

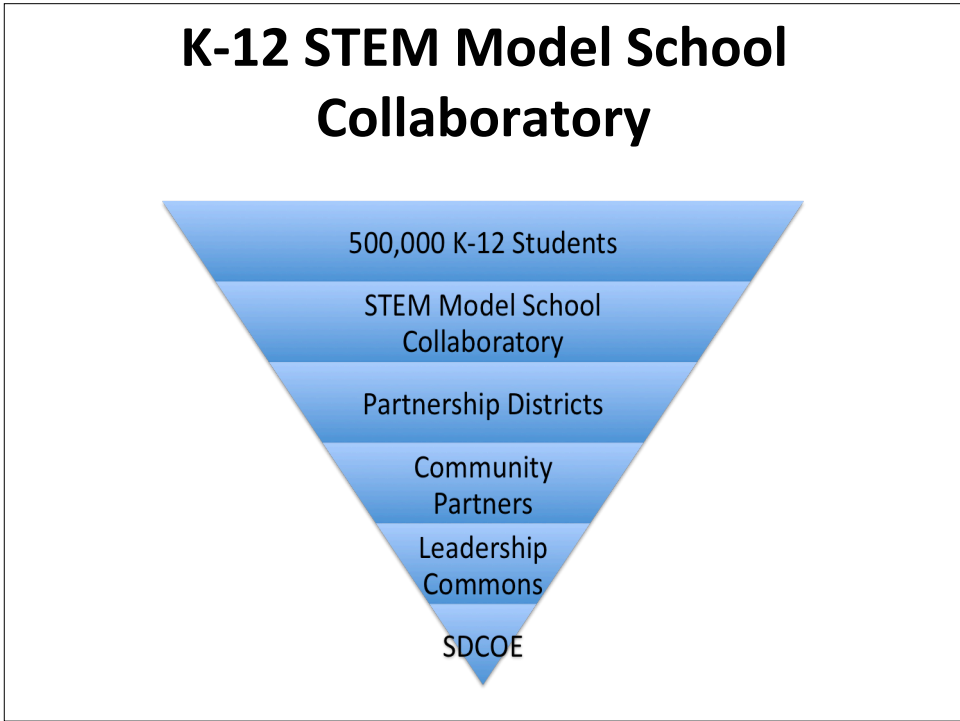
STEM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering and mathematics in contexts that make connections between school, community, work and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy.

Tspuros, 2009

San Diego K-12 STEM Education Model School Collaboratory

- Develop an **organizational plan** to engage private sector partners to collaborate on K-12 STEM Model School program criteria and implementation;
- Invest in the design, implementation and evaluation of a K-12 STEM Model School program **criteria and development process** for K-5, 6-8, and 9-12;
- Develop and implement **research-based professional development** to support highly qualified teachers in K-12 science, technology, engineering and math programs; and
- Identify **strategies and potential to scale** efforts for county-wide implementation.

I3 Development Grant
4-5 years



<p>The development of a K-12 STEM Model School Collaboratory that will serve as a cohesive structure for the joint efforts of school districts, organizations and the corporate community throughout San Diego County committed to work together to transform the current K-12 STEM education structure; and</p>	<ul style="list-style-type: none"> • District Strategic Plan • Committed Schools • Committed Partners • STEM Schools Collaboratory <ul style="list-style-type: none"> ◦ PD for teachers/principals ◦ PD for STEM professionals
<p>The creation of K-12 STEM Model School design and elements, a certification process, and annual incentives that will foster the development of community supported STEM schools throughout the county and provide evidence for broad replication; and</p>	<ul style="list-style-type: none"> • Design process • Leadership Development • STEM Instructional emphasis • Benchmark Assessment system • Annual progress and incentives
<p>An architecture for the active engagement of STEM Professional volunteers in Classroom Collaborations and community programs will develop digital citizenship and provide relevancy to all aspects of instruction; and</p>	<ul style="list-style-type: none"> • Classroom Collaboration • Community Events, Competitions • Annual progress and incentives
<p>Enable the creation and sharing of new knowledge about effective approaches to real time STEM challenges, educational practices, assessment strategies and quality criteria for program design</p>	<ul style="list-style-type: none"> • Lesson Study • STEM School Collaboratory • Benchmark Assessment • Evaluation measures

