

# GRAY MATTER

## THE EXPONENTIAL FUTURE

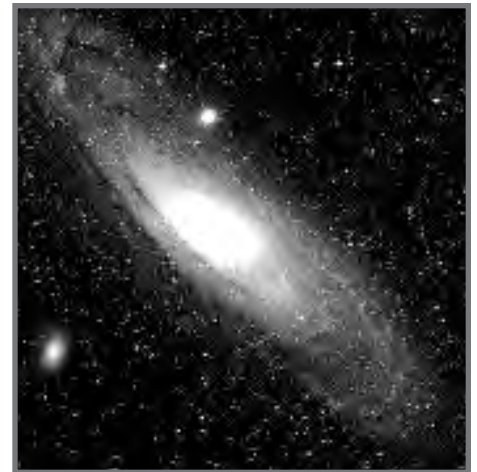
by 6th Grade Teacher Bill Walsh

Back in college I was intrigued by the writings of Teilhard de Chardin, a visionary French Jesuit, paleontologist, biologist and philosopher who spent his life attempting to integrate religious experience with evolutionary natural science. As you might imagine, the attempt did not endear him to either camp, and his books were banned by the Vatican and ridiculed by many scientists. Nonetheless, I was delighted by his buoyant spirit and taken by his basic premise that matter in our universe, despite many dead ends and failed experiments, has continually evolved toward greater complexity and consciousness. Long before the earth was photographed from space or the internet was anything but a fantasy of science fiction, Teilhard suggested that our planet as a living organism was developing a cerebral cortex or "noosphere" -- a planetary thinking network that would include vast amounts of shared information, instant communication, and global awareness. In my early teaching career, I was fond of posting one of his quotes on the classroom wall that said, "The age of nations is past. The task before us now, if we are to survive, is to build the earth." Teilhard's vision, however, did not end at the illumination of the earth --it included all of creation. He believed that the universe itself would ultimately wake up.

Fantastic as this vision may sound, it has recently found some confirmation in cutting-edge cosmology and the exponential growth of technology.

The scientific story of our universal past can now confidently trace our origins from the Big Bang to the formation of galaxies to the fusing of heavy elements in super novas to the creation of solar systems and the rise of life on our planet. Our earthly evolution itself is a process through which the atomic structures of physics and chemistry assembled into the greater complexity of DNA biology, which ultimately led to the neural circuits and consciousness of brains. It is important to note that this progression has not only been steady, but that it has gained increasing speed. The Big Bang happened some 13.8 billion years ago, our earth 4.5 billion years ago, the first microbes 3.5 billion years ago, the first animal forms 570 million years ago, and our own human species a mere 150,000 years ago.

Once our Cro-Magnon hominid brains developed the ability to talk -- a leap that some call the Mind's Big Bang -- we left behind millions of years of simple stone tools and fire to create an oral heritage of new ideas and technology. We left our African home in waves starting around 60,000 years ago and spread throughout the globe with astounding success. The great river civilizations of the ancient world begin to appear around 5,000 years ago, and with them came large-scale agriculture, architecture, arts, astronomy, mathematics, medicine, metallurgy, and the recording of knowledge in writing. Early writing first appears in clay tablets, but then makes its journey through sheepskin and



papyrus to paper and the printing press and library books to vacuum tubes and transistors to the silicon chips of computers. In short, human consciousness has consistently grown and built upon itself with increasing speed and efficiency. In the last 500 years alone, we have traveled from a central earth with an orbiting sun to a universe filled with billions of stars in trillions of galaxies; and one need only go back 100 years to find a world with just a few rudimentary cars and planes, let alone moon flights, cell phone satellites, space stations, celestial telescopes, or robotic rovers on Mars.

Many scientists believe that we are now at a point in technological evolution that the ever-expanding tools and speed of change are going to go through the roof. Explosive growth like this is called exponential because it builds upon itself and mimics the mathematical expansion of powers. If I start with

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# INNOVATIVE PROBLEM SOLVING IN MATH AT CRS

by Coordinator of Upper Grades Mary Walsh

**Given:** *The fields of science and technology are evolving at an exponential rate.*

**Prove:** *Problem solving skills are the most essential elements of a mathematics education that prepares children to face the challenges of the future.*

The theme of this edition of Gray Matter reflects the growing awareness among educators of just how rapidly the world around us is changing. It's an exciting time to be alive! However, the rate of change is such that it is impossible for any math curriculum to keep pace with all the new developments in a way that specifically prepares children to meet them. Clearly, our students need to be competent problem solvers who can make sense out of new ideas and draw their own conclusions.

