

SpaceTEAMS

**A Program and Model for Transforming San Antonio's Workforce Engine
and Competing on the Global Stage**

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An Initiative of Northwest Vista College, San Antonio, Texas

March 1, 2007



The 2006 SpaceTEAMS Summer Camp

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There is no shortage of discussion about the importance of STEM education, the need to transform schools, the need to reform teaching methods, and the importance of these tasks on the global competitive stage. The pressures of global competition are driving countless national, state and local initiatives in our country that aim to address Science, Technology, Engineering and Math (STEM) education, workforce issues and school reform. Activities that have always been related but often treated separately – workforce development, economic development, STEM education, school reform, curriculum reform and new teaching models in the classroom – are becoming harder to recognize as separate activities. The lines are blurring and activities are integrating. The pressure cooker that is forcing these activities into one is leading to a transformation of the School / Workforce / Industry / Competitiveness Ecosystem.

Has this transformation already begun? Perhaps -- but in the December 10th issue of Time, with a cover story of "How to Build a Student For the 21st Century,"¹ Time says: "This is a story about the big public conversation the nation is *not* having about education, the one that will ultimately determine not merely whether some fraction of our children get 'left behind' but also whether an entire generation of kids will fail to make the grade in the global economy because they can't think their way through abstract problems, work in teams, (and) distinguish good information from bad ..." Here is what Time calls out as 21st Century skills: (1) Knowing more about the world; (2) Thinking outside the box; (3) Becoming smarter about new sources of information; (4) Developing good people skills. Kids must "learn to think across disciplines, since that's where most new breakthroughs are made." These four recommendations were made in December 2006 by the *New Commission on the Skills of the American Workforce*, a high-powered bipartisan task force. The discussion is about to emerge as a national conversation.

This paper describes an ongoing and long-term initiative by Northwest Vista College to help transform the San Antonio workforce ecosystem. Community colleges are already on the front lines of this effort. They have assumed this position by helping high school and middle school students set their direction and prepare to enter a 21st Century workforce, and by pulling that pipeline right through their campuses. Northwest Vista's initiative, SpaceTEAMS, addresses STEM education, innovations in teaching, the use of

¹ Wallace, Claudia and Steptoe, Sonia, "How to Build a Student for the 21st Century." Time Magazine, December 18, 2006.

constructivist (exploratory) learning, teacher training in innovative methods, and connection of these efforts to the workforce development pipeline. SpaceTEAMS teaches kids how to think critically, how to synthesize multiple sources of information, and ultimately, how to innovate and integrate science and the arts.

SpaceTEAMS' impact will be felt across numerous high tech industry clusters, to include Telecommunications, Life Science, Aerospace, Information Technology and Advanced Manufacturing. This effort engages industry and brings it to the place where companies can transform what their workforce will look like ten, fifteen and twenty years into the future. SpaceTEAMS addresses San Antonio-specific issues of educational access for under-represented groups. It uses the national goal of a mission to Mars as impetus for learning and career planning. It creates a path to high-wage jobs. SpaceTEAMS takes established robotics programs, long used to attract kids to math and science, and applies them directly to pipeline building. Through all these techniques, SpaceTEAMS gets kids and educators thinking outside the box, gets them processing information sources critically, and it gets them working collaboratively (the kids *and* the adults) to build high-wage jobs and help make San Antonio a world-class competitor in the worldwide economy.

More About SpaceTEAMS

SpaceTEAMS is a comprehensive program for STEM education, educational transformation, educational access across our region, and building of a world-class global economy. SpaceTEAMS uses robotics as a tool, constructivist learning as an approach, teacher training to create systemic change, and existing workforce pipelines to pass forward the results to our citizens and to the local economy. SpaceTEAMS consists of the following major efforts:

1. The SpaceTEAMS Summer Camp
2. SpaceTEAMS Teacher Training in constructivist learning
3. The San Antonio Robotics Support Center
4. the SpaceTEAMS Virtual World, used to recruit students, train teachers, and extend the benefits of SpaceTEAMS into the classroom.