Strategies

- Select model criteria for districts as they evolve capability
 - assure rigorous content, teacher effectiveness, student engagement, community partnerships
- Develop teacher/principal leaders - Collaboratory
 - change agents for more effective learning environments
- Phased certification of STEM schools with incentives
- Band by grade levels with vertical articulation
 - match district needs, emphasis (K-2, 3-5, 6-8, 9-12)
- Enroll community STEM professionals
 - build capacity with teachers and inspire students with college and career opportunities

Professional Development

Districts commit – strategic planning, vertical articulation

Sites identified – cross section of teachers S,T,E,M

Teachers commit to 14 day +

Site Admin # of days

Flexibility to phase in grade span/content development

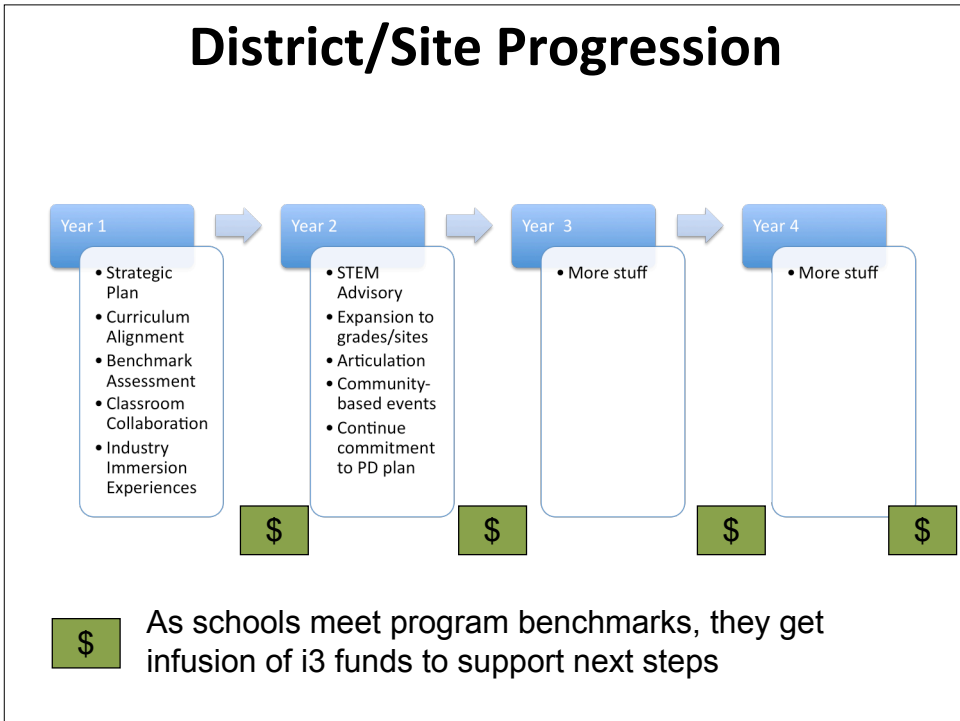
Summer Institute <ul style="list-style-type: none"> • 8 days total • 5 days PD • 3 days Industry Immersion 	Academic Year <ul style="list-style-type: none"> • 6 days total • Lesson study 	On site STEM Professionals <ul style="list-style-type: none"> • 10 days of classroom or project collaboration, per teacher participant

Bonus points for community events















Certification Process

District/School Commitments	STEM Professionals Commitments
<ul style="list-style-type: none"> • Letter of intent • Strategic planning team • Participate in i3 Professional Development • Classroom Collaboration • Community Events • Articulation w partners • Annual Report • Control/Treatment Research • Access to data 	<ul style="list-style-type: none"> • Letter of intent • Hours of commitment • Statement of in-kind value • Participate in District Strategic Planning team • Participate in i3 Professional Development • Classroom Collaboration • Support for Community Events • Survey data