Luckily, as far as developing problem solving skills goes, the Charles River School is way ahead of this wave of concern currently crashing into the educational establishment. In fact, our philosophy of teaching mathematics is based on a discovery approach. Beginning in Pre-Kindergarten, students engage in tactile activities designed to stimulate their curiosity and build a very personal understanding of concepts. Far from the spoon-fed teacher dictation of algorithms, our students are building their own web of mathematical numeracy. Through the years, the material becomes more abstract, but the thinking behind the ideas remains a central focus.

Starting in sixth grade, every math class begins with a problem of the day. In the lingo of math educators, these are called non-routine problems because they require students to integrate a variety of concepts and skills, that they may or may not be currently studying. Sixth grade teacher Bill Walsh likes to use sports analogies when describing the

impact this has on student achievement. In basketball, for example, players who love the game are motivated to practice their dribbling and shooting. Similarly, once students catch the joy of problem solving, they are willing to work on the basic skills and fundamental computational procedures that will improve their efficacy in these endeavors. This results in increased confidence and an eagerness to continue the process.

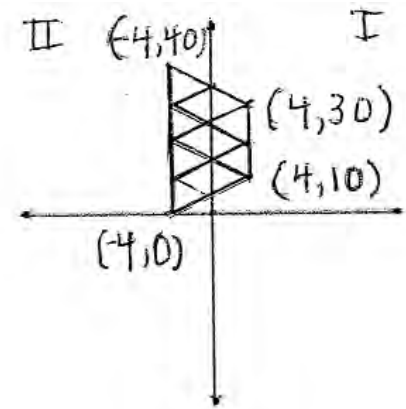
A key element of this approach is the emphasis on diverse explanations of how individuals arrived at a solution. If we hope to develop analytical skills, the thinking behind the answer is just as important as the answer itself. Students learn from each other, and they also gain an appreciation for the truly elegant solutions, ones that inspire exclamations of surprise and open new doors for future discoveries.

One type of problem Mr. Walsh often gives to sixth graders is: "Nurse Carol can paint a room in ten hours. It takes Desi five hours to paint the same room. How long will it take them to do the whole job if they work together?" Anyone who remembers algebra can solve this easily, but a sixth grader needs to combine fairly sophisticated fractional concepts with an understanding of rates in order to arrive at the solution. Many immediately guess seven and a half, but once it is pointed out that Desi could do it alone in five hours, they get down to work.



Eventually, most students solve it by reasoning along these lines: If Nurse Carol can paint the whole room in ten hours, she can paint one-tenth per hour. Similarly, Desi can paint it in five hours, so she can paint one-fifth, or two-tenths, per hour. Together they paint three-tenths per hour. After three hours they've painted nine-tenths. But how long will it take to paint the last tenth? A variety of solution methods lead to the conclusion that if they paint three-tenths in one hour, or sixty minutes, they paint one-tenth in a third of that time. So, it takes them three hours and twenty minutes.

Almost every day, there are multiple solution methods to the problem of the day. One time a particularly incisive solution to the wall painting problem emerged: If Desi is painting twice as fast as Nurse Carol, she completes two-thirds of the whole room when they work together. It takes her five hours, or three hundred minutes, to paint it by herself. Therefore, it will take her two-thirds of that time, or two hundred minutes, when she works with Nurse Carol. The same answer -- three hours and twenty minutes -- with a fraction of the effort! By the way, in an eighth grade discussion of a similar problem, we realized that the answer is always the reciprocal of how much the team can complete in one hour. Can you figure out why?



The enthusiasm around sharing solutions to the problem of the day is palpable when students come to seventh grade. They eagerly wave their hands in the air, pleading, "Can I say how I did it?" This year there is such passion around this that we are actually keeping track of who gets to present a solution each day in order to ensure equal opportunity idea sharing.

