"Partnering to help schools close achievement gaps in STEM"
2010-2011 CSTEM Community Impact Report

CSTEM Challenge Highlights

- Since its founding in 2002, CSTEM has become known for its National CSTEM Challenge hosted in Houston, Texas at the George R. Brown Convention Center every spring. Over 2,000 students and more than 200 teachers participated in the most recent challenge.
- The competition culminates the academic yearlong process of teacher professional development, planning, and instruction. It also serves as a platform for young STEM inventors to showcase their problem solving skills, creativity, and ingenuity through their development of collaborative artifact solutions for real world problems specifically designed by industry professionals.
- Students in grades PreK-12 representing 48 schools from around the country (TX, TN, MS, MD) and the Dominican Republic competed in the CSTEM Challenge.
- For six consecutive years, students from underserved communities across the Americas were recognized for developing STEM-based projects. The consistency of the 2011 first place winners is proof that the challenge has improved the performance of the schools for fully embrace the CSTEM pedagogy. These year's winners by category are: **Robotics Challenge:** Rusk Elementary, Jackson Middle School and Eastwood Academy; **Creative Writing Challenge:** Youens ES, Killough MS, and Elsik HS; **Sculpture Challenge:** Ports Towns ES, William Wirt MS, Bladensburg HS; **Mural Challenge:** Port Towns ES, William Wirt MS, Bladensburg HS; **CSTEM Green Challenge:** Youens ES, Killough MS, and Elsik HS; and **GIS Challenge:** Port Towns ES, William Wirt MS, Bladensburg HS.
- CSTEM is educating and preparing our future workforce for success in the 21st Century as numerous studies have shown that STEM is and will continue to be a key growth area for employment globally.
- A career in STEM comprises of incredible possibilities, and CSTEM works to ensure that underrepresented students gain a comprehensive perspective of future opportunities they could gain access to in STEM fields.
- Leading up to its national challenge, CSTEM convened a group of leaders in business, academia and the non-profit sectors to discuss improving the pathway for college and career readiness in the STEM disciplines, as well as exploring strategies and opportunities for collaboration and funding. Former Secretary of Education, Dr. Rod Paige, led the discussion and continues to serve as an advisor to CSTEM.
- CSTEM's success has provided an opportunity to participate in the national STEM discussion as evidenced by the participation of White House Appointee to President Barack Obama's STEM Advisory Subcommittee on Historically Black Colleges and Universities, Ken Tolson, who attended the CSTEM Executive Partnership Meeting in April 2011.

Research Based

The 2002 founding of CSTEM as an education non-profit was inspired by research from the U.S. Department of Education, the National Science Foundation, and the classroom teaching as well as school administration experiences of one Reagan D. Flowers, that indicated that minorities and underserved students were not pursuing STEM related careers at the same level as their White and Asian counterparts. The data clearly showed that minority and underserved students were hardly taking any higher-level math and science courses prior to completing high school. Furthermore, through her teaching experience, Dr. Flowers witnessed that the underrepresented students she taught were not avid readers or writers, which made it more difficult to perform in science and mathematics. "If students are not good readers and writers they cannot excel in math and science, which is why we integrated "communication" with STEM", said C-STEM founder, Dr. Reagan D. Flowers.

Research over the last 40 years has consistently displayed a continued widening of the achievement gap, confirming that different measures need to be implemented to prepare minority and underserved students for future leadership in STEM. The CSTEM action research project was implemented to assist schools with developing teacher content knowledge and changing the face of STEM instruction. "The achievement gap will continue to widen, and underserved and minority

students will continue to lag behind if we do not help our Pre K through 12 teachers work collaboratively to make STEM learning come to life in our classrooms," said Dr. Reagan Flowers.

To date, CSTEM's main source of funding is from private corporation's donations and grant funding from various agencies and organizations. At the completion of the CSTEM action research project in 2005, results from students indicated that they preferred experiencing STEM learning when it was 1) hands-on, 2) project-based, 3) real-world, 4) lead by motivated teachers, 5) involved competition, 4) inclusive of their peers, 5) exposed them to industry professionals, 6) engaged them in field experiences, and 7) not structured in a traditional classroom setting. The research study findings led to the development of the CSTEM Challenge Pedagogical Model, which was first implemented in 2006.

CSTEM combines a five-pillar community engagement model with CSTEM pedagogy to create sustainable STEM environments that engage both teachers and students in practical learning--relevant to real world issues and develops collaborative STEM Pre K-12 pipelines. "We have been able to increase minority and underrepresented students interest, motivation, and participation in STEM enrichment in greater numbers than any other related program in the nation. CSTEM is designed with the student and teacher needs in mind, and attending the culmination of the CSTEM Challenge competition puts you in an atmosphere just as exciting as the high school basketball championship", said Dr. Reagan D. Flowers.