The SpaceTEAMS Summer Camp

The SpaceTEAMS Summer Camp is a program for elementary and middle school-aged children. Themed around our nation's future manned mission to Mars, SpaceTEAMS opens career fields in Science, Technology, Engineering and Math (STEM) through the exploration of robotics. Successful robot builders must employ mechanical, electrical and software engineering, systems thinking, creativity and teamwork to succeed in their efforts. SpaceTEAMS uses age-appropriate techniques to start children down a path that integrates science and art in the course of STEM exploration. They learn skills that will serve them for years to come. Specifically, students are shown how the skills they learn in robotics will be used in the manned exploration of Mars.

The SpaceTEAMS Summer Camp is also a springboard for participation in robotics competitions. In 2006, four student teams competed in a Texas regional competition.

SpaceTEAMS Teacher Training

While the SpaceTEAMS summer camp is the core program offering, *SpaceTEAMS Teacher Training* is an essential step of preparation with long-term impact on the effectiveness of education in our schools. SpaceTEAMS Teacher Training consists of two weeks of intensive teacher training led by an expert instructor. Targeted at teachers who are used to delivering content via lecture and lesson plans, these two weeks use the SpaceTEAMS robotics kits and the upcoming summer camp as the driver for sharing new ways of teaching.

The main goal is to prepare the teachers to be effective as summer camp instructors, but there are many other benefits:

1. It gives teachers experience and techniques they can take back to the classroom.
2. It puts teachers on the leading edge of reforms that are making their way into schools.
3. It allows the program to learn from active teachers about how constructivist content can be integrated into current teaching requirements.

Leading exploratory learning is a fundamentally different skill than delivering traditional lesson content. In the case of robotics, children are learning the 21st Century skills called out by the *Time Magazine* article. Robots operate in a world governed by physical, electrical and chemical laws. Multiple sources of information are provided to the student, and those sources must be synthesized across disciplines in concert with teammates. Good results can be achieved with good thinking; excellent results are *only* achieved with out-of-the-box thinking. There *is* content to be delivered, but mostly, there is exploration to be guided and coaching to be done. This is a teaching skill that is often not natural to school instructors. It is one, however, that will serve those who learn it for the rest of their careers.

But What About TAKS?

Andrew Schuetze, Science Teacher, Edgewood High School, San Antonio, Texas

How can students help teachers be successful on the Texas Assessment of Knowledge and Skills (TAKS) but not teach to the test? This is the constant dilemma of any teacher in the State of Texas, and it's quite a challenge to teachers who wish to innovate and provide an engaging classroom environment.

This challenge is made easier when one implements a constructivist style of instruction. A constructivist methodology helps the student develop a deeper and stronger conceptual understanding of required material while moving them towards higher levels of understanding such as analysis, evaluation, and synthesis. A synergistic effect can be achieved involving both student understanding and content coverage.

Teachers will need to receive a significant amount of training in the implementation of this new paradigm, as well as time to develop new units of study that incorporate required TEKS. It is expected that both the students and teacher will be more engaged within the learning environment and not even realize that they are learning at higher levels. The result? They will become more successful on the TAKS.

Training twenty teachers for a 100-student elementary and middle school summer camp costs approximately \$50,000. \$4,000 covers compensation for a lead instructor, \$6,000 covers curriculum acquisition and equipment, and the remaining \$40,000 pays \$25 per hour to twenty teachers for two thirty-hour in-service sessions.

