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Quality instruction for success Empowering students for the future

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Preparation programs and the teacher shortage

An unscrutinized increase in teacher candidates may insufficiently reflect our progress toward quality teaching and fail to inform long-term and sustainable solutions to career development. **By David R. Jones**

Full STEAM ahead:

CREATING LEARNING OPPORTUNITIES FOR STUDENTS

How one school district created effective and award winning STEAM opportunities with a little bit of vision, focus and plenty of hard work. **The Hacienda La Puente** Unified School District (HLPUSD) is located in the San Gabriel Valley, serving 19,000plus K-12 students and 20,000 adult education students throughout 35 schools in the communities of Hacienda Heights, City of Industry and La Puente.

Healthy relationships among students, teachers, administrators, staff, parents, and community are recognized as the foundation for success for the HLPUSD. "What is happening on our campuses only happens with the cooperation between our Board of Education, personnel, parents and the community," said Superintendent Cynthia Parulan-Colfer. "Parent participation really is the genesis of what we do to create a successful learning environment for their children."

"It's all about the children; everything we do has to be focused on them," said Board President Penny Fraumeni at the 2016 State of the District address, with a special acknowledgement to the teachers in attendance. "It's about our students' achievements and well-being."

Data-driven need for STEM

The California Department of Education describes K-12 STEM education as encompassing the processes of critical thinking, analysis and collaboration in which students integrate the processes and concepts in real world contexts of science, technology, engineering and mathematics, fostering the development of STEM skills and competencies for college, career and life.

The Hacienda La Puente Unified School District analyzed its student assessment data and found that in grades 3-11, students met or exceeded state standards in English and language arts. However, only third and fourth grades met or exceeded state standards in math.

"We identified this trend a couple of years ago," Parulan-Colfer said, "and did the first adoption of new instructional materials in mathematics." To further support STEM, the district has a renewed focus on college

By Thomas Tan

and career planning.

"The board has made it a top priority that we make being college and career ready a reality for our students," Parulan-Colfer said. The district's success, she said, shows in the improving graduation rates. In 2010, the rate was 77.8 percent compared 90.1 percent in 2014.

Having identified these critical areas, in 2014-15, one of the Seven District Goals for Instruction was created calling for a focus on science, technology, engineering and math, through integration in all math and science instruction, to prepare students for college and career success in STEM fields.

Building STEM partnerships

Funded by a grant from Alcoa in 2013-14, the district created a Makerspace classroom at Sierra Vista Middle School, under the creative hands and leadership of science teacher Robert Yamasaki.

A Makerspace is a classroom environment that allows students to achieve through making things and learning through handson design. The objective of the grant is to spark interest in younger students in science and math to open career and college opportunities as the next generation of scientists and engineers.

"It was wonderful for the foundation to help us with our Makerspace program," said Parulan-Colfer in a recent San Gabriel Valley Tribune article. "We hope the students will continue their studies in the science and technology program at Workman High or the engineering program at La Puente High." Wilson High School also provides learning opportunities through Project Lead the Way in the areas of engineering, computer programming and biomedical classes.

Opportunities for partnership to support STEM were also found with the U.S. Navy Office of Naval Research SeaPerch program. SeaPerch is an innovative underwater robotics program that equips teachers and students with the resources they need to build an underwater, remotely operated vehicle (ROV).

The SeaPerch Program provides students with the opportunity to learn about robotics, engineering, science, and mathematics, while building an underwater ROV as part



"The things happening at the district are part of a plan to maximize the talents, interests and abilities of all our students, enabling them to meet the challenges and opportunities of a changing world." – Cynthia Parulan-Colfer, superintendent of Hacienda La Puente Unified School District

of a science and engineering technology curriculum. Students learn engineering concepts, problem solving and teamwork.

The HLPUSD Valinda School of Academics and Newton Middle School are participants in the SeaPerch program. "The SeaPerch partnership helps create student interest in a STEM career," said Angela Lin, executive director of elementary education. "Students were able to test robots of their own design in the high school pool."

The California Mathematics and Science Partnership (CaMSP) program is funded by a statewide competitive grant program administered by the Professional Learning Support Division's Science, Technology, Engineering and Mathematics Office of the California Department of Education. In 2014, the Math and Technology CaMSP Program recruited 50 HLPUSD third through fifth grade teachers for participation in its professional development program.

The first of three summer institutes began in 2014, where professional development focused on expanding the mathematics content knowledge of teachers, aligning mathematics curricula and practice to the California Common Core Standards, integrating technology into teacher lessons, and identifying technology resources that can be used by students to enhance their learning. Now in its third and final year of the project, Laurie Riggs, professor from California State Polytechnic University, Pomona Mathematics and Statistics Department, continues to guide participants by teaching the integration of science concepts within applied math instruction.

Carrie Peck, project director for the HL-PUSD Math and Technology CaMSP Project observed that she has seen the increased confidence, especially in seasoned teachers, many of whom have been teaching math and science to elementary school kids for 15 or more years.

Technology supporting STEM

Technological investments and improvements include the installation of a second computer lab at every school to improve student access to technology and the growing opportunities in online instructional resources.

In the summer of 2014, under the leadership of then incoming Assistant Superintendent of Curriculum, Instruction and Assessment Judy Fancher, STEM access was expanded to 10 middle grade classrooms in the 10 district K-8 and middle grade schools. These STEM teachers were provided professional development and a wireless laptop cart with 20 laptop computers.

