Imagining the Future: Digitally Enhanced Education in California

Summary of California Teacher Advisory Council (Cal TAC) Summit

June 2011

Imagining the Future: Digitally Enhanced Education in California

Summary of California Teacher Advisory Council (Cal TAC) Summit

June 2011

ACKNOWLEDGEMENTS

We would like to thank the S.D. Bechtel, Jr. Foundation for its generous underwriting of this project and extend our sincere appreciation to the California Teacher Advisory Council (Cal TAC) for arranging this summit. We would also like to thank Nicole Lezin of Cole Communications for writing this report.

COPYRIGHT

Summary of a California Teacher Advisory Council (Cal TAC) Summit
June 2011
ISBN-13: 978-1-930117-47-1

CCST is a non-profit organization established in 1988 at the request of the California State Government and sponsored by the major public and private postsecondary institutions of California and affiliate federal laboratories in conjunction with leading private-sector firms. CCST's mission is to improve science and technology policy and application in California by proposing programs, conducting analyses, and recommending public policies and initiatives that will maintain California's technological leadership and a vigorous economy.

For questions or comments on this publication contact:

California Council on Science and Technology
1130 K Street, Suite 280
Sacramento, California 95814
(916) 492-0996
ccst@ccst.us

Table of Contents

Introduction

Dr. Henry Cogswell, founder of Cogswell Polytechnical College

On March 25, 2011, a group of teachers and administrators joined representatives from technology companies, philanthropies, policy groups, STEM (science, technology, engineering, and mathematics) networks and publishers on the grounds of Cogswell Polytechnical College in Sunnyvale, California.

The Cogswell setting seemed particularly appropriate for a summit on digitally enhanced education. The college is known for excellence in digital media, arts, animation, audio technology, and engineering and was recently designated one of the 10 "most wired" campuses in the country by U.S. News and World Report. As Cogswell President **Charles Haskell** noted in his welcoming remarks, the college's founder — Dr. Henry Cogswell — was a strong believer in education designed to meet the changing needs of industry. In the decades since the school's founding in 1887, this mandate, codified in the trust that initially funded the school, continues to guide Cogswell Polytech's mission.

The California Teacher Advisory Council (Cal TAC)

The summit was convened by the California Teacher Advisory Council (Cal TAC). Cal TAC was formed in 2005 by two co-sponsoring organizations: the California Council on Science and Technology (CCST) and the Center for the Future of Teaching and Learning (CFTL). CCST and CFTL joined forces to form Cal TAC in 2005 as a means for bringing real-world classroom experience — the "wisdom of practice" — to policy makers and others whose decisions affect the quality of science and math education in California.

CCST is a nonpartisan, impartial, not-for-profit corporation established 20 years ago to offer expert advice to the state government and to recommend solutions to science- and technology-related policy issues. CCST's core support comes from California's major post-secondary institutions, which provide important backing, support, and resources to CCST. CCST is governed by a Board of Directors composed of representatives from its sponsoring academic institutions, from the corporate and business community, as well as from the philanthropic community. Together, these members are helping both the public

and private sectors find answers to the important science and technology-related issues facing California.

About the Summit

Susan Hackwood, CCST's Executive Director, framed the discussion about digital education by noting that this topic had risen to the top among many discussed in a series of regional meetings of thought leaders across California. (The other two "game-changing" topics that emerged from this process were the innovation process itself, and the implications of looming water shortages in the state.)

"One thing we know with absolute certainty," Dr. Hackwood said, "is that in 5 or 10 years, the classroom of the future will look nothing like what we have today." Both anecdotal observations and neuroscience research highlight that digital natives — young people who have never known an environment where they are not surrounded by technology — learn differently. Indeed, Dr. Hackwood observed, some of the most creative people in industry are those who create ditigal media. How we take advantage of these changes and shifts to shape the classroom of the future will have profound implications for industry — as well as education.

CCST has been asked by bipartisan groups of legislators representing both chambers of the state legislature to offer specific legislative ideas for responding in the three areas — innovation, water policy, and digital learning. "There's a real hunger and interest in this topic," Dr. Hackwood told the group. "You have an unusual opportunity as you think through scenarios." She charged the Summit participants with the challenge of coming up with a roadmap and the beginnings of a business plan for digitally enhanced education in California, without getting bogged down in anticipated challenges and impediments.

The day-long summit was an opportunity for science and mathematics teachers, school administrators, researchers, district and state agency education officials, legislative staff, parents, and advocates to discuss the implications of different types of assessments for teaching and learning in California.

Anne Marie Bergen, Cal TAC's Chairperson and a science teacher at Cal Poly San Luis Obispo, added that in preparation for the Summit, she had been on a "learning journey" of her own over the past several months, exploring topics such as the learning and the brain, innovation in digital education and learning, how this looks in the classroom, and how it is already transforming schools, teaching, and learning.

