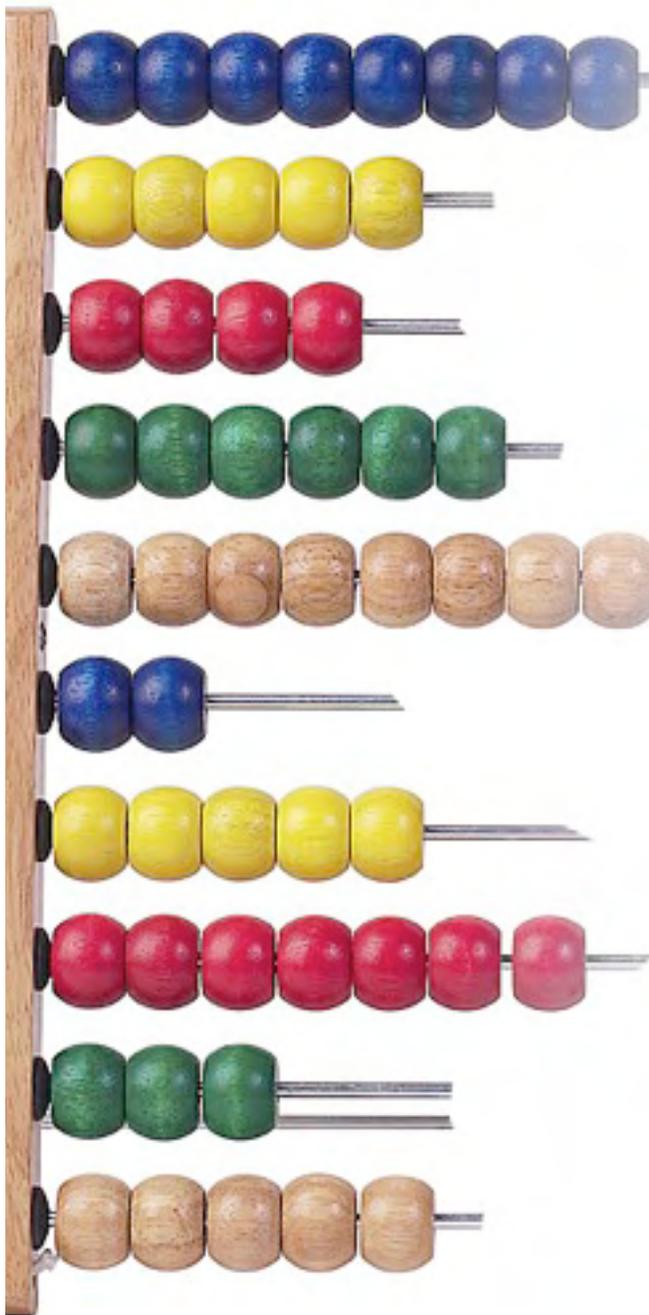
Equations: $24 \div 2 = 12$ marbles per unit (rectangle)
 $12 \times 12 = 144$ (12 units with 12 marbles each)

Sentence: Sara bought 144 marbles.

A whole faculty learns a new way of looking at math instruction

MATHEMATICS: Constructing a Way of Thinking

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Teachers at Saint Mark's Episcopal School, Upland hosted a week-long professional development course last summer in early July. The course, "Mathematics, A Way of Thinking," was presented by The Center for Innovation in Education, a non-profit organization founded in 1975 on the belief that all children can learn mathematics. The Center offers two courses, "Math Their Way," for teachers in pre-K to second grade, and "Mathematics...A Way of Thinking" for teachers in second through sixth grade. Both courses approach mathematics from a constructivist perspective but each develops that perspective by showing teachers how to facilitate transfer between the concrete and abstract aspects of mathematics education.

Our school has embarked on a three-year development of our mathematics program; therefore we wanted all of our teachers, pre-K through 8th grade to attend the workshop. Hosting the workshop last summer meant that Saint Mark's teachers not only attended as a team, but were able to meet and share ideas with other area teachers, both public and independent. This proved helpful in networking outside our immediate school environment, and broadened our respect and appreciation for the teaching profession.

The course was taught as a model classroom with teacher participants working together as students, and the instructor modeling the role of an effective mathematics teacher in the classroom. Because educators who have implemented the strategies in their own classrooms lead the workshops presented by The Center, the instruction was both practical and philosophical, challenging participants to think about what happens in a classroom and why it happens. This format also allowed teachers to take a step back and consider how students think and learn about mathematics. As teachers wrestled with new concepts and ideas, it became clear why understanding is so elusive for some students, and how even top performers sometimes have only a superficial understanding of foundational concepts such as place value.

Middle school teacher, Guen Vinnedge, appreciated the opportunity to reflect on teaching methods, and the impact of learning styles within a group. "Working with a group allowed me to think about group dynamics from the inside of a group in ways not possible as a classroom teacher observing from the outside."

Kelly Mancuso, fifth grade teacher, realized that there could be more than one teacher in the classroom, as participants in the course learned as much from each other as they did from the instructor. This translates to students' activity, and allows students of varying levels of cognitive development to play an active role in their construction of mathematical understanding. Veteran and new teachers alike found strategies for the classroom, but more importantly, as Linda Arbizu, second grade teacher, shared, "Our individual confidence and enthusiasm as teachers of mathematics grew as the instructor encouraged us to think 'outside of the box,' and showed us how to help our students do the same."

So often the focus is on "getting through the book" rather than guiding students in their development of problem solving and reasoning skills. Through our participation in the workshop, teachers learned how to ask *the right questions* to guide student construction of understanding rather than simply providing them with *the right answers*.

As teachers of various grade levels worked together, an appreciation for the work at all grade levels as well as a team spirit for our work as educators here at Saint Mark's was fostered. Because teaching is such an isolated activity, this



St. Mark's math faculty members use manipulatives to help students understand and demystify math

during the week helped faculty to work as a whole when evaluating successes and addressing areas of challenge.

Mathematics is a constructive discipline. We know that mathematics knowledge is cumulative, and we tell our students this repeatedly. The workshop helped us to see just how true this really is, and how to help our students demystify math through the use of manipulatives and group problem solving. In this way, students can discover patterns and work to draw their own conclusions. Teachers realized that the justifications behind many memorized formulas and algorithms were possibly not fully understood. As teachers begin to implement these strategies in classrooms, students will discover the same "rules" for themselves, feeling a greater sense of ownership in their work. We can help students by providing opportunities for connecting new material with prior knowledge. Perhaps Kelly Mancuso said it best, "We discovered that mathematics isn't just calculations, or getting the right answer, it really is 'a way of thinking' that needs to be nurtured among our students."

Saint Mark's faculty will be hosting *Math Their Way*, August 18-21, 2008, and we invite teachers from other schools to join with us as we investigate ways to enrich the mathematical learning and understanding of students PreK-2nd grade. To learn more about workshops offered by The Center for Innovation in Education, visit their website at www.center.edu, or contact Denise Gideon, Saint Mark's Math Coordinator at dgideon@stmarks-upland.org. ■

"We discovered that mathematics isn't just calculations, or getting the right answer, it really is 'a way of thinking' that needs to be nurtured among our students."

- Kelly Mancuso

workshop gave teachers an opportunity to view the mathematics program as one whole entity, and to see how all of the pieces, across the grade levels, fit together. Although the course aims its instruction at the second-fifth grade, it is critical that all mathematics teachers understand the part their instruction plays for those students who come before and after them. Preschool teacher, Darlene Glasson, shared her surprise when she learned that the work in preschool classrooms with basic shapes has direct bearing on student success with geometry problems in pre-algebra. Such conversations with one another