Using the curriculum and projects from the Makerspace lab, teachers had a proven roadmap of hands-on STEM activities for their students. This roadmap included computer programming using the MIT Scratch programming language, engineering, rocketry, robotics and electronics. The reach of STEM to students was increased with the addition of the STEM program to all selfcontained sixth grade classrooms at the remaining 17 elementary grade schools in 2014-15.

"The things happening at the district are part of a plan to maximize the talents, interests and abilities of all our students, enabling them to meet the challenges and opportunities of a changing world," Parulan-Colfer said in her 2016 State of the District address.

Adding the arts

A 2014 New York Times article highlighted that engineering and art were not always completely separate disciplines. As one of the greatest inventors in history, Leonardo da Vinci is recognized for combining art and science together.

"Five hundred years ago, you couldn't really tell the difference between artists and engineers," said James Michael Leake, director of engineering graphics at the University of Illinois, Urbana-Champaign.

Research of the backgrounds of leading scientists by biochemist Robert Root-Bernstein revealed many cases of the linkages among the sciences and art. Galileo was a poet and literary critic, Einstein was a keen violin player, and Samuel Morse painted portraits (NY Times).

Apple Founder and CEO Steve Jobs frequently shared that the biggest difference between Apple and all the other computer companies is that Apple always tried to marry art and science. The original Apple Macintosh computer team came from backgrounds in anthropology, art, history and poetry (CIO).

The value for the arts and STEM together can benefit college and career readiness. Technology companies are widening their hiring horizons beyond the STEM fields. Larry Quinlan, Deloitte's chief information officer, argues in favor of STEAM, science, technology, engineering, arts and math. "It's not enough to be technologically brilliant," Quinlan says. "We need senior people who understand business processes, too" (Forbes).

To encourage and strengthen teachers use of the arts, the district partnered with Los Angeles County Museum of Art (LACMA) for an interactive professional development series in K-6 arts integration, titled the Technology Enhanced Arts Learning (TEAL) project. The TEAL series focused on ways in which true arts integration supports learning in the classroom and addresses the Common

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Indicators of STEM success

Hacienda La Puente Unified School District has been recognized in several areas for its success in bringing STEM opportunities to students.

Los Altos High School students were the winners of the U.S. Rep. Ed Royce (R-Fullerton) 2016 Congressional App Challenge. Students Andrew Rojas, Santiago Torres and Eric Liu created Drop Saver (find it on YouTube), a mobile application created to help smartphone users manage their water usage.

Public Works, a non-profit evaluation organization that serves as the statewide and local evaluator for the California Department of Education's California Mathematics and Science Partnership Program recently found 70 percent of HLPUSD teachers felt confident in integrating curriculum across STEM disciplines and 98 percent felt confident integrating technology into their students' learning experiences.

"Teachers and principals have been very positive about the CaMSP training," said Mikala Rahn, president and co-founder of Public Works and lead evaluator for CaMSP at HLPUSD. "Principals are very enthusiastic about their teachers participating in the projects, and teachers have said that the CaMSP professional development has increased their enthusiasm for teaching math."

In September 2015 in its report "The STEM Teacher Drought: Cracks and Disparities in California's Math and Teacher Pipeline," the Education Trust-West recognized HLPUSD as a "Bright Spot" district for its technologyfocused professional development and support. To encourage student interest in STEM before high school, the district developed a pilot STEM course at all middle schools, guiding students through computer-based units utilizing classroom laptop carts. To prepare teachers for this shift, all teachers engaged in three days of professional development around this new technology.

The district also formed professional learning communities that provided paid afterschool time for teachers to plan and learn together. Classroom teachers were supported throughout the year by teachers on special assignment, who focus on science and technology to build educator capacity and help them feel comfortable with the new tools.

Building teacher capacity for STEM learning in the early grades has included school leaders working with elementary teachers to make learning more interdisciplinary and to make more thoughtful connections between STEM and literacy in particular.

For example, second grade teachers at one site read the fairy tale "Rapunzel" and then challenged students to build the tallest tower using various materials. Doing so provided an opportunity for classes to discuss the engineering practices included in the Next Generation Science Standards, an area few teachers at that grade level had previously taught. Core State Standards and California Visual Arts Standards.

LACMA arts educators guided participants through various galleries filled with visual masterworks, learning by doing both visual thinking strategies and hands-on educational experiences with the visual arts in a LACMA studio. Educators were engaged in creating connections between the California Visual Arts Standards and the Common Core State Standards using model lessons and lesson-building activities.

To support the arts and STEAM opportunities for students, HLPUSD added two visual and performing arts (VAPA) teachers on special assignment to the TOSA team. These VAPA TOSAs help other teachers incorporate arts concepts into more effective instruction of other subject areas of English language arts, science and math.

The district commitment to STEAM can be found in the annual District Art Show. Student work featured often incorporates math concepts and art created using technology for students to express themselves. The District Open House Expo features a joint arts and STEM showcase for the parents and community.

The Instructional Services Division's vision for all students evolved from STEM to STEAM in the Seven District Goals for Instruction in 2016-17. This vision for the future called for integration of science, technology, engineering, arts and math in math/science instruction to prepare students for college and career success in STEAM fields.

Students STEAM ahead

In 2013-14, Hacienda La Puente USD was one of the first four districts to join the California College Guidance Initiative. CCGI supports sixth-twelfth grade students and their families to plan, prepare and learn how to fund a college education.

Through technology-based college planning tools and a data infrastructure that supports sharing of academic data between K-12 districts and higher education partners, CCGI helps students to learn about requirements for college admission and planning for a successful college experience.

Through the CCGI partnership, HL-

PUSD students can explore STEAM related college and career paths, identify what majors relate to what careers, and which colleges offer which majors or programs of study to plan for future success.

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