Throughout this series of fascinating lectures, events, and personal interactions, Ms. Bergen said, she realized that she had not necessarily been hearing new things, so much as realizing that the exciting, innovative best practices are still the exception, rather than the rule. "I want them to be the rule," she said. Ms. Bergen noted that in her own experience, technological tools in the past have been just that — tools, rather than transforming her practice as a teacher in the classroom. During the Summit, she said, she hoped the group would explore several questions:

- What does a digitally designed and enhanced classroom look and feel like?
- How will it transform teaching and learning — the culture of a school?
- What is the toolkit to accomplish this type of transformation?

This summary covers the main presentations and discussions at the summit, including:

- the **keynote address** by Cogswell Polytechnic College's President, Charles Haskell;
- three **demonstrations** of how different tools can be used in the classroom (along with a response and reflection from Cal TAC member Jeff Foote);
- a discussion of **new partnerships** and how these could be launched and strengthened;
- an **example** of how one California high school already has embraced the digital future; and
- a discussion of specific **next steps** emerging from the summit.

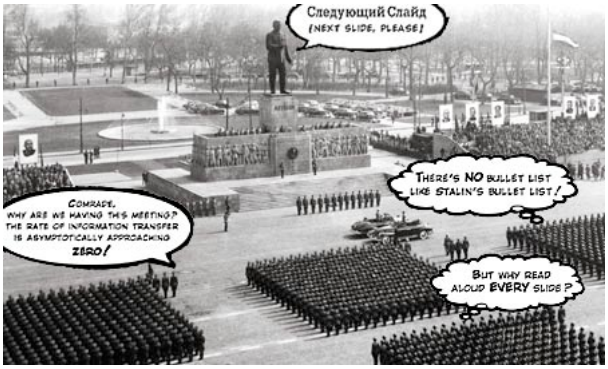
Summit participants were encouraged to contribute their **"2 cents"** worth of reactions and ideas in writing, since discussion time was scarce. These comments are presented throughout this report with a 2-cent logo, as shown here.

Comments from a "Give Your 2 Cents" option for input during the meeting appear like this throughout the summary.

Keynote Address

Charles Haskell, President, Cogswell Polytechnical College

After a deft, one-slided dig at the stultifying effects of PowerPoint, **Charles Haskell,** President of Cogswell Polytechnical College and the summit's host, engaged his audience with an overview of Cogswell educational philosophy and curriculum, as well as some reflections on what he and his colleagues have learned.



Cogswell's Interdisciplinary Educational Philosophy

Dr. Haskell described Cogswell's approach as providing professional education for emerging professions. In the technology companies that surround Cogswell's Sunnyvale and Silicon Valley campus, employees must be able to function within large, collaborative teams of specialists and communicate with one another. To foster this set of skills, Cogswell graduates are required to accumulate a third of their credits in general education courses.

Dr. Haskell noted that many of the Silicon Valley technology companies did not exist a generation ago. They were created by entrepreneurs who were largely self-taught, because there were no programs to prepare them for the innovative products and processes they were in the midst of inventing. Now, however, schools like Cogswell Polytechnic can customize programs and classes to respond to industry needs, even though change is constant.

Lessons Learned

Reflecting on what he and his colleagues have learned as they try to keep pace with changing tech industry needs, Dr. Haskell shared the following observations:

- **Technology is just a tool.** As one Cogswell faculty member puts it, "a computer is a fancy paintbrush." Dr. Haskell agrees, and noted that that's why the college pays so much attention to fundamentals. "You can't do graphics unless you have some sense of traditional fine arts," he said.

- **Change is constant and unpredictable.** The only way to keep up with unpredictable change, Dr. Haskell noted, is to teach young people to become autodidacts, with the ability to constantly teach themselves. "The digital technology of today will be obsolete tomorrow," he said. "That's why learning to learn is so important — during the educational process, and after." A broad-based education also supports the ability to deal with change.

  Companies recognize this, Dr. Haskell said, because they need to hire people who not only can perform on the project of the moment, but also help solve unpredictable problems down the road. Companies that formerly hired the most promising college juniors at the end of their summer internships, luring them away from college, now guarantee them a job *after* they've earned their diplomas.

- **The role of the instructor is central.** If technology is used properly as a tool, Dr. Haskell said, the instructor's role becomes even more central — as a provider of the conceptual base and context in which these tools are deployed. This, in turn, has important implications for professional development.

Reasons to Care About the Digital Enhancement of Education

Saving money is definitely *not* a reason to care about digitally enhanced education, Dr. Haskell said. "Technology is not a cost-cutting way to provide education at any level . . . It's not a way to do quality education on the cheap, and it's not even a way to do poor education on the cheap."

Digitally enhanced education does help students in at least two ways. First, it enriches education across the board by engaging them in what they're learning. Engaged students learn best, and digital technology is a path to engagement.

Digitally enhanced education also helps students succeed. In Silicon Valley and across California, Dr. Haskell noted, high-tech companies are highly dependent on imported talent. Two-thirds of the entrepreneurs who started companies in Silicon Valley in the past two decades were from outside the United States, he said; in Santa Clara County, English is not spoken at home in over half the households. Imported talent has many other options, all over the country and all over the world, posing a challenge for California.