The San Antonio Robotics Support Center

Essential to long-term success is establishing collaboration among robotics programs in San Antonio. It is important that these programs work in concert to connect STEM education to workforce needs, economic development needs, and strategies for the San Antonio region. A sustained collaborative effort is what can seed a STEM-based workforce and increase the number of students in high school and college STEM programs. Such an effort will increase the quality of graduates, build up the workforce, and demonstrate commitment to incumbent companies and other companies considering the San Antonio region. The existing robotics programs in San Antonio are SpaceTEAMS, SA-BEST and GEAR. SA-BEST is hosted by St. Mary's University and hosts an annual competition. GEAR was hosted in its first year by UTSA in the spring of 2006. None of these programs have an abundance of funds. Other communities have recognized the need to connect robotics programs and have established robotics support centers. These centers span the variety of robot types and curricula available to provide generic support to programs in their region. There are local "next steps" that could be taken if the region formed a more substantial support system. For example, San Antonio is large enough to host a regional Botball tournament, but does not. The BEST tournament could easily expand to double the number of teams but has not experienced much growth in the decade of existence.

SpaceTEAMS proposes to gather robotics leaders in San Antonio to form a Robotics Support Center, and we believe such an effort would meet multiple objectives:

1. Provide support for multiple robotics programs.
2. Coordinate among programs in the region.
3. Make SpaceTEAMS Teacher Training available for all robotics programs.
4. Sponsor a yearly regional robotics tournament in San Antonio.
5. Lead efforts to intentionally connect robotics programs with related workforce and economic development efforts. For example, this effort could build a bridge for sending students into Alamo Area Academies, meeting needs for the local Aerospace, IT, IT Security and Advanced Manufacturing industries.

We propose forming the Robotics Support Center on the following ideas and principles:

1. Community Colleges, as the players on the front line in workforce development innovation, are the natural drivers for these types of efforts. Northwest Vista College will lead out in connecting STEM education to a broad range of STEM careers using the SpaceTEAMS model.
2. A Director will be hired to run the Center.

- The Center's mission will be to support local robotics program, conduct yearly regional competitions, and connect robotics efforts to workforce and economic development.

The initial funding required is \$85,000 to fund a Robotics Support Center Director for 18 months. The Director would: (1) Form an association from robotics programs in the San Antonio region; (2) Create a plan for a 2008 regional robotics competition in San Antonio; (3) Define policy for creating robotics programs that benefit local employers and workforce development programs, including Alamo Area Academies; (4) Work toward a sustainable business model for the Center.

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CORE is a motivated organization of faculty, staff, and students at the University of Houston, engineers and scientists at NASA Johnson Space Center (NASA-JSC), and the community at large who are interested in the utilization of robotics as a venue for science, technology, engineering and mathematics education.



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2006 LONE STAR FIRST LEGO LEAGUE (FLL) ROBOTICS TOURNAMENT
Scheduled on Saturday, December 2, 2006 at the University of Houston. [Download the registration form here.](#)

[FLL Volunteers Needed](#)

Botball Kick Off Training
Scheduled on Saturday, Feb 3 & Sunday, Feb 4, 2007.

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Example: University of Houston Robotics Support Center

The SpaceTEAMS Online Virtual World

Summer camps and competitions are effective ways to engage students in STEM education, but their impact is limited if steps are not taken to expand engagement before and after events. Their impact on local workforce and economic development efforts are limited if they are not integrated with education and recruiting into local workforce development pipelines. Online best practices indicate that “Web 2.0” technologies are the most effective way to gain and maintain engagement.

SpaceTEAMS will develop an online virtual space that will engage students and teachers before events, allow continuation after events, connect students with educational, government and industry players that operate workforce pipelines, and ultimately offer to students and their parents the chance to pursue high-wage jobs in high-growth STEM-based clusters. Essentially, the online virtual space becomes the long-term presence that integrates robotics, education, teacher training, ongoing student engagement, student outreach, and connections to workforce development programs.

