Focus: Teaching Quality

Technology Integration in Science and Mathematics
The Opportunity to Explore

by Paula Johnson, M.A., Veronica Betancourt, M.A., and Hector Bojorquez

Though children are exposed to and begin development of algebraic models at a very young age, there is no true relevance in the early stages of their education. The idea of a natural mathematics progression in subsequent grade level knowledge is lost on the students themselves. For example, the formulae for rate and slope are relatively intangible concepts. We simply ask young scholars to take our word for it that if an unknown variable continually increases by the same value in subsequent steps in a pattern, it has a constant rate. And if this rate were to be graphed, it would indeed have a slope consistent with that rate, thus creating a linear function... What?

We can find similar scenarios in science as well. For instance, imagine graphing data collected during an experimental investigation that centers on the enzymatic effect on reaction rates of chemical combinations. It is difficult enough to understand the periodic table and how elements combine to form compounds, but now ask students to create a visual representation of data that demonstrates how enzymes affect the rate of reaction when two compounds are mixed together. Again, what?

Technological applications enable students to visualize scientific and mathematical concepts they may not be able to otherwise imagine. As children progress cognitively through their educational career, they are asked to give a variety of relational descriptions that are truly abstract notions. Asking a student to take such great leaps of faith is optimistic at best. In a generation dedicated to technology, it is in our best interest to take advantage of the engagement built into the devices at our disposal.

Options for Dynamic Learning
Technology is evolving and becoming more accessible to us instantaneously. It is certainly true that the availability of resources provided to individual teachers can vary dramatically and so does their level of technology efficacy and implementation. Dynamic learning can start off simply by including interactive websites that demonstrate conceptual targets, such as functions in math or chemical reactions in science. It also can embrace whatever technology is available at that moment, such as graphing calculators.

Mathematical Ownership
It often is questioned whether or not calculator-based ranger (CBR) activities actually improve student graphing aptitude and understanding. This device presents data in real time on calculators which may help students better visualize physical problems and check their intuitions. Kwon (2002) compared the mathematics achievement of students (in grades seven and eight) who used CBRs against those who did not (11th graders with no experience with CBR or graphing calculators). The findings suggest that use of CBR activities enhance students’ graphing abilities. These results speak to the endless (cont. on Page 2)

“The challenge before us is not that the faces of our nation’s children are changing. Our challenge is not our children at all, but rather our capacity, commitment and will as adults to achieve excellence in education for all students – everyone.”

– Dr. María “Cuca” Robledo Montecel, IDRA President and CEO
possibilities that exist even with what seem to be the most archaic technologies.

The point here is that we must seize the opportunities to embrace the technologies available. Imagine the feeling of accomplishment as you witness learners overcoming their initial preconceptions or misunderstandings about graphs (including their previous interpretations). In a discovery-based environment, students are less apprehensive and can actually enjoy themselves while making these connections. Moreover, an experience with CBR technology leads students and teachers to recognize the value of communication (oral and written) in learning mathematics (Stylianou, et al., 2005) and can set the foundation for further exploration of web-based technological applications as co-learners in the classroom.

Scientific E-Learning

In science, graphing calculators also can be used to find pH, temperature changes, acidity levels, change in rate and dissolved oxygen readings. The possibilities are numerous. However, we must find the courage to venture into the realm of the Internet and explore the possibilities of interactive technologies available for use in math and science.

Why?

Paper and pencil tasks offer a limited and narrow opportunity for understanding concepts. A slope is not simply a shape on a graph, it can represent the movement of concrete real-world applications. Yet, on paper it is static. CBRs, online applets and any form of technology that enables students to view in real time the effects of changing variables brings mathematical and scientific concepts to a deeper level of understanding.

What makes more sense to us: that the slope is a shape on cartesian coordinates or that the slope of a line can be representative of steepness of real-world objects (mountains, ladders, buildings) or exponential functions (temperatures, weight)? Technology offers us the opportunity to bring these concepts from abstractions to concrete examples by simulating the effects of numbers.

Resources


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IDRA has developed a series for educators to give ideas and help educators gain greater benefits from effective parent and community engagement to ensure school success for all children. There are seven issues in the series, one for each month of the school year. Each includes a theme for the month, classroom tips, an equity goal for the month, ideas for breaking down barriers, a self assessment tool, an action planning guide and resource suggestions. What follows is an excerpt from the first issue.