At the same time that we need to grow more of our own talent, Dr. Haskell noted, the capacity of California's education system is declining at all levels. "Education that provides not only digital literacy but excellence is essential to

making the full and best use of young talent right here on our doorstep," he said. In this sense, digitally enhanced education is not only the means to an end, but, in the long term, and end in itself.

Visualization: The Future of Digital Media

The future of digital media is not entertainment, Dr. Haskell said, but "serious gaming — visualization in every conceivable way." Examples include the U.S. military, which uses digital technology to train soldiers as if they were moving through the allies of Kandahar, as well as to operate drones in Pakistan. Medical education provides another example.

In Silicon Valley and around the world, both start-ups and established companies are transforming gaming platforms into other uses — teaching and practicing languages in real time, synchronizing video and text ("Karaoke" style) to help the estimated billion people around the world who would like to improve their spoken English, offering in-depth visualizations (such as building blueprints for visitors to French cathedrals).

Taking Advantage of Technology, Innovation, and Creativity

The lack of bandwidth in the United States is a huge barrier to taking full advantage of technology's potential, Dr. Haskell said, especially compared with what is available in other countries. South Korea has been particularly ambitious, announcing (and well on its way to reaching) goals such as wiring every home and office in the country at blisteringly fast speeds of 1gigabit per second by the end of next year. (The current average in the United States is about 3-4 Mbps per second.) It is no coincidence that South Korea is already the world leader in massive multiplayer online games.

A related barrier is accessing connectivity, once it is in place — both in terms of infrastructure and in terms of cost and affordability. "High-speed broadband," Dr. Haskell said, "should be an unnoticed utility."

An even greater barrier, he argued, involves imagination. By this, Dr. Haskell explained, he meant not a failure of imagination among those trying to achieve change, but rather the limits of imagination inherent in being an adult today — i.e., someone who learned how to use technology after adolescence.

Dr. Haskell quoted Will Wright, an electrical engineer now in his early 50s and the game designer behind Sim City, Spore, and other games. Wright believes that if we imagine today's technology capacity as a rectangle, even those in the gaming industry are using just a corner or fraction of that potential rectangle. It will take another generation or two of children growing up with technology

incorporated into their lives and the way they think, before more of the available technological capacity is tapped.

Dr. Haskell noted several important implications of Wright's insight. One is that we need to find ways to engage students in the design of digital technology and how this is used in educational experiences. Another is the argument for 1:1 computer-to-student ratios. "One computer per student," Dr. Haskell emphasized, adding an important caveat: "and the freedom to use it as he or she sees fit." This, he maintained, would give students an innate, constant tool for creativity and engagement.

Another implication is that we should not restrict our thinking about digital media to science, technology, engineering, and mathematics (STEM). In his own general education classes, where he teaches courses on international political economy and globalization, Dr. Haskell requires his students to give an oral report on a subject they choose, using technology (as long as it isn't PowerPoint!) in some way. "They come up with all sorts of things," he said admiringly, "including videos, animations, maps, and charts."

Focusing on Professional Development

Finally, Dr. Haskell observed, a key implication of Will Wright's insight about unused capacity and imagination is that we should focus intensely on teachers. "There's a real need for ongoing professional development," he said, "not simply to learn about technology, but to learn to use it in ways that make sense for the teacher, the subject being taught, and the students."

Students, too, are part of the solution. Clearly, students are more technologically savvy every year; they bring a lot to the table. Professional development, Dr. Haskell urged, needs to figure out how to tap into those skills. Quoting a recent OECD report on building a high-quality teaching profession, Dr. Haskell noted that worldwide, teachers who pay some or all of the costs of professional development are more likely to engage in it than those who do not.

The OECD report also highlighted the high level of freedom and respect evident in countries with successful K-12 systems — investments that he acknowledged are simply not going to occur in California's current budget climate. "Digitally enhanced education can do some amazing things," he said, "but it requires an investment in teachers, not just hardware." We should all be very clear, he said, that digitally enhanced education "is not a cost-saving panacea. Using it well requires time, effort, and money." In an environment of pink slips, he added, the least senior teachers — the ones with the most tech skills — are also the first to be let go.

Opportunities

Despite these challenges and barriers, Dr. Haskell noted that many opportunities still exist. They include:

- Colleges and universities with expertise in digital media and technology should design and offer professional development workshops for teachers. Cogswell tried to offer such workshops, but a County Superintendent declined the offer, saying that teachers just didn't have time. Nevertheless, Dr. Haskell said, undeterred, other colleges and universities could and should make similar offers and keep trying. "Our friends in the public education system are under tremendous stress," Dr. Haskell conceded, sympathetically. "Their capacity is reduced, but it doesn't mean their capacity is zero."

- **Create venues for teachers to learn from other teachers.** Partnerships between and among teachers at the K-12, undergraduate, and graduate levels — e.g., graduate schools of education — offer many opportunities. Dr. Haskell offered Cogswell as an example of a university that would be interested in such partnerships.

