America Losing the Competitive Advantage
A Solution

Randolph E. Gunter, Ph.D.

> "A highly skilled workforce is the lifeblood of any successful company, industry, or national economy. Regrettably, the U.S. K-12 system is failing to provide the math and science skills necessary for kids to compete in the 21st century workforce, and the U.S. higher education system cannot produce enough scientists and engineers to support the growth of the high-tech industry that is crucial to economic prosperity." (*AeA*)

> "If America is to sustain its international competitiveness, its national security, and the quality of life of its citizens, then it must move quickly to achieve significant improvements in the participation of all students in mathematics and science." (*A Commitment to America's Future*)

As I will detail in this white paper, we have a proven effective, research-based, inexpensive, and easy to implement solution that can help reverse current math and science achievement trends; a unique research-based online professional development solution for teachers. This solution is for fifth through eighth grade teachers that can lead to dramatic and measurable improvements (test scores) in student math and science achievement. This solution trains teachers to effectively integrate 21st Century technology to both teach and more importantly reach/engage today's digital generation. First, let's look at how we are doing in math and science achievement and why America is loosing the competitive advantage in the global economy.

How We Are Doing – Mathematics Achievement

The latest mathematics data from *The Nation's Report Card, Mathematics 2007* and *12th-Grade Reading and Mathematics 2005* released by the U.S. Department of Education and the National Center for Educational Statistics (2007) is summarized in the following table.

	Below Basic Level (percent)	**Basic Level (percent)**	**Proficient Level (percent)**	**Advance Level (percent)**
4th Grade	19	43	33	5
8th Grade	30	39	24	7
12th Grade	39	38	21	2

Notes:

- **Below Basic Level** – Not defined by the U.S. Department of Education; however, students scoring below basic level clearly lack even partial mastery of prerequisite knowledge/skills.
- **Basic Level** – Students reaching this level have a partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at a given grade level.
- **Proficient Level** – Students reaching this level have demonstrated competency over challenging subject matter.
- **Advance Level** – Students reaching this level have demonstrated superior performance.

This research data reveals that 62% of fourth graders, 69% of eighth graders, and 77% of seniors scored at or below the basic level. Notice the decline in achievement from fourth through twelfth grade.

How We Are Doing – Science Achievement

The latest science data from *The Nation's Report Card – Science 2005* released by U.S. Department of Education and the National Center for Educational Statistics (May 2006) documents student performance in science and is summarized in the following table.

	Below Basic Level (percent)	**Basic Level (percent)**	**Proficient Level (percent)**	**Advance Level (percent)**
4th Grade	32	36	29	3
8th Grade	41	30	26	3
12th Grade	46	34	18	2

Notes:

- Average scores for fourth grade students were higher in 2005 than in 2000 or 1996; however, overall scores in 37 states remained unchanged.
- Science scores for eighth grade students remains unchanged since 1996.
- Performance of the nation's twelfth grade students in 2005 was unchanged from 2000; however, it was lower than in 1996.

The above data shows that 68% of fourth graders, 71% of eighth graders, and 80% of twelfth graders scored at or below the basic level. These results document a steady decline in science achievement from fourth through twelfth grade.

A second report, *The Nation's Report Card – Science 2005 Trial Urban District Assessment of Grades 4 and 8* released by U.S. Department of Education and the National Center for Educational Statistics on November 15, 2006 reveals that children in major U.S. cities performed worse than other students with 34% of fourth graders and 43% of eighth graders performing below the basic level.

An extensive body of research has conclusively documented that middle and high school dropout rates and failure to meet annual yearly progress (AYP) in math and science scores are directly correlated to a ***lack of*** the following:

1. Student stimulation in the classroom (digital kids need digital teachers)
2. 21st Century technologies and curriculum (relevant teaching)
3. Parental involvement

According to the National Center for Education Statistics only 28% of twelfth graders believe that school work is meaningful; only 21% believe that their courses are interesting; and only 39% believe that schoolwork will have any bearing on their success in later life. No wonder up to 40-45% of students in many high schools drop out before graduation.