Program in Four states and Latin America

Funding received primarily from private industry has supported the operation of CSTEM in Texas, Tennessee, Mississippi, Maryland and the Dominican Republic. Some key supporters of CSTEM include Shell Oil, Schlumberger, KBR, ASME, Dow Chemical, State Farm, Wachovia Wells Fargo Foundation, University of Houston, and the American Association of Blacks in Energy. Since the founding of CSTEM, the program has operated in over 260 Pre-K-12 schools. The components of CSTEM, including teacher content development, instructional STEM tool-kit resources, industry mentorship of students, a focused collaborative framework, participation in a national STEM competition, and a proven track record of engaging minority and underrepresented students in STEM, provides school districts with an effective program that supports closing the achievement gap. Key points regarding CSTEM's demographics, impacts on teacher performance and student achievement are:

School Data

- 82% urban, 12% suburban and 6% rural
- 100% of participants are high minority serving schools
- 100% Pre-K through 12 collaborative STEM teaching and team participation
- Reasons students participated in CSTEM at their school: 62% indicate they want to learn more about science and technology, 35% are interested in a STEM job or career; 22% want to learn how to apply math and science to real-life, 18% want to become an engineer, 84% like working with their hands, problem-solving, and putting things together
- Since 2002, 100% school district retention
- 39 Texas, 3 Maryland, 3 Mississippi, 3 Tennessee, and 2 Dominican Republic participating schools in 2011
- CSTEM's virtual social environment is conducive for facilitating STEM discussion: 745 elementary, middle and high school active participants on the CSTEMbreak Social Network on average

Teacher Data

- Over 500 Pre K through12 teachers trained in STEM
- 44% females and 56% males
- 61% Black, 20% Hispanic, 14% White, 3% Asian, and 3% Other
- 98% get involved in CSTEM as an opportunity to get their students involved in hands on projects, use problem based learning strategies, and expose students to STEM topics

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- Only 2% get involved because it was their job as a teacher
- 100% of teachers had never engaged in collaborative interdisciplinary Pre K through 12 teaching prior to CSTEM
- 95% of teachers were not engaging their students in STEM project-based learning prior to CSTEM
- Participating teachers become role models
- Teachers are actively encouraging both genders to participate in CSTEM
- Subject Demographics: 40% Science, 13% Technology, 10% Math, 6% English Language Arts, 6% Art, 6% Engineering, 5% History, 2% Social Science, and 2% Health

Student Data

- Over 50,000 students impacted since 2002
- 91% Black and Hispanic student participation in CSTEM
- 45% female student participation
- Over 53% of CSTEM participants that have graduated high school are in college or university pursuing a STEM related degree
- 94% of students report that they want to continue in the CSTEM program
- 100% indicate that CSTEM provided their first STEM enrichment experience (i.e. robotics, GIS, digital fabrication, etc.)
- 60% are NOT in a GT program and are successfully engaging in STEM enrichment
- 82% of students indicate that they plan to attend either a college or a four-year university
- 75% spend 3 hr/week or more on CSTEM project (20% spending 10 or more hr/week)
- 100% of CSTEM students passed math and science state standardized tests
- Participating schools serve 80%-100% economically disadvantaged students
- CSTEM gives students never exposed to STEM enrichment, the opportunity to engage in hands-on, applied individual and group projects, thus enhancing their sense of efficacy and helping them visualize what a career in STEM means
- CSTEM provides constructive social pressure, particularly important for female and Hispanic students
- All participants leave highly motivated about STEM

Participating School List

Maryland

Prince George's County Public Schools		
Port Towns Elementary School	William Wirt Middle School	Bladensburg High School

Tennessee

Memphis City Schools		
Oak Haven Elementary School	Oak Haven Middle School	Oak Haven Early College High School

Mississippi

Cleveland School District		
Cypress Park Elementary School	D. M. Smith Middle School	East Side High School

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Texas

Houston Independent School District		
Bell Elementary School	Edison Middle School	9th Grade Preparatory High School
Codwell Elementary School	Cullen Middle School	Empowerment High School
Rusk Elementary School	Rusk Middle School	Madison High School
Gallegos Elementary School	Jackson Middle School	Jack Yates High School
Franklin Elementary School		Eastwood High School
Peterson Elementary School		Austin High School
Alief Independent School District		
Youens Elementary School	Killough Middle School	Elsik High School
Fort Bend Independent School District		
Glover Elementary School	Missouri City Middle School	Thurgood Marshall High School
Ridgemont Elementary School	McAuliffe Middle School	Willowridge High School
North Forest Independent School District		
Lakewood Elementary School	Forest Brook Middle School	9th Grade Center
Charter Schools		
Southwest Elementary School	Southwest Middle School	Southwest High School
Baker Ripley Elementary School	YES Prep	YES Prep
	KIPP Liberation	

Dominican Republic

Dominican Republic
Academia Canaan (K-12)
Los Pininos (K-12)

References

Velez, Luis, MD, Ph.D. (2011). Rap Evaluation: CSTEM Challenge. University of Texas Medical Branch.

Johnson, James, Ph.D and Owens, Emil, Ed.D. (2007). External Evaluation Report: Shell Schlumberger Sea Turtle Robotics Project. Statlab Data Services.