- **Engage the private sector.** The private sector has helped, but could help even more, Dr. Haskell said, citing such models as the Sloan Multi-versity consortium and Futurelab's Pedagogy 3.0. "These are good models," he said, "but to meet the need, they need to be multiplied many times over and scaled up."

- **Find mechanisms to use the talents of current students.** Federal college work-study funds could support undergraduate students working in public schools, Dr. Haskell suggested. Many undergraduates have impressive levels of technical skills; properly supervised by teachers, they should be able to help in the classroom. (Again, Cogswell teams had suggested this approach using their own students, but local school system administrators couldn't find the time to figure out how to make it work, Dr. Haskell said.)

- **Create a comprehensive clearinghouse for new technology options, simulations, objectives reviews, and commentaries.** Perhaps a foundation could support a team of undergraduate students, supervised by master teachers, in the creation of such a clearinghouse. "Students are good at assessing what works and what doesn't," Dr. Haskell said.

In conclusion, Dr. Haskell applauded Cal TAC and CCST for seeking ways to improve digitally enhanced education, and for focusing on dissemination, collaboration, and information sharing through venues like the summit.

"Digitally enhanced education is central to preparing our students for a lifetime of learning," he said, adding that it is not primarily a matter of the actual tools. "The only way to do it properly is to invest in teachers," he said. "Here at Cogswell, we're pleased to assist in any way we can, not only because it's a responsibility we have, but frankly, the better job you're able to do, the better job we'll be able to do."

Demonstrations and Data

Cal TAC member Caleb Cheung introduced panelists from three organizations — two technology companies and a research institute — who provided overviews of tools that could be deployed in the classroom. Their presentations were followed by a response and reflection from Cal TAC member Jeff Foote.

Jim Vanides, HP Office of Global Social Innovation

Jim Vanides, Program Manager for HP's Office of Global Social Innovation, described his office's work as exploring what's happening at the intersection of teaching, learning and technology to create what he called "powerful learning experiences." Over the past 7 years, the Office has supported 1,200 educational institutions in 41 countries. Key findings from this work include:

- moving the needle on student academic success involves two variables: combining **great teaching** with the **right technology, used effectively**.
- technology is more than just a tool. "I think of technology in education as a **workshop**," Mr. Vanides said — "a place where we go to build knowledge together."

Formative Assessments

Mr. Vandies also shared what he considers to be three core ideas of innovation, made possible by technology. The first is the opportunity to conduct **truly formative assessments** in real time — as he put it, "knowing what the student doesn't know before the bell rings, so we can help them." Instead of a pop quiz at the end of the week, these assessments help inform the instruction at that very moment.

Make STEM an everyday experience!

Citing examples from institutions as varied as Clemson University, California State University Monterey Bay, DePauw University, and Cañada College, Mr. Vanides explained how these assessments are affecting expensive, persistent challenges such as completion rates, pass/fail ratios, grade distribution, and the need for remediation.

To achieve results, the interventions combine a pedagogical intervention — shifting from lecture-style to studio-style instruction, with small groups of students working and talking together — with enabling technology (in this case, pen-based tablets, laptops, and graphical response software).

In the examples he cited that used graphical responses in real time, Mr. Vanides pointed out three distinctive features.

- **Simultaneity** — the power of engaging all the students in a classroom at once (as opposed to calling on one and hearing his or her answers, while the attention of everyone else drifts away).
- **Anonymity** — allowing wrong answers to be discussed without penalty and removing obstacles to participation for shy or withdrawn students.
- **Immediacy** — real time, graphical feedback that gives teachers new insights about exactly where and how students might be stuck in their conceptual understanding or problem-solving (as opposed to the simple, and less revealing, dichotomy or right and wrong answers).

Create **"SWAT" teams** with students assisting teachers and mentoring, and teachers helping teachers, too.

Mobile Learning

Mr. Vanides also described the use of tools such as tablets that extend the classroom beyond a school's walls, allowing teachers and students to collect data in the field or work collaboratively with students in other countries.

From elementary school to the university level, Mr. Vanides shared examples of students and teachers visiting and then modeling a riparian corridor for an environmental science class, working with Chinese students in a sister school on

water quality projects, or conducting graduate level research in geology and archeology, and building a rocket launcher. These tools and activities, he noted, make math and science more relevant and interesting, connecting students to science "where it really is."

Online Learning

Dispersed computing power has changed the way we think about online learning, Mr. Vanides said, by redistributing computer power and making it much more accessible and affordable. For example, a cheap dorm room laptop can become a workstation, with sophisticated computer-aided design capabilities. Students and teachers in rural high schools can practice high-end STEM work, without even owning a computer. At a school in Spain, the school's computers have no applications residing on the computer itself — everything is virtual, housed in the cloud. At Carnegie-Mellon, textbooks are transformed into social media platforms, as students "read" texts and insert annotations and highlights they can discuss together. At Northwestern, students have access to remote laboratories, allowing them to conduct real experiments even if they don't have a lab within their own school.

