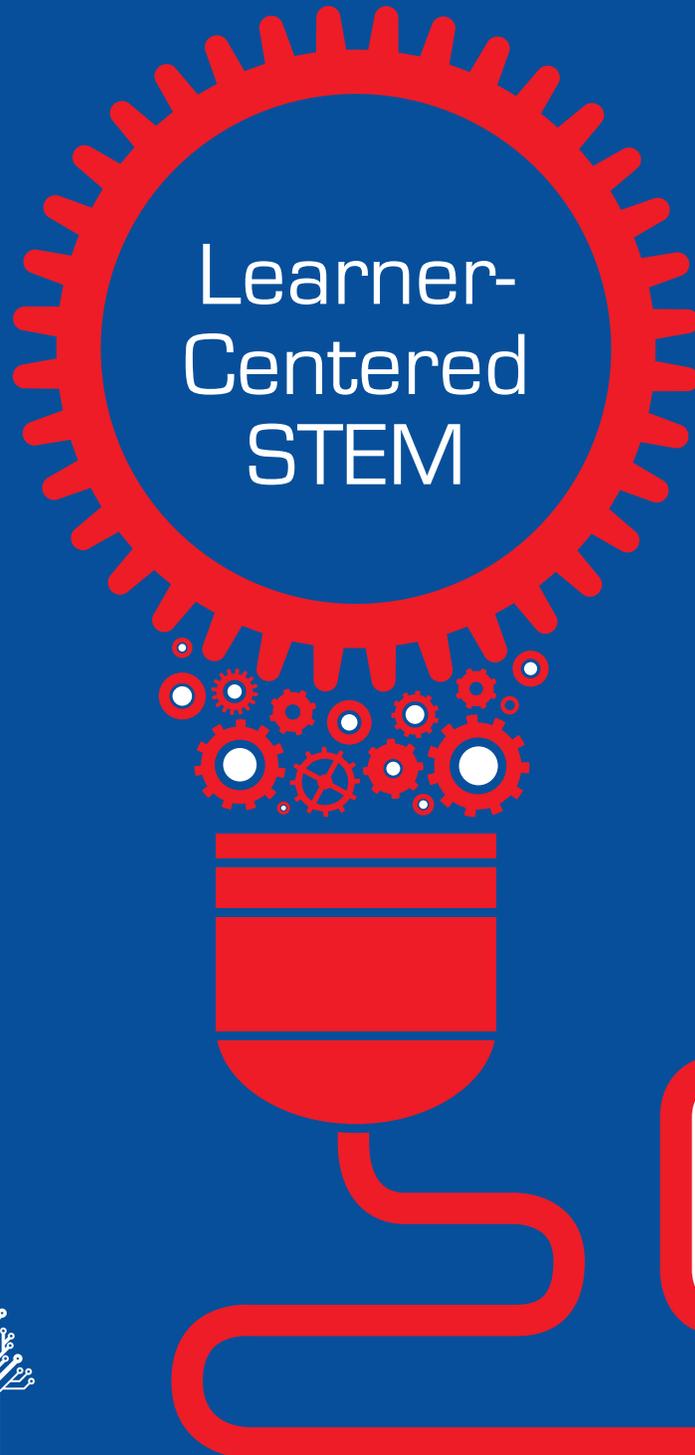


# GETTING SMART ON



Learner-  
Centered  
STEM

IN PARTNERSHIP WITH:

  
HARMONY  
PUBLIC SCHOOLS

PUBLISHED BY:



# Introduction

Tom Vander Ark, CEO, Getting Smart

## Learner-Centered STEM: Meet Harmony Public Schools

What do you get when you mix college prep, personalized, blended learning, project-based STEM learning and a small, supportive environment? You get the largest high performing school network you've probably never heard of: [Harmony Public Schools](#).

The first Harmony school opened Houston in 2000 with 200 students. The network started with grades 6-12 and added elementary schools in 2005. Now, 46 schools serve over 30,000 students (and even more than that on the waiting list).