Many 7/8 students also participate in the Mathcounts club, which meets once a week during recess and lunch. (Mathcounts is a national non-profit organization whose mission is to promote mathematical excellence among middle school students.) Students solve ten non-routine problems a week and then share their thinking at meetings. Creative solutions inspire particular admiration in this group, and we recently had a perfect example of a succinct, divergent approach to the following problem: "A trapezoid has coordinates of  $(-4, 0)$ ,  $(4, 10)$ ,  $(4, 30)$  and  $(-4, 40)$ . What is the ratio of its area in the first quadrant to its area in the second quadrant?" By the time they are in eighth grade, most problem solvers can compute the length of vertical and horizontal

segments by subtracting the relevant coordinates, so the standard solution is to find the lengths of the bases, use these to find the area of the entire trapezoid, and then figure out how much lies on either side of the y-axis. However, this requires first figuring out at what points the figure crosses the y-axis, which calls for fairly complex reasoning from this age group. One of our most accomplished mathematicians explained this complicated process in detail, concluding that the area in the first quadrant is 100 and the area in the second is 140, so the ratio, reduced, is 5:7. Another student then shared a stunningly simple visual solution. By drawing the figure and then dividing it into equal triangles, he was able to quickly cut to the heart of the problem, irrefutably showing that the ratio is, indeed 5:7 -- just count the triangles on either side of the y-axis! There was an audible gasp of delight when he finished his demonstration. (See graph; x-axis interval = 2, y-axis interval = 5) *(top right)*

Our most sophisticated venue for solving non-routine problems is the fall Mathcounts elective. It offers the most motivated and capable mathematicians the opportunity to stretch their skills

and even learn content not taught in regular courses. It also prepares them to compete against other middle schools in February. Every week these students attempt to solve ten super challenging problems, which they are given time to discuss in math class and with each other at the elective. These are not trivial problems! In fact, this is my personal vehicle for keeping the joy of problem solving alive and fresh. It feeds my enthusiasm for teaching and reminds me what it feels like to puzzle through confusion and piece together personal understanding.

Throughout their years at the Charles River School, students are encouraged to make meaning out of what they learn, whether in thematic studies or mathematics. This has always been true, but it is more important now than ever. Our curricula are designed to help students become flexible, creative problem solvers -- skills they will need in order to thrive in this rapidly changing world. We aim to cultivate minds that will be ready to meet the challenges of the future -- challenges we can now only imagine.

# CREATIVE CONVERSATIONS WITH CHILDREN

by PreK Teacher Karen Belsley Pratt

Parents of our students frequently ask us the question, "What can we be doing at home to help our child learn in school?" They are often surprised by our advice: have meaningful conversations with your children.

One might argue that we talk with our children all the time. Think, however, about the nature of many of those conversations; "I need you to help clean up your toys... Would you rather have green beans or broccoli?... Please stop hitting your sister." Much of our language is directive, or poses questions that offer limited choices. And though some children can be downright creative with their arguments as to why they shouldn't have to eat broccoli, for the most part children respond by following (or choosing not to follow) our directions with little or no further communication.

Having conversations that encourage our children to develop constructive and creative verbal expression takes work, thought, and a lot of practice. But it is through substantive and imaginative dialogue that creative language, and with it the building blocks necessary for learning to read, write and think critically, are developed.

The practice of having regular, meaningful conversations with children forms the framework of the Reggio Emilia approach to early childhood education, originating in the municipal preschools of Reggio Emilia, Italy. The Reggio Emilia approach emphasizes creating dialogue with children; a part of each day they describe as *conversazione*, or "serious talk with children about their ideas about something of importance." Teachers see their role during these conversations as facilitators, rather than



instructors. Their job is to ask questions that provoke discussion and thought. To quote Reggio Emilia educator Carla Rinaldi; "Children are searching for the real meaning of life. We believe in their possibilities to grow. That is why we do not hurry to give them answers; instead we invite them to think about where the answers might lie. The challenge is to listen. When your child asks, 'Why is there a moon?' don't reply with a scientific answer. Ask him, 'What do you think?' He will understand that you are telling him, 'You have your own mind and your own interpretation and your ideas are important to me.' Then you and he can look for the answers, sharing the wonder, curiosity, pain -- everything. It is not the answers that are important, it is the process that you and he search together."<sup>1</sup>

In PreKindergarten, we have been working on having regular "conversations" with our students. Through this practice, we are able to discover and explore our students' own understandings and misconceptions, and encourage them to use their imagination, search for

connections, and explore vocabulary, analogy, and metaphor to explain their thinking.