The Solution

It is critical to address the problem in middle school and our solution addresses many of the middle school issues that impact student achievement, dropout rates, and AYP. Our solution is not just about technology integration, but "out of class" integration; getting students excited and parents involved in the learning process with **21st Century curriculum and technologies for 21st Century kids**. Our solution is a grade- and curriculum-specific professional development solution for fifth through eighth grade teachers.

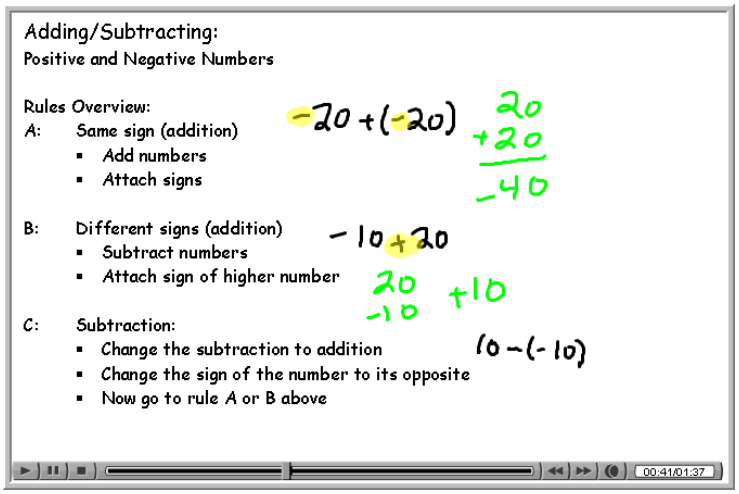
Project Math and Science

- One graduate level online class, *Teachers Discovering Computers – Integrating Technology and Digital Media* (TDC), taken by all fifth grade teachers and sixth through eighth grade math and science teachers
  - Grade- and curriculum-specific
  - Extensively video and Web enhanced
  - 100% online and fully instructor led
  - Equivalent of a 3 semester hour graduate class for professional development or continuing education credit; teachers can opt for graduate credit
- Three to four district and school level informal workshops where teachers will work together to produce grade-specific mathcasts and sciencecasts for the parental involvement component of the solution

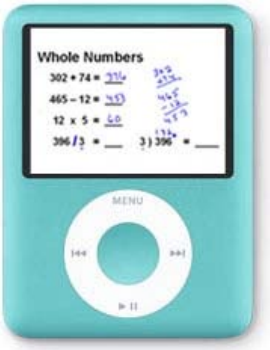
The Teachers Discovering Computers (TDC) course provides teachers with extensive curriculum-specific and kid-specific integration strategies utilizing advanced and emerging 21st Century technologies such as video screencasts, podcasts, blogs, wikis, and many others. The overarching theme of the TDC course is that **digital kids deed digital teachers** so that students can engage in new learning environments, which will increase their achievement and, in turn, better prepared them for successful employment, life-long learning, and citizenship in the knowledge-based, digital, and global 21st Century. The most distinctive and proven effective aspect of the TDC course is that each participant learns how to integrate technology into their specific classroom curriculum or administrative area (curriculum-specific) and with their students (kid-specific). Every participant engages in a different learning track with their instructor.

An extremely important feature of the TDC course is the weekly Classroom in Action. During these 14 weekly segments, the TDC digital guide assists educators as they learn about (1) the characteristics of the digital generation and how they learn; (2) how to become a digital teacher and meet the needs of their digital kids; (3) globalization and America loosing the competitive advantage; (4) multiculturalism and how teachers can adapt their teaching strategies to reach all kids, regardless of cultural background; (5) 21st Century skills that students need to succeed in the global economy; (6) curriculum specific strategies for helping their students meet the recently refreshed national student standards (NETS-S) which include creativity and innovation, communication and collaboration, research and information fluency, critical thinking, problem solving and decision-making, digital citizenship, and technology operations and concepts; and (7) specific strategies for helping their students meet NCLB requirements that "all students be technologically literate by the end of the eighth grade."

