

# Lighting Up Students with Technology and Progressive 21st Century Learning Strategies

By Dr. Ronda Frueauff, Tony Wall, Ron Essley and Michael Hall

*A child starting school today won't leave until 2023, by which point who knows what technology will be commonplace? Schooling must become more flexible and therefore more engaging and interesting. Classrooms worldwide remain largely traditional, and technology is usually prescriptive. It is clear that bold action is required to improve STEM education if we are to maintain our place of prominence in the global economy.*

Colonel Smith Middle School Complex will be one of the country's most progressive examples of collaborative and technology-based learning for Science, Technology, Engineering and Math Curriculum (STEM). The school will house 450 students in grades 6-8 and an additional 150 in a proposed charter high school. STEM programming will be appropriately differentiated for each grade level. Instructional delivery methods will put heavy emphasis on project based, interdisciplinary instruction

that stresses real world problem-solving and experimentation in a collaborative environment. This innovative facility will enable students to utilize hand-held technology such as: tablet computers, electronic workbooks, laptops as learning tools within a fully functional cloud computing environment. All spaces inside and outside will be spaces for learning. The entry to the school, school site and all areas of the complex create interest, curiosity and learning opportunities. CSMS reflects environmental awareness and

learning opportunities to students through its day-to-day operation. In total, the New Colonel Smith Middle School Complex will be a secure, student-centered school that champions student achievement using strategies and technologies that will change the language and essence of school design for generations to come.

The Fort Huachuca School District is committed to creating highly engaging and technologically advanced programs for the 1,100 K-8 military dependents served by the school district. The district finished building two new elementary schools during the past five years and has begun the planning and designing process for a new middle school with the opportunity to charter a small specialized high school with a curricular focus on Science, Technology, Engineering and Mathematics.

The governing board of the district is purposeful in its pursuit of research based, technologically enhanced rigorous educational programs for the students attending the district schools. The way this is being accomplished is through placing technology integration specialists at each school. These specialists create building action plans for utilization of new technology into the instruction design and delivery



CSMS Groundbreaking



CSMS Student Collaborative Space

process. Their role is to coax, coach and model implementation of interactive boards, hand held student devices, student response systems and technology based instructional programs. This job-embedded professional development component provides teachers with the necessary support for radically changing day to day instruction.

This foundation is preparing the teachers for the creation of a new school design developed with external



CSMS Design Team Meetings

and internal collaborative, adaptive and flexible learning environments. In 2012-2013, middle school students will move into this high tech state of the art new school. Shortly after this school is open, the district will phase in a new secondary option for the students enrolled in the middle school. The plan is to begin the phase in the 2013-2014 school year. The school design process has involved engineers, architects and school construction experts who have envisioned, engaged and innovated to create a truly revolutionizing educational facility.

Language was changed to embrace Dr. Ronda Frueauff's vision. Examples include changing classrooms to Extended Learning Areas, extended learning areas to a Student Collaboration Area, science labs to STEM Labs and library to Research Commons.

Rethinking what sustainability means, the team incorporated space that is rapidly reconfigurable. Flexibility allows teacher and student educational delivery needs to be met at any point during the school day. With very little effort, space can be created and re-created that works with building systems allowing students to participate in an effective and exciting educational delivery process.

From the very beginning the design team had a major goal to reduce

building energy. We have done this using an integrated design process focusing on:

- Orientation and shape of the building
- Site design
- Lighting, day lighting & electricity
- Ventilation
- Heating and cooling
- Material selection
- Envelope design and quality assurance

Day lighting in this context is the careful introduction of natural lighting throughout the majority of the school so the need for electric lighting is reduced to a very few hours per day. Skylights, clerestory windows and high-performance window-wall glazing systems create a layered approach to control of glare, solar heat gain and uniformity of luminescence throughout educational spaces.

The resultant effect is Colonel Smith Middle School Complex, an educational complex that generates more energy than it consumes on an annual basis. Such a building is called a "Net Zero Energy Building" (NZEB). After the initial energy demand of the school is reduced by almost 50%, remaining energy requirements will be met utilizing a 250 kW photovoltaic site produced electrical energy system, solar potable water heating and 5 wind machines which are part of the educational delivery system.

In the past seven years of the 21st century, the number of people entering science and engineering jobs grew at the smallest rate since the National Science Foundation began tracking the data in the 1950s. Twenty-five percent of all college-educated workers in science and engineering jobs in 2003 were born abroad.

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CSMS Perspective

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The vision for this learning environment was strengthened by research from the National Science Foundation, the Science Foundation of Arizona, the 21st Century Partnership, the International Society of Technology, the Science and Technology Network,

the National Academies, the Arizona K-12 Center, the National Diffusion Network, the Center for Innovation in Engineering and Science Education, and the National Assessment of Educational Progress.

For an informative video showing images of the project along with discussions of the learning environment, please go to “Tapestry for Learning: Interwoven Instructional Design Components” at [http://www.youtube.com/watch?v=laodF\\_GwBjE](http://www.youtube.com/watch?v=laodF_GwBjE) ■



CSMS Commons

**Dr. Ronda Frueauff** has directed programs and districts since 1989, and is currently the superintendent of the Ft. Huachuca Accommodation District in Sierra Vista, which serves the children of military personnel at the Ft. Huachuca U.S. Army Base. Her field studies include Instructional Strategies Impact, Effective Schools Impact, and Leadership Impact Studies for Ohio school districts. She received a Bachelor of Science in Elementary Education/Special Education from Miami University (Oxford, Ohio), a Masters Degree in Learning Disabilities/Behavior Disorders (Xavier University, Ohio), a Masters Degree in Educational Administration (University of Akron, Ohio), and an Educational Doctorate in Educational Administration and Supervision with research emphasis in Organizational Development (Arizona State University).

**Tony Wall**, 3W Management, has served as a school administrator, and is the former Executive Director/CEO of The Council of Educational Facility Planners International. In the private sector, he has experience as a successful general contractor, real estate developer and owner’s representative, giving him an unparalleled background to assist school districts across the country. His hands-on approach and broad perspective leads teams to successful development of unique and sophisticated projects.

**Ron Essley**, AIA, NCARB, REFP, Emc2 Group Architects Planners, PC, has been actively involved in design and construction of 52 new schools including 25 elementary, 17 middle/K-8 and 11 high schools throughout Arizona. He has a Masters of Architecture and Urban Planning from Washington University (St. Louis, Missouri), and a Bachelor of Architecture from Arizona State University.

**Michael Hall**, AIA, REFP, Fanning Howey, serves as K-12 group director and chief marketing officer for Fanning Howey, a 200-person architecture/engineering firm with 10 regional offices. Under Michael’s direction, Fanning Howey has worked with educational communities in 36 states, the District of Columbia, and the Philippines. He has also helped lead the firm’s sustainable design initiative, which has resulted in Fanning Howey being named a “Top 100 Green Design Firm” by Engineering News-Record.