Websites and Blogs on Digital Learning HP Office on Global Social Innovation

www.hp.com/go/hpcatalyst

www.hp.com/go/socialinnovation

www.hp.com/go/hied-blog

www.guide2digitallearning.com/blog

Do we want to continue to demand standardized education? Does everyone need to now the same thing? Or do different kinds of future professionals need to know different knowledge and different skills?

Concluding his remarks, Mr. Vanides reminded the meeting participants that man resources are available on line, including the examples from his presentation that are the recipients of HP Catalyst grants. (For more information, visit the blogs and websites recommended by Mr. Vanides.)

Julie Dunkle, Intel Corporation

Julie Dunkle, Headquarters Education Manager for the Intel Corporation, reviewed three professional development tools for teachers that are available on Intel's website. The tools are designed to help teachers integrate technology effectively into content they already use to promote creativity and critical thinking.

Provide education technology professional development for teachers, administrators, legislators, and school board leaders.

- **Visual Ranking.** In this example, a teacher asks students to rank the greatest inventions of the 21st century (although any other question could be posed). The teacher and/or students can populate the list, and then students rank the items — with options to add comments about their choices. The rankings can be shared across groups, or printed for discussions about the choices and the rationale for them.

- **Seeing Reason.** This concept mapping tool helps students investigate relationships in complex systems, mapping their ideas about cause and effect using arrows and color coding to denote the strength and direction of relationships.

- **Showing Evidence.** This tool prompts students to construct well-reasoned arguments, supported by evidence, using a visual framework. Students can rate the quality and validity of different evidence and sources of evidence, as well as generate their own, before drawing conclusions,

Each tool, Ms. Dunkle explained, includes unit plans, examples, and instructional strategies and assessments. Drawing from Intel's approach overall, the modules use a backward design approach, starting with what the students are intended to learn.

In addition to sharing these tools, Ms. Dunkle reminded meeting participants about the Schools of Distinction Awards (SODA) — a national competition with a streamlined applications process and a potential source of funding.

Tools for Educators
Intel Corporation
http://www.intel.com/about/corporateresponsibility/education/k12/tools.htm

Intel Schools of Distinction Awards

http://www.intel.com/about/corporateresponsibility/education/soda/index.htm

Catriona Glazebrook, MIND Research Institute

> If we are going to make math more relevant, do we need it to be more integrated with science? If so, do we need interdisciplinary majors and degrees and teaching credentials for high school teachers?

Catriona Glazebrook, Senior Development Officer for the MIND Research Institute, provided an overview of the Institute's visual math software program, ST Math. The program is based on neurological research on spatial temporal reasoning (STR), which is defined as the brain's innate ability to hold an image in working memory and then evolve it through a sequence of steps in space and time (e.g., envisioning a chess move).

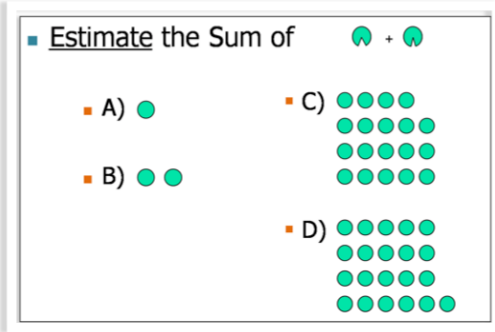
MIND Institute's ST Math software uses this research to help children visualize math concepts. The program, Ms. Glazebrook explained, is now in place in over 1,000 schools in 20 states, involving 13,000 teachers and 300,000 students. By tracking students' keystrokes, MIND Institute's research team is able to track results in real time, seeing how children adapt to different learning modalities.

One of the ST Math program's biggest advocates of Shawn Smith, Chief Area Officer of Chicago Public Schools. In Chicago and elsewhere, the ST Math approach is to go into the lowest-performing schools and lift academic performance in math. "One thing we can help children and society do," Ms. Glazebrook explained, "is to help students become masterful at solving problems." The ST Math program succeeds, she said, because it really focuses on people's innate problem-solving ability.

The program's visual emphasis is key not only for children, but for teachers as well. Ms. Glazebrook explained how the program gives teachers an option to customize the sequencing of classroom content, adapting the program to meet their students' needs in real time. Content can be accelerated or decelerated for individual students, or matched to textbooks, district pacing guides, benchmark exams, and state standards. Reporting options allow teachers to pinpoint which students are having the most difficulty with a particular step or problem, so that the teacher can intervene with that student at the moment he or she is stumbling.

To illustrate how the program works, Ms. Glazebrook presented a typical math test problem, asking students to estimate the sum of two fractions: 7/8 + 12/13. The multiple choice options included:

- 1
- 2
- 19
- 21.



Among 8th graders, 76% chose an incorrect answer to this problem. High school seniors did better, but not by much: 63% of them also got it wrong. More alarmingly, the majority of 13-year-olds picked the least likely answers: c (19) and d (21).

The ST Math depiction of the problem (above) uses circles to represent both the fractions to be added and the possible answers, making the correct answer (2) much more obvious.