The 14-week course culminates in a final project when teachers create curriculum-specific, multi-level (student achievement levels), and kid-specific video screencasts for use by their students and their parents. A screencast is a digital recording of a computer's screen output with narration (examples shown in figures that follow). Curriculum-specific screencasts are unique in that they are created by teachers for their students to use when out of class; for example, mathcasts (see image below), sciencecasts, vocabularycasts, historycasts, and so on. Screencasts can be used to provide all students with a 24/7 live tutor with the tutor being their classroom teacher. This is using 21st Century technology in powerful and positive ways to improve student achievement, dropout rates, and AYP status.



These teacher and student created screencasts can be viewed live from the Web (shown above), from a CD or DVD on a computer, video iPod or iPod Nano (see below) or any other video player. DVDs also can be viewed at home using a DVD player and TV.



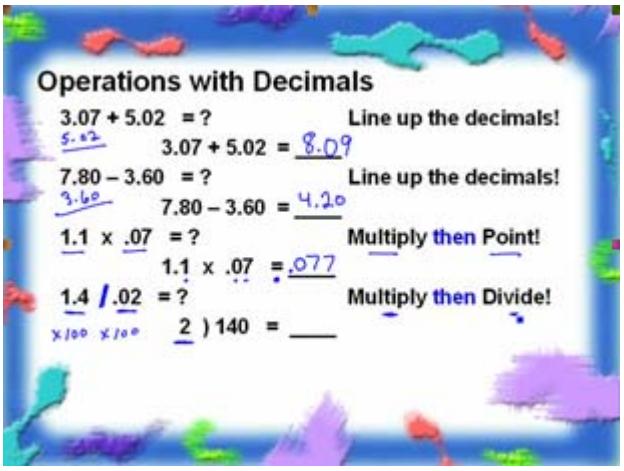
Imagine the potential of students reviewing and studying science or math concepts for a third period quiz using an iPod Nano on the bus ride to school – true 21st Century curriculum and technology using the tools that today's digital kids already love and crave. The best part is the students are interacting with their own teacher.

Teacher created screencasts for home use (DVD player/TV) virtually eliminate the digital divide and allow parents to help their children with, for example, their math homework. Parents do not

have to know the math concepts, have a computer or Internet access, or be trained on using a specific technology. These parental involvement screencasts also can be created in Spanish and other languages to help solve our increasing English as a second language problems. Think of the power of Hispanic parents helping their 5th grade child learn math concepts or helping them with their homework in cultural-specific Spanish using their television remote control – 21st Century learning using 21st Century tools all at the cost of approximately 20 cents per student (the cost of blank DVD).

Below is an example of what students and their parents could be interacting with during the summer using their DVD player, TV, and remote control. The video could start with a message from the teacher and then have a menu of videos, just like a movie DVD. For example when the DVD is inserted into a DVD player, the video starts with: "Hi, I am Ms. Jones and I need your help. I am going to be one of your child's seventh grade math teachers this coming school year. On this DVD are videos that you can use to help make sure your child has sufficient sixth grade math skills to succeed in seventh grade math. I will review …"

Our solution provides teachers with a realistic and easy to implement opportunity to get parents involved in helping their children learn math and other core subjects using 21st Century communication strategies between school and home. The enormous potential here is fueled by imagination as shown in the teacher-created video below. This particular video is 34 minutes long, is fully interactive using a DVD remote control, contains lots of color, and utilizes background music track (sixth grader's music or hip hop, not ours). It is also available on the Web at: http://www.21cls.com/kids/math.html



For more information on 21st Century Learning Solutions and our solution to provide **21st Century curriculum and technologies for 21st Century kids**, visit www.21cls.com. Included at our Web site is extensive quantitative and qualitative research conducted on thousands of educators that have completed TDC (12,000 to date), a video about the TDC learning adventure, and a TDC course Demo that includes the syllabus and first two weeks of the course.