During our study of pond habitats this fall, it became evident in that many children were confusing different types of bodies of water. Oceans were mixed up with ponds, and whales were swimming among the frogs and duckweed. With a large pan of water as a prop, we initiated a "creative conversation" with the question "Can ponds have waves?" and let the conversation unfold.

- (T: teacher, C: individual children)  
 T: *Can ponds have waves?*  
 C: Sometimes ponds can have waves. My mother's mother's pond has waves... we saw them when we went to visit.  
 C: There are always little waves going up and down.  
 T: *I'm wondering -- what makes the waves?*  
 C: Wind makes waves.  
 C: Maybe there is a waterfall somewhere. Waterfalls make waves.  
 T: *That's an interesting idea. I'm curious -- how does a waterfall make waves?*  
 C: When the water comes down the

waterfall it cannot go up and it makes waves.

C: Sometimes it is wind. Sometimes it is big animals.

T: *If a pond has waves, how do you think they got there?*

C: Boats can make little waves.

C: Animals make waves. Fish make waves.

C: No, they are ripples. Not waves.

C: Wind.

T: *Can wind blow on a pond?*

C: Yes.

T: *What do you think will happen if I blow on this water?*

C: It will make waves.

(Teacher blows on water in pan.)

C: It is making ripples!

T: *I'm curious -- are ripples waves?*

C: Ripples are little waves.

C: No, ripples aren't waves. Waves are bigger.

T: *What makes waves in oceans?*

C: Storms and wind.

T: *Are waves in oceans bigger than waves in ponds?*

C: Yes.

T: *How come waves in oceans are bigger?*

C: Because they are bigger -- the waves are bigger because oceans are bigger.

C: Because there are more animals, and they move around.

C: Ships can make big waves because ships are bigger than boats.

T: *You're thinking about animals making waves big, and ships making waves big. What else do you think makes waves big?*

C: Storms.

T: *Has anyone ever been in an ocean wave? Or felt an ocean wave? How did it feel?*

C: Cold.

C: Warm.

C: I went swimming with my dad and he held onto me.

C: Waves in Brazil are bigger than the oceans here. Because the ocean there is bigger than the ocean here.

C: I felt the waves when I was in Miami.

C: Waves are crazy!

C: When I was in the waves I kept wanting to go back.

C: Roan fell down and Mommy had to go get him.

In his article "Helping Children Ask Good Questions,"<sup>2</sup> George Forman notes that good questions encourage children to think about their own thinking. In our conversation above, the child who suggested that waves in ponds are made by waterfalls was encouraged to question his own understanding by being asked: "That's an interesting idea. I'm curious -- how does a waterfall make waves?" The teacher used the child's idea to address the incompleteness of it, and to encourage him to think further about his response. The accuracy of the child's observation is not important; what matters is exploring the idea that each of us can ponder our own responses, and deepen and alter them to our satisfaction. By asking, "I'm curious -- how does a waterfall make waves?" rather than "What do you mean by a waterfall makes waves?" we are honoring the reasoning that the child has constructed, rather than asking him to change his response. We want to encourage the child to explain how he sees that happening ("When the water comes down the waterfall it cannot go up and it makes waves"), rather than leave him with the feeling that he has failed to communicate.

It can be hard at times to let the technical inaccuracy of the response slide, and yet, for the purpose of this type of conversation, it is entirely necessary. If we respond, "Are you sure that waterfalls cause waves?" we have taken the focus away from the child's thought, and turned it to what the teacher thinks of the child's thought. Sensing incredulity in a teacher's tone, a child might quickly back off his thought process, instead of providing a more reflective response. When reflecting on the suc-



cess of a "conversation," we are less concerned with the information we were able to convey than the insights we are able to glean about our children; what did they know, think, wonder, guess and feel? Did they share knowledge with their peers? Did they listen to each other, and possibly adjust their own ideas in response? Did they connect our questions with their own personal experiences? Were they able to use descriptive vocabulary and analogy to explain their reasoning? And most importantly, was their conversation meaningful to them?

The process of exploring concepts, expressing ideas, and evaluating them critically, with language that is purposeful and creative, is at the root of all learning. Children bring these developing language skills with them as they learn to read, and endeavor to assign meaning to the text in front of them. As they begin to write stories and essays of their own, their developing skill with dialogue, and with language that is both generative and evaluative, gives them the tools they need to write imaginatively and thoughtfully. Their ability to think and express themselves creatively and critically begins with the meaningful conversations they have with their peers, teachers and parents.