District/Site Progression



Grand Challenges National Academy of Engineering

 Make solar energy economical	 Provide energy from fusion	 Develop carbon sequestration methods
 Manage the nitrogen cycle	 Provide access to clean water	 Restore and improve urban infrastructure
 Advance health informatics	 Engineer better medicines	 Reverse-engineer the brain
 Prevent nuclear terror	 Secure cyberspace	 Enhance virtual reality
 Advance personalized learning	 Engineer the tools of scientific discovery	

<http://www.engineeringchallenges.org>

Break Down Silos of Content

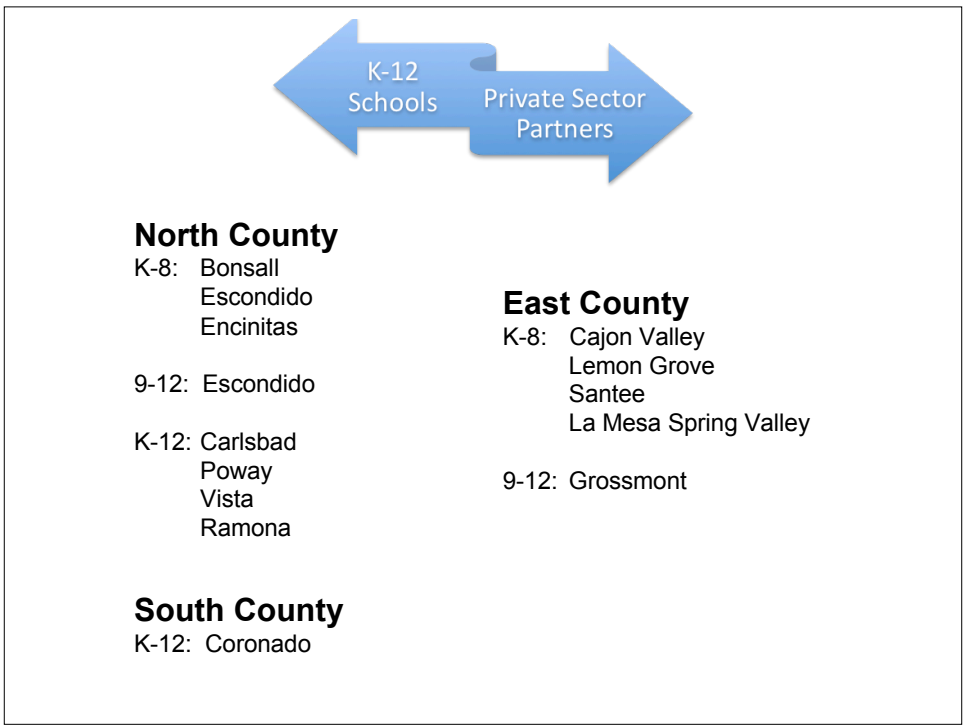
SCIENCE	TECHNOLOGY	ENGINEERING	MATH	LANGUAGE
K-5 Earth, Life Physical, Investigation and Experimentation	Creativity & Innovation, Communication & Collaboration, Research & Information Fluency, Critical Thinking, Problem Solving, and Decision Making, Digital Citizenship, Technology Operations and Concepts	Emphasize engineering design, promote engineering habits of mind. Systems thinking Creativity Optimism Collaboration Communication Attention to ethical considerations	Number sense; algebra and functions; measurement and geometry; statistics, data analysis, and probability; and mathematical reasoning.	Reading: Text complexity and the growth of comprehension <i>Writing: Text types, responding to sources, and research</i>
6-8 Earth, Life Physical, I&E			Algebra I, geometry, algebra II, trigonometry, mathematical analysis, linear algebra, probability and statistics, Advanced Placement probability and statistics, and calculus	Speaking and Listening: Flexible communication and interpersonal skills
9-12 Biology, Chemistry, Physics, Earth, I&E			Language: Conventions and vocabulary	