This visual approach, Ms. Glazebrook explained, is helpful to many different types of students, but especially those whose language skills might otherwise prevent them from becoming proficient in math. The program also is child-friendly and fun for children, without being distracting in ways that detract from learning and focus. Another unique feature is the class time spent actually solving problems. In a typical 50-minute class period, students in a traditional classroom solve fewer than 10 problems, compared to over 60 with ST Math.

To highlight the types of results that can be achieved, Ms. Glazebrook used the example of Anderson Elementary in West San Jose — a low-performing school of 424 students that is 70% Latino, with 66% of the students classified as English Language Learners and 75% enrolled in the Free and Reduced Lunch program.

Out of 237 schools in the district, Anderson was at the bottom in math scores when it began the ST Math program in grades 2 and 4 during the 2007-08 school year. The program was so successful that the principal expanded it to grades 2 through 5 the year after the initial pilot, and the school moved from last place to first in math test scores. Ms. Glazebrook noted that this was achieved with the same teachers and principal. The change was providing them with something that works. "It created a culture of success in the school," Ms. Glazebrook said, "for both students and teachers."

Create **"mentor centers"** where parents, students, teachers, and business people learn from each other and take classes together.

Schools interested in trying the program must secure their principal's approval. The software itself is free of charge under a grant program, but there is a charge for the support team that trains and supports teachers as they implement the

program in their classrooms (and is staffed by teachers). For more detailed information, Ms. Glazebrook suggested that teachers and principals contact her directly (cglazebrook@mindresearch.net).

Jeff Foote, Cal TAC

Responding to the three presentations, Cal TAC member Jeff Foote vowed to either change his existing practices, or return to good practices that may have fallen by the wayside. Specifically, he said, he planned to:

> What do we want students to know? We have been talking about the how — the skills — but what about the **content**? Do we need to change our definition of content?

- Disseminate clickers to groups of students and let them do their own work together.
- Figure out how to turn students' curiosity about contacting strangers on the Web into a learning tool — to create a social network of learning.
- Try the visual ranking and seeing reason tools to help middle school students gather and assess information about energy resources and work to actively solve problems.
- Devote more class time to solving problems, "and less time listening to me talk!"

Minarets High School

Jon Corippo, Media Coordinator and English/Communications Instructor and Michael Niehoff, Principal

During a lunch break, Jon Corippo and Michael Niehoff shared slides, video and anecdotes about Minarets High School, where they already have incorporated many of the principles described by other presenters.

First of all, Minarets is a **1:1 laptop school**. Students are allowed and encouraged to use computers, as well as cell phones — which are used in class as clickers (as well as to contact teachers with questions or observations). Teachers and students are connected on Facebook; communication is constant. In general, Mr. Corippo and Mr. Niehoff reported, student access to laptops and cellphones appears to lead to fewer distractions and interruptions — not more as commonly assumed.

Frequent, **ongoing feedback** is another feature of the school, enhanced by technology. Every teacher surveys his or students four times a year about each class, focusing on the quality of instruction and the experience students are having — with feedback obtained in enough time to change direction if needed.

Statewide Student Information System (SIS) with a built-in **"school loop"** for collaborative opportunities. Why do every (most) school districts have different systems?

In general, the school promotes an atmosphere of **experimentation**, which Mr. Corippo and Mr. Niehoff agreed is often very difficult for adults who are used to being in control. "We trust kids and believe in them," they explained. They also question many rules that others may take for granted. Why, for example, do students have to be quiet all the time, in the hallways and even in the lunchroom? "Do we have to direct every moment?" Mr. Niehoff asked. Indeed, instead of a library, the school sports a **media lounge** with wifi, a flat screen TV, coffee (and books as well) — but "no mean lady who says 'Shhhhhh!' all the time." As a result, the media lounge has become the school's cultural hub.

The letting go translates in important ways to the classroom — to setting up an environment in which the students have a large say in what happens and thus become much more engaged. One hallmark of this is the adoption of **Student Project Coordinators** — juniors or seniors who lead groups, demonstrate projects, tutor other students, or referee discussions and disputes. The theory, Mr. Niehoff and Mr. Corippo explained, is that "the highest moment in learning is teaching." Moreover, the coordinators can parlay their leadership experience to career and job searches outside of school, listing the experience on their resumes and describing it in interviews.

Inspire students, teachers, legislators, and school board leaders.

Students enjoy a **student bill of rights** and are entitled to three graded assignments during class (with teacher lectures restricted to a maximum of 10-15% of class time). Heeding research that shows teenagers have and need different sleep patterns, school starts at 8:50.