Parent and Community Engagement Leads to Student Success

Research confirms that strong school-home partnerships enhance teaching and learning. Engagement is a shared responsibility that builds trust over time and nurtures and supports students’ graduation and college readiness. Strong relationships with parents and community are built on valuing students, their families and communities as partners in education. Thus, positive attitudes are key to establishing a culture of engagement. Actively honoring and preserving language and cultural traditions are key to supporting successful engagement. It has been said that a people without knowledge of its language and culture is like a tree without roots. Parents, families, educators and communities help to foster the values and culture that sustain an ever-emerging civilization. Language is not only the expression of a culture; language generates culture. This series is designed to give you ideas to create a culture of engagement with parents and community as partners to ensure school success for all children.

This Month’s Theme...

Knowing the history, culture, knowledge and wisdom of the community we serve empowers educators to be more effective.

What We Should Know...

- Parents have unique contributions that support children’s learning that must be tapped by the school.
- Parent and community involvement enhances, deepens and accelerates children’s learning at all levels.

What We Can Do...

- Incorporate the community’s wisdom into the curriculum.
- Honor the knowledge, language and resources of families and communities.
- Make the school’s policies and practices more understandable, inclusive, and accessible to the community.
- Work toward mutual understanding and trust.

Apply This Month’s Equity Goal

Ensure equitable treatment for all students. Patterns of interaction between individuals and within an environment are characterized by acceptance, valuing, respect, support, safety and security such that students feel challenged to become invested in the pursuits of learning and excellence without fear of threat, humiliation, danger or disregard. Some examples:

- Implement decision-making strategies that seek parents’ engagement as equal partners.
- Create and support positive cross-cultural interaction among staff, parents and students.
- Set policies to assure non-discrimination under Title VI, Title IX, Section 504 and the Individuals with Disabilities Education Act.

Catalyzing for Action

Challenge: Form a community of practice involving community, family, students and school stakeholders that reflects a range of perspectives to conduct a self-assessment of a school’s status in relation to the equity goal addressed in this month’s issue. Conduct an assessment of your current engagement by reflecting upon and discussing (cont. on Page 4)
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(Community Engagement Tool for Educators, continued from Page 3)

each of the following items. Then use this self-assessment to plan for effective engagement in the section below.

1. Is training provided for staff, students, and parents in prejudice reduction, non-discrimination, and the eradication of racism, sexism and classism?

2. Are training and development being provided in areas such as problem solving, decision making, conflict resolution, interpersonal, and cross-cultural communication?

3. Does the staff create and implement plans for decreasing isolation, separation, and segregation between and among racially and culturally different students?

4. Do the interactions of all individuals – including staff, students, and parents – reflect sensitivity to and respect for the language, cultural and class differences of others?

5. Is there evidence of equitable support, treatment, assistance, and guidance given to students, parents, and staff?

Plan Together for Effective Engagement

Action: Use this section to continuously improve your community engagement using an equity lens. Determine one action that each stakeholder will implement. Review the progress being achieved around each of the equity goals already addressed.

• What’s working?
• What’s holding us back?
• What can be improved?
• Next actions
• By when?

Classroom Tips for Establishing Partnerships for Student Success

Proverbs cleverly express the folk wisdom of diverse cultures in memorable ways. Many people, including speakers of other languages, have grown up with proverbs taught to them by parents, grandparents, and other family members. Try these ideas...

• Use proverbs to honor culture.
• Teach students how to play with language and how to deal with life.
• Draw on the arts to help students appreciate their cultural heritage.

• Strengthen students’ linguistic skills through cultural and ethnic literature.
• Improve students’ abilities to cope and thrive in our complex world by discussing scenarios.

Related Resources

Books

• My First Book of Proverbs, by Ralfka Gonzalez and Ana Ruiz. See “An Introduction to Proverbs” lesson from the International Reading Association online at: http://www.readwriterthink.org/lessons/lesson_view.asp?id=184
• Promoting Student Leadership on Campus: A Guide for Creating a Culture of Engagement by R.G. Rodríguez and A. Villarreal, J.D. Cortez (IDRA, 2002).