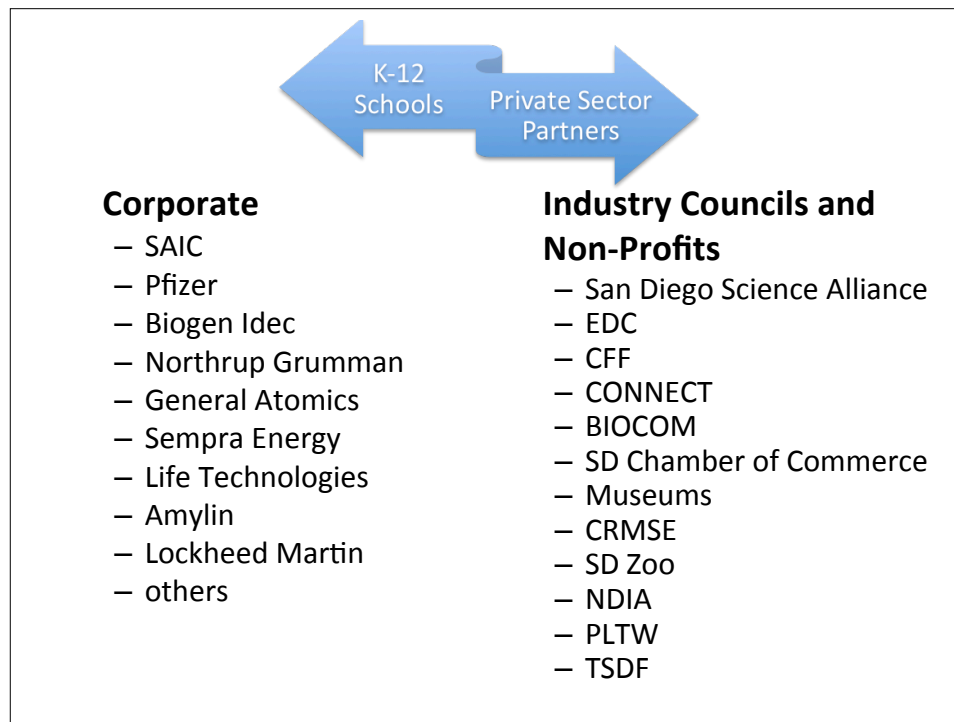
Sources include California Frameworks, National Educational Technology Standards, Engineering in K-12 Education, Common Core Standards

Leverage K-12 STEM Programs

	Science	Technology	Engineering	Math	Language
K-2	Energy and You Mad Science		Eng is Elem	Texas Instruments	Everyone a Reader SST
3-5	EcoLife Mad Science Elementary Sci Field Day	GLOBE Google Earth Moodle	FSEA MIT Club Eng is Elem	Math4America	GLAD WRITE iTouch, Esc SST
6-8	YPP Midway Salk AVID EYH NOAA BEWISE POS Biogen Idec MSSELI Biobridge	iQUEST Thinkfinity IVIE AVID High Tech Fair Tech Trek	PLTW Botball Robotics AVID GSDSEF EYH	CAHSEE Math AVID Midway Rubiks Cube mathforum.org	GLAD WRITE iTouch, Esc SST
9-12	LSSI COSMOS RAHSI Health Science	Cyber Challenge CTE High Tech Fair	PLTW CTE GSDSEF	Math competition CTE	WRITE SST

■ curriculum
 ■ school day
 ■ events
 ■ after school
 ■ prof dev





Outcomes: Result and Process

(Baldrige Quality stuff)

Result Measures

- Achieve greater twenty-first century skills
- STEM literacy
- Communication skills
- Collaboration skills
- Critical thinking skills
- Problem solving skills

Process Measures

- Student engagement:
 - behaviors, attendance, initiative, collaboration
- Community support:
 - resources, advocacy, field trips, internships, professionals
- Teacher effectiveness:
 - differentiated instruction, STEM literacy for teachers, classroom management skills
- Assessment process
 - rubrics, data gathering tools, analysis tools

**It is amazing what you can
accomplish if you do not care
who gets the credit.**

Harry Truman