<sup>1</sup>Cadwell, Louise Boyd (1997) "Conversations With Children." In Joanne Hendrick (Ed.) *First Steps Toward Teaching the Reggio Way*, Upper Saddle River, N.J.: Merrill/Prentice Hall

<sup>2</sup>Forman, George, (1992) "Helping Children Ask Good Questions." In B. Neugebauer (Ed.) *The Wonder of it: Exploring How the World Works* Redmond, WA: Exchange Press

# A PARENT'S PERSPECTIVE

by CRS Parent Lisa Henderson



As parents we know we want to prepare our kids for life. It can just take a little while for us to figure out how best to do that. While it used to be "enough" for parents to tweak what their parents did, the world is changing so rapidly these days that many of us are anxious -- perhaps overly so -- about what foundation will best serve our children beyond childhood. One area where this anxiety is paramount, for parents who are fortunate enough to have options, is the selection of an elementary school. It has never been easy to determine what will be the best long-term fit for a four-year-old -- their school life has just begun! But in a rapidly changing world, this challenge can seem even greater. How do we determine what school will best prepare our child for a world we cannot yet envision? Two sayings come to mind, one from an Oriental rug seller, and one from a child psychologist, that may hopefully shed some light.

Scott Gregorian, of Gregorian rugs in Wellesley, once told me that his father would often say, "When looking to buy an Oriental rug, it is best to pick

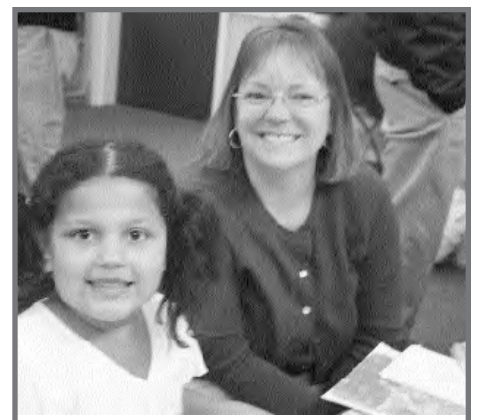
the rug dealer first, rather than delving into the vast inventory of rugs available on your own." The reason: It is a very complex market, with lots of false information that sounds real, and no real way for a novice -- even one who has read several books on the subject -- to know the real value of a given rug. It is far easier to research a rug dealer than it is to try to track down and determine the veracity of the details of a given rug.

Determining what the world will look like in twenty years and what skills and experiences will be fundamental to success, however you define it, is far more complex than purchasing an Oriental rug, but I believe the analogy holds. In picking a school, we are picking a partner, an organization that will work with us to help our child grow, learn, and enjoy his childhood. In fact, when you add up the hours, the adults from the school we ultimately choose may end up spending more time with our child than we do! In selecting a school, it is important to assess which partner is worthy of this relationship, which school's outlook on the world we can trust, and which school is growing

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and learning itself. And while our chosen elementary school --and we -- may not be able to predict the future two decades from now with certainty, we can pick a school whose approach to change, learning, and skill development reflects our own. Then, as my father used to say, we have to trust the process.

Robert Evans, PhD, the child psychologist I previously referred to and author of *Family Matters*, is often quoted as saying something to the effect of: "We must prepare our child for the path of life, rather than preparing the path for our child." It is quite common these



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days for parents to try and prepare the path for our children, so that their ride through childhood is smooth and comfortable. This is completely understandable -- who wants to see their child suffer or fail? And yet, the emerging world, just like the world we were born into, is a world that isn't perfect. It doesn't cater to each and every one of us. It rewards prudent risk-taking, messy teamwork, creative and unconventional thought, multiple viewpoints, and adaptability. Children who are prepared for this path are children who are prepared.

What does this have to do with picking a school? A school that sees its role as preparing the child for the path is concerned about how ideas are taught, not just what ideas are taught. It encourages kids to think critically, to learn directly from their lives, to wrestle with problems and points of view, to work within groups to articulate problems and identify solutions, to manage their time and the deluge of information available at any given moment, to know themselves and be able to reflect on their lives, and to be able to enjoy -- and thrive -- throughout their childhood.