Teachers and school administrators are constantly on the hunt for technology **resources** — many free or low-cost — that can be tried and used in different ways to enhance student engagement, teaching and learning. "When you use the Internet as your curriculum," Mr. Corippo noted, "the resources are there." A sample list shared during the summit included:

- **Google Apps** — this eliminates the need for a server (and a network administrator). Minarets teachers use Google Apps routinely for collaboration and for conducting surveys without running them through Scantron (because Google tallies them automatically). The entire state of Oregon is using this approach; the only cost is for a filter.
- **Poll Everywhere** (www.polleverywhere.com) turns every cell phone into a clicker, at a cost of $500/school or $2/student. ("Would they give California a great deal if we went statewide?" asked Mr. Corippo.)
- **Grockit Academy** — offers free GMAT/SAT prep. The site includes pre-formatted study plans and can even be set up to remind kids to study.
- **Khan Academy** and **That Quiz** — with thousands of assessments, lesson plans, and tests to choose from.
- Using **iMovie** and web cameras to document rate of work problems — and **Screencaster** (a free program that captures and records what's on screen into steps, stills, or video). The repetition reinforces learning, and the process makes every student a teacher. Another recording and visualization tool is **Doceri** — $50 for the iPad app — which allows you to draw with finger, record the lesson or illustration, and then play it back.

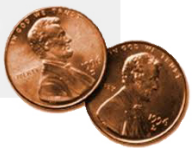
In response to many questions about how the Minarets experience could be replicated in other schools, Mr. Corippo and Mr. Niehoff noted that every school they have ever visited has had an **internal champion** — the person who can flip a school with resistant staff. "Find two or three of those people, and give them everything — although they'd be thrilled with $100 a year," they said. Pretty soon, parents will be saying they want their children in that teacher's class. The two will grow to five; the five to twenty.

Set up a **teacher tech leader** at every school/district; give them time and money to work and assist colleagues.

Partnerships and Next Steps

Cal TAC member Sue Pritchard facilitated a discussion about strengthening existing partnerships, or launching new ones, to support digitally enhanced education in California. Here are some of the summit participants' ideas:

Create a **Golden State Ed Portal** for collaboration, education and innovation, with exemplars and opportunities to connect around digitally enhanced teaching and learning.



- **Use and expand existing networks.** The new **California STEM Learning Network (CSL-Net)** came up often as a potential home for connecting teachers, industry, and educational institutions. Functions could include providing the clearinghouse described by Dr. Haskell (providing one-stop shopping for websites, best practices, new information, and professional development opportunities).

  Another idea was to follow something along the lines of the **Cancer Commons** model, which uses a wiki approach to get information on new drugs and treatments circulated much faster than it would otherwise be (while still relying on solid documentation and best practices). Although it is not public yet, the Silicon Valley Education Foundation website, with support from IBM, will soon offer one-stop shopping for educators interested in STEM education (www.svefoundation.org).

- **Tap the interest and resources of private industry.** Specific ideas included public-private **partnerships** for companies to work with teachers to adopt new technologies; using **collaboration tools** to communicate with one another in a learning community environment (e.g., Cisco's "quad" environment); connecting to **company volunteers** to sponsor a **"bring STEM students to work day"** in which they could learn about STEM careers; and asking industry representatives to serve as consultants to school districts on how to **coordinate technology across schools and districts** (and avoid the patchwork that currently exists).

Create an **Innovation Summit** with ACSA and industry partners.

- **Draw upon the enthusiasm of teachers**. Several Cal TAC members offered to serve as classroom labs for technology ideas.

- **Engage resources throughout the P-21 educational pipeline** — teachers, students, and administrators (e.g., via ACSA, the Association of California School Administrators). Explore placing students from schools like Cogswell into classrooms to help and guide teachers; consider (with industry help) a technology

facilitator/coordinator role for schools and districts. Keep the professional development issues front and center; make sure these, too, take into account multiple ways of learning. (As one teacher said of her professional development experiences, "We take teachers and put them in rows in an auditorium and lecture to them — modeling exactly what we *don't* want them to do with their students!")

- **Keep the summit group connected to share resources and ideas**. Plans were afoot for a Facebook group even before the meeting adjourned, and for collaborative work on upcoming grant opportunities.

Let's **include students** in these discussions to truly represent all stakeholders!

Lots of great things happening . . . we need to **share, disseminate**, etc.

CCST/Cal TAC **propose legislation** to reconsider instructional materials adoption and use of funds.

Have a **business team** work with a teacher on a digital project to help teach a STEM topic.

Investigate resources . . . SAS curriculum pathways; Aventa/Apex modules

California Cloud Content Portal — schools access without having to purchase new "stuff."

Reflections

Reflecting on why they find digital media so compelling, teachers attending the summit shared both their frustrations with the current system and their hope for what could be. Several noted that today's schools and classrooms are in many respects unchanged from those of half a century ago — unlike almost any other aspect of modern life.

"Ultimately, teachers want kids to be successful and engaged in the learning process," said one teacher. "For kids today, this — the digital environment — is their world. Ours was tactile; theirs is virtual. We shouldn't ignore the virtual world they live in, we should engage them." Another added, "Has there ever been a period in history where students knew how to do so much more than their teachers?"