Articles


IDRA Classnotes Podcast

• “Broadening the Conversation with Parents about Mathematics” with Jack Dieckmann, M.A. – Episode 46
• “Effective Parent Outreach” with Aurelio Montemayor, M.Ed. – Episode 28

IDRA’s Community Engagement Series for Educators, by Rosana G. Rodríguez, Ph.D., Juanita C. García, Ph.D., and Abelardo Villarreal, Ph.D., is available from IDRA for $15 per set of seven issues.

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Harnessing the Power of Web 3.0 with IDRA’s OurSchool Data Portal

by Kristin Grayson, M.Ed.

Ready or not, Web 3.0 is already here! Students are using it in their daily lives through multiple applications on their smart phones, iPads, computers and other devices. IDRA has developed a website, using Web 3.0 technology, to inform schools and help improve teaching quality and promote educational systemic changes. So, what is the IDRA OurSchool portal and what is Web 3.0? And what are other ways that educators can use the advances in technology to improve schools and consequently student achievement?

The power of this new generation of the Web (Web 3.0) is that it allows for the linkage of huge amounts of data that can be strategically managed and directed to attain goals and objectives. To put this into perspective, Web 1.0 was focused on Internet websites as static places where people could access information. It was followed by Web 2.0, also known as the social web (Armstrong, 2009), that focused on social networking and use of the web for interactive exchanges. This includes sharing sites, such as Facebook, MySpace, Twitter, YouTube, blogs and other sites where people collaborate and communicate in the virtual world.

Web 3.0, the newest phase of Internet use, is known as the semantic web. It includes the features of previous web versions and adds the awareness of location, moment and preferences (Armstrong, 2009). Web 3.0 is accomplished through linkages, created by advanced technology, that connect many disparate data sources and transform these pieces into meaningful information. This is done through accessing, sorting and summarizing large quantities of data.

A recent 2010 Verizon whitepaper defines: “Web 3.0 is referred to as the semantic web because it will use semantics – the study of meanings behind words and information – to interpret searchable content and thus deliver more appropriate and relevant content to end-users.” Hence, in Web 3.0, machines become the readers and writers of information that is important to us, whether it refers to an organization, a school or an individual user (McEneaney, 2011).

There are critics who say that Web 3.0 poses privacy and infringement issues, with machines controlling the information that is available to us (Kroeker, 2010). However, one must keep in mind that human agency determines the design choices made for computer usage. Other critics say that Web 3.0 lacks neutrality, that it reduces the democracy of the interactive Web 2.0 and might give incomplete information because of inadequate connectivity (Turban & Volonio, 2010). Despite these objections, in education, a key question remains: How can we use the latest technologies to work for us, as educators and educational systems?

IDRA has harnessed the power of Web 3.0 in its OurSchool data portal (http://www.idra.org/OurSchool). The portal exemplifies Web 3.0 because it is uses multiple data sources and innovative technology to provide synthesized data in a way that becomes usable information transformed to actionable knowledge that can inform educational policy and practice. It is a (cont. on Page 6)
many people interacting in many ways. Interactive reading and writing has become a reality. In Web 1.0, the writer was the computer programmer, whereas the reader was the user. In Web 2.0, the user and/or the student can be both the reader and the writer. Web 3.0 uses literacy robots (litbots) as machines or computers that are readers and writers (McEneaney, 2011) that can synthesize data into information that is then transformed into knowledge.

Web 3.0 is seen in the surging number of new applications available for digital devices. Students are using digital devices and applications without reservation. It is our challenge as educators to use these Web 2.0 and 3.0 tools in creative ways to propel student achievement forward.

Education has to make significant reforms to fit with the *netizens* (the Z or “Internet Generation” born after 1995) of today’s school populations. These are today’s students who have grown up with the Internet, interactive digital gaming, social media and the unlimited imagination of how technology in small devices, such as phones, readers and pads, can be used for individual and group interaction (Robertson, 2009).

Growing up in the digital age, the netizens’ perspective is essentially different, more global and imaginative than those who came before them. In order to challenge and engage students as more advanced technologies emerge, there must be a paradigm shift for many educators and educational systems to incorporate the power of Web 2.0 as well as Web 3.0.