When choosing a school, each of us has to determine what we value, and the skills, perspectives, and environment that best suit our families. Now that we have a sophomore and junior in high school, I look back at our experience at Charles River School and am grateful for the partnership we have enjoyed, and the skills and experiences my children gained at CRS. It has been a terrific foundation for my children, and a worthy partner for my husband and me, as we have grown and developed as parents.



the number 1 and double it, I get 2. If I double 2, I get 4 -- then 8, 16, 32, 64, 128, 256, 512, 1,024 and so on. It's easy to see how quickly this gets out of control in only ten doublings even though it starts in small increases that seem fairly manageable. If I graph these numbers on a coordinate plane and connect the dots, they produce a smooth upward curve that starts in a slow slope but eventually rockets toward infinity. In the same way, the successively exponential leaps we are now making in modern science could soon transform every aspect of our world. The emerging fields of nanotechnology, genomics, and robotics promise to solve the problems of pollution and global warming, fight disease and increase human longevity, provide clean renewable energy, ameliorate poverty, and start our journey to the stars.

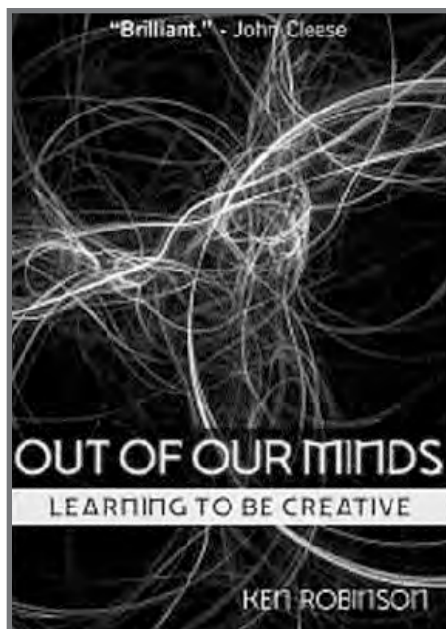
It is intuitively difficult for us to absorb this exponential vision of the future because we live our lives in a linear fashion and must proceed moment-by-moment to meet the challenges of the day. We each have no personal guarantee of tomorrow, let alone the experience of these extraordinary changes that are almost too incredible to imagine. There are also many intractable problems that beset us on all sides, not the least of which seems to be our own human nature. In 5,000 years of human history we have recorded over 14,000 wars, and one need only look to the reckless

financial crisis to see how self-accelerating feedback systems can implode as well as explode. Still, tomorrow is coming with or without our consent, and it is exciting to envision the possibilities and opportunities of our children's lives. In the last few weeks since I began to think about this article, NASA has successfully tested a deep space internet, a nanoengineered coating for solar panels has increased the top absorption of sunlight from 60% to over 97% from any angle, a complete cancer gene has been sequenced, and a skinny pill 1,000 times more effective than resveratrol has been found to dramatically affect health and longevity in mice. It is estimated that 4 exabytes ( $4 \times 10^{19}$ ) of unique information will be generated this year, more than in the past 5,000 years. And it appears the noosphere has arrived as well -- Google records over 10 billion searches per day, and the number of people on the internet social network MySpace alone could rank them as the 5th most populous country in the world.

Today when I encounter the ubiquitous scientific debate about the coming singularity or the eventual intelligent destiny of the cosmos, I remember the hopeful optimism Teilhard maintained in the face of censure and cynicism. Like any true teacher, he inspired me to look at things anew and to try to live beyond myself in a more transcendent view. I imagine he would feel very at home here at CRS -- a place where intellectual and artistic dreams are passionately nurtured within a context of cooperation, caring, and courage. As Teilhard said himself, "Our duty, as men and women, is to proceed as if limits to our ability do not exist. We are collaborators in creation."

# OUT OF OUR MINDS: A BOOK REVIEW

by Dean of Faculty Dibby Moder



In his book *Out of Our Minds*, Ken Robinson claims that we must radically change our priorities for education if we hope to adequately prepare children for their future.

Robinson underscores the currently exponential rate of social and economic change throughout society, largely due to the impact of technology. New skills and abilities are necessary for success in the changing world, Robinson argues, which are not being developed or valued by our present educational system. Drawing on a wide-ranging perspective on history, science, technology, philosophy, economics, art, and psychology, Robinson explains what is happening in our current cultural revolution, defines creativity and why it is so necessary for the future, and suggests how education can identify and develop creativity within individuals, and as part of the overall culture.