The virtual space will have these capabilities:

1. It will be an online, multiplayer space in which students can learn about robotics.
The space will be open access at no charge.
2. Students can form teams, program virtual robots and conduct virtual competitions.
3. Schools can challenge other schools in online competitions.
4. Teachers can organize classes in the space and connect online activities to academic requirements.
5. The space will proactively offer to students the chance to connect with local workforce development programs. If they opt in, they and their parents will be contacted by those programs.
6. Programs can do bulk outreach (in “batch” only, until a student opts in) to students participating in the space.
7. Specific features will provide pre- and post-event activities, extending usage for students and teachers.

Whyville.net is a Web 2.0 platform for STEM education with a history of successful student engagement. Whyville integrates education with social activities and entertainment that are organized to reinforce positive behaviors and learning. The SpaceTEAMS Online World will be developed on the Whyville platform, leveraging prior work in the space, including \$440,000 in development work already funded by the Texas Workforce Commission (TWC) for the Texas Biotechnology and Advanced Manufacturing industry clusters.

Connections to Industry Pipelines

At all points of the program, SpaceTEAMS will integrate to workforce development pipelines that operate in the San Antonio region. There are many reasons to make this a priority effort of SpaceTEAMS. Industry participation makes events real. It emphasizes to students and parents the potential associated with STEM education and specific workforce pipelines. It helps align educational content with actual industry need. It demonstrates to industry the value of their investment in STEM education. Last but not least, it is the step that yields regional payoff for the program’s partners, guiding students into the local high-wage careers that build up our community.

There will be many points of contact of industry with SpaceTEAMS. Industry can:

- Guide and participate in the SpaceTEAMS summer camp
- Provide summer camp guest speakers
- Guide and participate in the Robotics Support Center
- Provide industry tours to teachers, staff and administrators involved in robotics
- Review educational content
- Make guest appearances in the online virtual space
- Use SpaceTEAMS resources for industry outreach through SpaceTEAMS events and the SpaceTEAMS online virtual world. They can do this outreach directly or through their associations and workforce development programs.

Here are specific workforce pipelines that SpaceTEAMS will connect to today. All of these programs have functional workforce development pipelines that benefits SpaceTEAMS, and all wish to grow and can benefit from outreach to the SpaceTEAMS student population.

1. The Alamo Area Aerospace Academy graduates about 50 students per year from a high school junior and senior program in Airframe and Powerplant maintenance. All graduates receive a certificate, jobs at local Aerospace companies, and achieve their Airframe and Powerplant certificate within six months of graduation with the support of their employers. SpaceTEAMS will highlight the connection between robotics and Aerospace manufacturing, build connections to the TWC-funded Whyville Advanced Manufacturing activity in Whyville.net, and integrate with student outreach and recruiting efforts.
2. The Manufacturing Technology Academy, a recent addition to Alamo Area Academies, graduates about 15 students per year in related manufacturing fields. SpaceTEAMS will integrate along a similar model to the one described above.
3. The Information Technology and Security Academy graduates 40 students per year and sends close to 100% into mostly local college programs in IT, security or software development.

Northwest Vista College has a special relationship with World Savings that will be connected to the SpaceTEAMS effort.

But How Can You Decide Kids' Future So Early?

A primary criticism of early-start workforce development programs is that they channel kids into pipelines early, essentially limiting their options. We understand this perception but believe it misses the point. We believe that:

1. We fail children when we fail to communicate to them what education is for, what a career really means, and why they should care. We fail parents when we fail to send their children home asking important career questions.
2. Our job is to expose children to careers and encourage them. We must always let decisions belong to children and their parents, and this is a fundamental principle of the SpaceTEAMS approach.
3. We fail children when they are able to pass classes and graduate, and having done so really have no idea about where their hard-won accomplishment is headed. Exploratory learning encourages students to think this through for themselves. Career pathway options force them to really think about what they want from careers and life.
4. Fundamentally, life is about making choices and then reacting to the results. Many students who enter a pipeline will exit that pipeline, but will do so smarter and wiser, to the benefit of themselves and their communities. This is a much more effective approach than what we frankly see as *drifting* through school with no challenge presented to choose a future.