**Resources**


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Coca-Cola Valued Youth Program
High School Winning Essay

Kayla Rugg
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Editor’s Note: IDRA sponsored a national essay competition among participants in the Coca-Cola Valued Youth Program, a nationally-recognized cross-age tutoring program of IDRA. Coca-Cola Valued Youth Program tutors wrote about how the program had helped them do better in school and how they had helped their tutees to do better. Six students received prizes. Below is the essay of the first place winner at the high school level.

What will I remember the most?
The smallest things in the world could leave the largest impacts on a certain person. You know the saying, “Every rose has a thorn?” Well, then is it also true that every thorn has a rose? In my case it is. Throughout the duration of the last two years, I have come to learn a lot about myself as well as others around me. I was steadily growing and developing as a person with these intelligent children as well as my own peers. What will I remember the most about this whole experience in the Coca-Cola Valued Youth Program? Where do I even begin? One specific thing doesn’t stand out to me because there have been a multitude of experiences that I’ve had.

Primarily, my main focus has always been on my well-being. How will I get where I am going? I never saw anyone else in the running, only myself surrounded by a wall of glass, ready to break. I was on the brink of losing everything that I had worked so hard for. Then, things just went from bad and skipped over worse to extremely terrible. The only thing that kept my feet firmly planted on the ground was the knowledge that I was here for someone else, and they were depending on me. Over the last few months, my priorities have completely been rearranged. After my mother kicked me out of the house, it was like I had this epiphany. No one is going to make my life better because that is something I have to do on my own. I have learned that if I do not keep my eyes focused on something real to me, it is so easy to fall. My grades started to slip, and I could see my dreams getting farther and farther away. That was when my focus was thrown from my emotional well-being, to my academic well-being.

I had more drive than ever. For the first time, the only thing I saw was the fact that I have to do this for me, and if I wanted to make a change it was now or never. I started going over to the elementary school more and more [as a tutor], really any chance I had. I put my life on hold and focused on theirs [my tutees]. I figured if I focused on them, then I wouldn’t get lost focusing on myself. You see, when you are enveloped in a cloud of darkness and you can’t see which way to go, there’s not much you can do. These children were my light. I came to find that I was learning as much from them as I was with the rest of my peers. Every time I sat down to help them out, it felt more like I was escaping from my own reality and diving head first into theirs. I was completely submerged in a realm of total comfort. You could find me going over to the elementary school both in the mornings as well as in the afternoons, that’s how hooked I was.

One of the hardest, best things that had ever happened to me during this whole situation was the fact of changing partners when the year began. I had spent an entire year getting to know these two people who graduated last May. This meant that I would be forced to meet someone new, convince them to join the Coca-Cola Valued Youth Program, and then get used to working with them. So, I met this young man who was my age, and it was surprisingly easy to convince him to join the program. He had a totally different personality than I was used to working with. Somehow, he just seemed to connect with the children on a level that I did not think was possible. I learned a lot from my new partner, and thanks to him we helped to improve the grades of pretty much the entire class. If there is anything that will stick with me throughout my college years and the rest of my life, it is the valuable lessons that I have learned from him.

This is my last year, my last chance to make a difference in these children’s lives. This is their last chance to make a difference in my life. Looking back, it seems so bittersweet to say goodbye to all of this. I’ll never forget my teacher, Ms. Smith, for all of the help and support that was and will forever remain a part of my extended family. Next year, when I am sitting in a college class helping a fellow student, I will always remember the influence that she had on me. No one learns the same things the exact same way, and that’s a lesson I have learned from this program. No matter what, that is what I will remember the most from my two years in the Coca-Cola Valued Youth Program.

For more information on the Coca-Cola Valued Youth Program contact IDRA at 210-444-1720 or contact@idra.org or visit www.idra.org/Coca-Cola_Valued_Youth_Program.htm

Scan this code to see the full winning essays and to learn more about the Coca-Cola Valued Youth Program.
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“A teacher who is caring, skilled, well-prepared, able to build on the strengths of each child, and a partner with families is a treasure.”

– Dr. María “Cuca” Robledo Montecel, IDRA President and CEO

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