## *The Cultural Revolution*

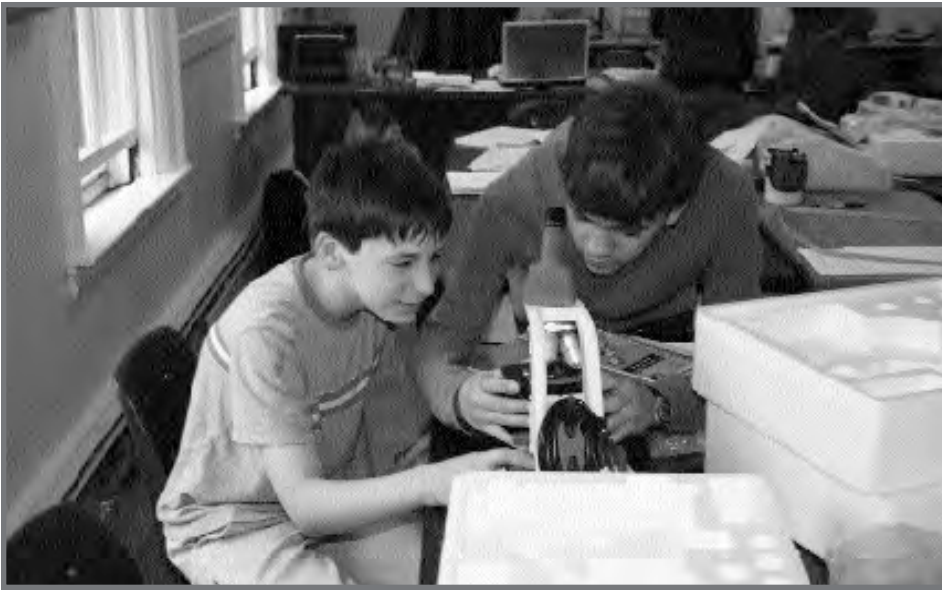
We are currently experiencing such dramatic changes in all aspects of our lives that we cannot even imagine what the future will bring. Robinson identifies a number of social, economic and technological forces converging to transform the way we live and view our world. He draws a parallel with the transition from medievalism to the modern age, when the world culture radically shifted from superstition and myth to the development of rational, objective thought and factual knowledge. This "paradigm shift," which created tremendous turmoil in how people lived their lives, is similar to what we are experiencing today. Such cultural revolutions

are "tumultuous, complex, and drawn out." (p.182)

In today's rapidly changing world, we live in the age of information and our main commodity is ideas. People will live their lives and earn their livings based on what they know, and what we need to know is changing every day. We cannot predict the types of jobs that will soon be created, and cannot anticipate what is now unimaginable, but will soon be reality. Already there is "a massive gap between the skills and abilities that business needs and those that are available in the workforce." (p.18) So how do we prepare for this unknowable future? What are the skills and abilities we should be developing in our children? Robinson states that what we, and they, will need creative and innovative thinking, flexibility, and the ability to work and communicate effectively in teams.

## *What is Creativity?*

Robinson defines creativity as a "dynamic process that draws on many different areas of a person's experience and intelligence." (p.12) While creativity is a function of intelligence, it also involves a wider range of human capacities than merely the intellect, such as imagination, emotion, intuition, and personality. It takes the whole person to generate original ideas, moving beyond rational thought "into the flow." The human capacities of rational thought, emotion, intuition and imagination all contribute to the creative process. As Robinson describes the creative process; "we let down a bucket into our subconscious and draw up something that is normally beyond our reach." (p. 154)



Creativity flourishes in cultures that encourage risk-taking and experimentation...

One misconception about creativity is that some people have it and many do not. In fact, all people are creative, but many may not have found the medium through which they could most naturally express it. If given the right opportunities and encouragement, everyone has the capacity for creative thought and expression. Another misconception is that creativity is only expressed through the arts such as music, visual arts, and drama. Creativity is, in fact, inherent in every form of human endeavor. It is also closely connected with its cultural context. An original idea results from all that has gone before it, and the individual who generates it does so based on interactions and influences from others within that culture. Creativity flourishes in cultures that encourage risk-taking and experimentation, and can just as easily be shut down in cultures that do not value it. It is a dynamic process that develops incrementally, building on what has come before, and through multi-disciplinary interactions among different areas of expertise. Creativity also involves taking wrong turns, making mistakes, and using those experiences to further build what is not only creative but also valuable to the culture.