4. Other “pipeline segments” exist that will be explored and connected; for example, the articulation agreements that exist between area high schools and Northwest Vista College.

SpaceTEAMS: Creating 21st Century Students and Helping Transform San Antonio’s Workforce Engine

This paper started by describing the major trends that are driving a transformation of education and workforce development. A national conversation has begun about how to best prepare our children for the 21st Century workforce and maintain America’s position as the world’s leading economy. SpaceTEAMS will use our nation’s goal of a mission to Mars as a theme to explore robotics, and in turn will use robotics and build a four-pronged program to create 21st Century students. SpaceTEAMS will connect those students into the workforce development pipeline.

The SpaceTEAMS Summer Camp will serve as a flagship event to engage kids in STEM education. It will create students that know more about the world, think outside the box, are smart about information, and work constructively with people of all types.

SpaceTEAMS Teacher Training will prepare teachers for the SpaceTEAMS summer camp and provide long-term benefits that extend backward and forward from the summer camp and into core classroom activities. It directly addresses the issues raised by the *New Commission on the Skills of the American Workforce* by addressing education reform in the classroom. Teachers who attend this training will find themselves on the leading edge of educational reform.

The Robotics Support Center will build the support system and achieve the economy of scale needed to run robotics programs successfully in the San Antonio region. Robotics is only a tool, but it is a high-profile and successful tool for exploratory learning and for engaging kids in STEM education and careers. It is also important to integration of these educational efforts with the workforce pipelines that will yield the payoff of our efforts for the San Antonio region.

The SpaceTEAMS Online Virtual World will also extend robotics before and after the summer camp experience for teachers and students, will extend into the classroom, and will be a point of integration with workforce development programs and pipelines for student exploration and program/industry recruiting. Integration of efforts across boundaries of all types is key to gaining the benefit our region needs to compete globally. Exploratory learning is a central theme in the emerging national conversation on creating students who know more about the world, think outside the box, are smart about information, and work constructively with people of all types.

Through a flagship summer camp, teacher training, a Robotics Support Center and an online virtual world, SpaceTEAMS will create 21st Century students. It will integrate those efforts with workforce and economic development to help the San Antonio region be a world-class global competitor.

Appendix A -- SpaceTEAMS Status and Roadmap

SpaceTEAMS was started by Northwest Vista College with a summer robotics camp in 2006. Beginning in 2007, SpaceTEAMS is guided by an Advisory Board that consists of robotics experts, workforce professionals, industry and community leaders, educators, government officials and staff, and industry representatives. SpaceTEAMS maintains relationships with city, state and national initiatives in workforce education.

This roadmap is the result of efforts by Northwest Vista staff, workforce consultants, and early members of the Advisory Board. It guides the efforts of the SpaceTEAMS program through 2011.

SpaceTEAMS Roadmap, 2006 - 2011

Year	Number of students (elementary / middle)	Number of teachers	Number of school districts	Teacher curriculum offering	Online offering	New partners	Community college district expansion
2006	50 / 50	16	4	Ad hoc	None	City of SA Edgewood ISD	n/a
2007	50 / 65	20	5	Pilot	None	TexPrep	n/a
2008	100 / 100	35	4	Developed	Complementary gaming site for students	Additional school district	ACCD Southwest Campus
2009	200 / 200	50	4	Enhanced and online	Teacher additions and extended time scope	TBEC Additional school district	n/a
2010	350 / 350	65	4	Location independent	Integrated with camp	Three additional ISDs	n/a
2011	650 / 650*	85	5	Location independent	Advertised to every San Antonio student in age group	Most ISDs in San Antonio region	ACCD Northeast campus