Additional Resources Suggested by Symposium Participants

Utah Education Network — organized as virtual library with workflows, by grade level, and linked to standards (www.uen.org)

Clearinghouse for video-based projects that allows classrooms to connect to others around the world (www.cilc.org)

California Ed Portal Clearinghouse for Learning and Digital (County Offices of Education)

Mission: to support school districts

- Credentialing
- Students
- Hot spot
- Professional development
- Collaboration (preschool – university – business)
- Lesson links/best practices
- Ed links
- CTAP
- Parents/students/educators/staff
- Legislature
- Mentoring
- Business to ed connect
- Tech talk
- Life link to teleconference
- Video feed
- SIS Web
- ETC!!!!!

Perhaps not, but as Cal TAC member Lew Chappelear pointed out, the themes of the day — critical thinking, engaging students, project-based learning — all were topics of concern to John Dewey 75 years ago, too. Ending on an optimistic note, he said, "When something does work, we know our kids are completely capable and are going to soar. It's going to be amazing when we get it right!"

Appendices

Imagining the Future: Digitally Enhanced Education in California Meeting Agenda

March 25, 2011
Dragon's Den, Cogswell Polytechnical College
Sunnyvale, California

8:30 A.M.	**Continental Breakfast**	
9:00 A.M.	**Welcome, Introductions and Framing the Day**	Susan Hackwood, CCST Executive Director Anne Marie Bergen, Cal TAC Chair
9:30 A.M.	**Keynote Address** *Chester Haskell, Cogswell Polytechnical College*	
10:00 A.M.	**Demonstrations and Data** *Jim Vanides, HP Catalyst Global Education* *Julie Dunkle, Intel Corporation* *Catriona Glazebrook, MIND Research Institute* *Respondent: Jeff Foote, Cal TAC Member*	Caleb Cheung, Cal TAC Member
11:30 A.M.	**Creating New Partnerships**	Sue Pritchard, Cal TAC Member
12:00 P.M.	**Lunch** *Documentary on Minarets High School followed by Q&A* *Mike Niehoff & Jon Corippo*	
1:15 P.M.	**Looking to the Horizon**	Lewis Chappelear, Cal TAC Member
2:30 P.M.	**Synthesizing and Next Steps**	Diana Herrington, Cal TAC Member
3:00 P.M.	**Adjournment**	Brian Shay, Cal TAC Member

Imagining the Future: Digitally Enhanced Education in California

March 25, 2011

Presenters

Jon Corippo
Media Coordinator and Eng-Comm Instructor
Minarets High School

Julie Dunkle
Headquarters Education Manager
Intel Corporation

Catriona Glazebrook
Senior Development Officer
MIND Research Institute

Chet Haskell
President
Cogswell College

Michael Niehoff
Principal
Minarets High School

Jim Vanides
Education Program Manager
Office of Global Social Innovation
Hewlett Packard Company

California Teacher Advisory Council (Cal TAC)

Anne Marie Bergen
Teacher in Residence
College of Science and Math, Cal Poly San Luis Obispo

Jeff Bradbury
Chemistry Professor
Cerritos Community College

Peg Cagle
Math Teacher
Lawrence Gifted/Highly Gifted Magnet

Lewis Chappelear
Engineering Teacher
James Monroe High School

Caleb Cheung
Manager of Science
Oakland Unified School District

Jeff Foote
Sixth grade Teacher
Kermit McKenzie Jr. High

Heidi Haugen
Agricultural Science Teacher
Florin High School

Diana Herrington
Math Teacher
Clovis High School

Jennifer Howard
Kindergarten Teacher
Miraloma Elementary School

Suzanne Nakashima
Fourth Grade Teacher
Lincrest Elementary School

Sue Pritchard
Science Teacher
Washington Middle School

Brian Shay
Math Teacher
Canyon Crest Academy

Attendees

Craig Blackburn
Director
California Technology Assistance Project, Region 5

Muhammad Chaundry
CEO
Silicon Valley Education Foundation

Stephanie Couch
Acting Executive Director
California STEM Learning Network (CSL-Net)

Jim Greco
Education Administrator Mathematics and Science Leadership Office
California Department of Education

Susan Harvey
Program Director
S.D Bechtel, Jr. Foundation

Jim Hawley
Senior Vice President & General Counsel
TechNet

Ashwin Patel
CK-12 Education Foundation

Mohammad Qayoumi
President
CSU East Bay

Rene Ramirez
Vice President
Silicon Valley Education Foundation

Christopher Roe
CEO
California STEM Learning Network (CSL-Net)

Malaika Singleton Duran
CCST S&T Policy Fellow
Senate Office of Research

Ted Smith
Chairman and CEO
MIND Research Institute

Ignatios Vakalis
Chair, Department of Computer Science
Cal Poly, San Luis Obispo

Ken Wesson
Educational Consultant, Neuroscience, Vice President, Western Division and International Divisions
Delta Education/School Specialty Science

Maz Zabaneh
Education Sales Business Development Manager
Cisco

California Council on Science and Technology (CCST)

Susan Hackwood
Executive Director
California Council on Science and Technology

Stacey Kyle
Education Specialist
California Council on Science and Technology

Nicole Lezin
Writer
Cole Communications, Inc

Diana Rudé
Consultant
California Council on Science and Technology

Sandra Vargas–De La Torre
Project Coordinator
California Council on Science and Technology