#### *How Can Education Prepare Students for the Future?*

Schools must now examine their underlying assumptions about what should be taught and how. While Robinson agrees that standards should be high, he questions the value of the standards currently in place. He states that educators should not be striving to just do better than what has been done in the past. Raising current academic standards will not be helpful if those standards are not what is needed to prepare students for the future. Instead, we must define new standards that more fully develop human capacities beyond the narrow range of academic skills that are the basis of current educational practice. Traditional education has placed a priority on a limited set of skills based on factual knowledge, critical analysis, and short-term memory. Academic success, as measured by these skills, is frequently confused with overall intelligence. However, many highly intelligent people are not necessarily successful in traditional academic settings. Schools need to broaden their appreciation of the myriad ways in which human intelligence can be expressed, and in particular, encourage the development of creativity. As

Robinson says, "Real creativity comes from finding your medium, from being in your element." (p. 10) When each individual is more fully using his or her creative intelligence, the entire society benefits. A primary goal of education should be to help students find the medium through which they can express their inherent potential, in whatever forms it takes.

To develop creative thinking in individual students, schools need to foster a climate that facilitates risk-taking and experimentation, and provides opportunities to explore, play, and imagine. This does not mean that traditional academic skills are no longer important. Effective harnessing of creative efforts also requires problem-solving, reasoning, and acquired knowledge. Both the generation of novel ideas and the critical analysis of their usefulness are integral parts of creating something of value. Schools need to broaden the range of opportunities available for expression of individual intelligence and for working collaboratively across disciplines, which can then lead to valuable innovations within their cultural context.

# TAKE A RISK!

by 3rd Grade Teacher Nicole Mladenoff



Creativity is a characteristic that is brought up over and over again when discussing what skills will be necessary to be successful in the 21st Century. Students at CRS learn to be creative in many different ways. One way we encourage creativity is by fostering risk-taking in the classroom. Each school year begins with the task of writing a community agreement for the classroom. How do we want our community to look and feel as we embark on this new year? It's a chance for children to have a fresh start and to put their best foot forward. It's an exciting and important time of year during which we set standards, raise the bar and see how high we can reach. It's a time to take risks!



This year when the third graders sat down in a "puddle" at my feet and began brainstorming what they thought needed to be to put on our community agreement, they quickly came up with the ideas we would hope and expect them to come up with by the time they reach third grade; be respectful to your teachers, classmates, and materials, be safe, and have fun. Just when we thought we were finished with our list, another hand went into the air. "Take risks," came a small voice from the floor. Yes, I thought! This is an important item to add to our list! Take a chance, try something new, and step out of your comfort zone... Take a risk!



By the time children enter third grade they are beginning to gain independence and are more aware that there is a big world out there. They are becoming less egocentric and more able to see that their actions have an effect on others around them. Having this knowledge is important information for

a child who is being asked to become a risk taker. The reason it is so important is that their reactions when a friend takes a risk will likely affect that person's self-esteem. A positive reaction will send a third grader's self-confidence soaring, while a negative reaction will make him tentative about taking another risk anytime soon. Therefore, creating an environment in which children feel safe and protected is the essential first step.

It is imperative that the child feels comfortable with her/his classmates, herself/himself, and the teachers. Without the safety net of their classroom community, it will be more difficult, if not impossible, to take risks. Taking a risk means that there will be more opportunities to fail. We teach the kids that failure can be a good thing. Without mistakes, there is nothing to learn from. In a safe environment, it is good to make a mistake, because we can all take that mistake and learn something from it.

It's important to talk about what language to use when someone takes a risk. A positive leader uses supportive language such as, "Wow, that must have been hard for you to raise your hand when you weren't sure of the answer" or "I think that what you did was really brave. Thanks for helping me learn." Teaching kids that sometimes all it takes is a few kind words to make someone feel better about themselves helps to create social harmony in the classroom and builds a caring and respectful classroom -- a classroom in which students feel comfortable and are ready to take risks!