Appendix B – SpaceTEAMS 2006 Demographics and Outcomes

- The camp served 94 children grades 4 through 8, from four independent school districts and 16 public school teachers
- The camp was designed to serve children from groups who are under-represented in STEM careers, including females, African Americans and Hispanics and those of low socio-economic status. The camp was highly successful in recruiting and serving the targeted population:
 - Over 70% of all camp participants qualify as low SES based upon reported household income.
 - The gender and ethnicity of participants also fell within project goals:
- Key demographics from the elementary school camp were:
 - 49 students
 - Male 49%
 - Female 51%
 - Hispanic 94%
 - Black 4%
 - White 2%
- Key demographics from the elementary school camp were:
 - 46 students
 - Male 56.5%
 - Female 43.5%
 - Hispanic 82.6%
 - Asian 8.7%
 - White 6.5%
 - Black 2.2%

Appendix C -- Value Propositions for Customers and Partners

SpaceTEAMS has a strong value proposition for customers and partners. Understanding these value propositions is essential to recruiting the range of support needed for the program. Here is a breakdown of the value proposition for each type of stakeholder.

For Students

- Learn science, technology, engineering and math.
- Learn critical thinking skills
- Explore high-tech, high wage careers
- Develop academic plan for specific career fields
- Learn teamwork
- Spend time with friends during the summer and make new friends
- Compete with other schools
- Be creative
- No summer boredom
- Get a head start on core coursework
- Get a head start on joining the middle school TexPrep program

For Parents

- Involve your children in a fun and worthwhile summer activity
- Educate your children in science, technology, engineering, math, teamwork and creative thinking.
- Get them a head start in core coursework.
- No summer boredom!
- Expose your children to interesting, high-wage career options.
- Get your children on an academic path to high-wage jobs.
- Sign your children up for competitions that encourage learning.

For Teachers

- Expand your teaching experience into related areas.
- Get trained and experience first-hand the benefits of exploratory learning.
- Meet requirements for professional development credits.
- Work with motivated students.
- Do all this and get paid to do it.

For the City and Partners

- Give children an early start in important educational areas.
- Attract grant funding to our region.
- Seed talent pipelines in growing industry clusters with high-wage jobs.
- Help capture the value of exploratory learning programs for our region.
- Develop the reputation of our region as supportive of high-growth industry.

Appendix D -- Strategies

This appendix captures in summary form the strategies recommended by the Advisory Team for the long-term success of the SpaceTEAMS program.

1. Form a board with wide participation to oversee the program, establish goals and strategies, and pursue funding. The board should represent institutions, major STEM/workforce players, state representation, local government, and industry.
2. Define a roadmap that sets funding goals and ties funding levels to service levels.
3. Set aggressive teacher standards to ensure the quality of the SpaceTEAMS summer camp and further efforts associated with the program.
4. Connect in detail to city and state STEM initiatives, and establish and maintain contact with relevant organizations statewide; connect your purpose in detail to those initiatives.
5. Position SpaceTEAMS as a scaleable effort in using constructivist learning and the use of gaming in education to seed talent pipeline for high growth clusters and to give children in our region a competitive advantage in education.

Acknowledgements

The authors would like to thank the following for their key contributions to the SpaceTEAMS program: the San Antonio Foundation, the KISS Institute for Robotics, Edgewood Independent School District, San Antonio Independent School District, Northeast Independent School District, Dr. Federico Zaragoza, Ramiro Cavazos, Gloria Valle, Melissa Roel, Dr. Charles Winton, Sean Dooley, Dean McCall, James Mann, Richard Donnelly, Kristen Romero, Lauren Romero, Jonathan Martinez, Maria Leiva, Aaron Hackney, and Justine Pressly.

SpaceTEAMS would also like to thank Mayor Phil Hardberger, the San Antonio City Council, the City of San Antonio and City Public Service for its support and funding of SpaceTEAMS via the City's Interlocal agreement.

SpaceTEAMS deeply appreciates the vocal support of Dr. Francis Kane and the late Gen. Robert McDermott for the SpaceTEAMS program.