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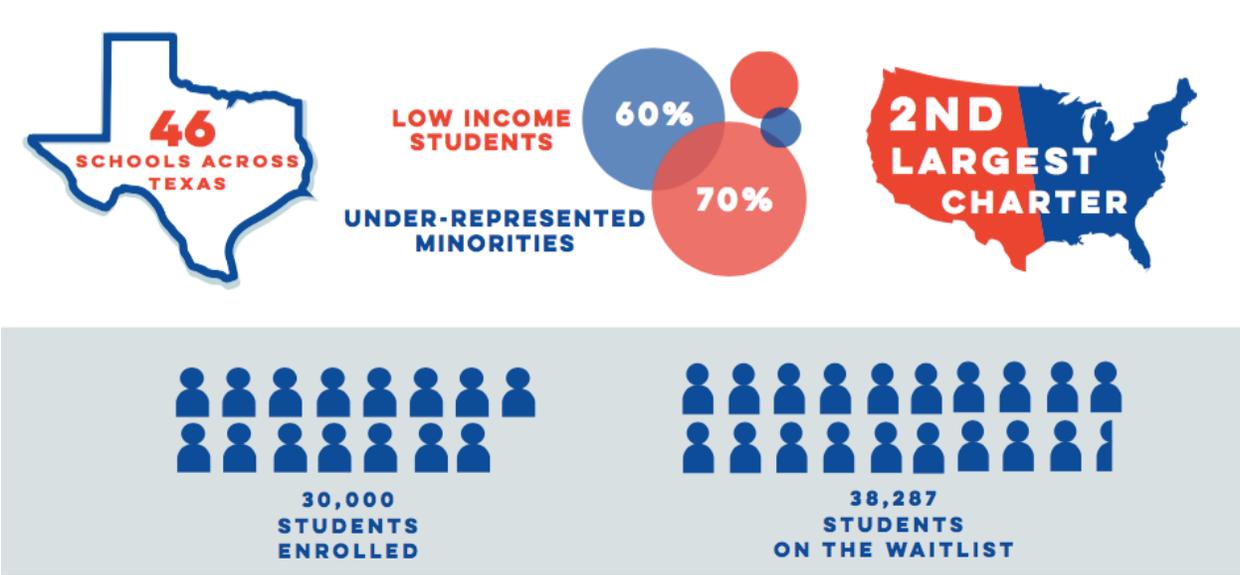
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Two Harmony School of Excellence student tour guides

In February, I visited [Harmony School of Excellence](#) in Austin, a 6-12 school opened in 2009 in a South Austin business park. The converted office warehouse is a welcoming space that serves mostly low-income Hispanic students. Like the tour pictured above, mine was led by two capable students, Abraham Medrano (sophomore) and Zakya Anwar (senior). The lobby is filled with pictures of graduates that have all gone on to college.

The student-centered, project-based, STEM-focused school has become one of the largest and highest performing in the country. The visit inspired us to launch a series, "Getting Smart on Learner-Centered STEM."



**Core Values in Action.** Harmony's core values — high expectations, dedicated staff, working together, character matters and STEM for all — were obvious in classrooms and school culture. Harmony has created a high-press, high-support environment. There's a strong community feel where rigor, relevance and relationships are clearly emphasized. Students are provided with a good balance of support and independence.

The college-going culture is reinforced by policies, practices and supports. College acceptance and college credit (AP or dual enrollment) are graduation requirements. College planning starts in eighth grade with a high school plan. Harmony School of Excellence in Austin currently offers nine AP courses, and several Harmony schools offer double that. College visits start in ninth grade with at least two per year in grades 10, 11 and 12. Students meet with an advisor daily and a counselor on a regular basis. My student tour guides said the advisors and counselors were very helpful in identifying and applying to colleges (echoing our thoughts on the [role of advisory in personalized learning](#)).

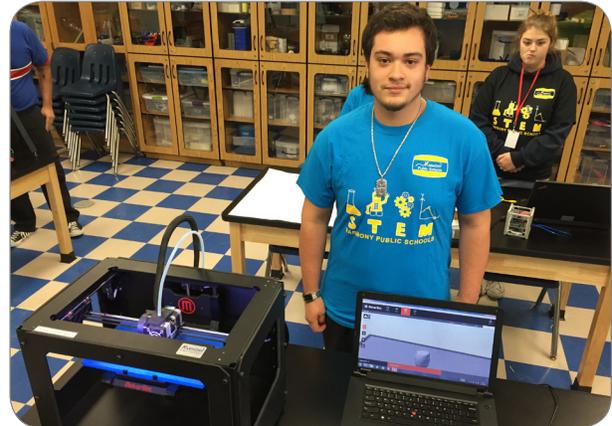
Harmony recruits talented teachers, including some with international experience. Many have advanced degrees and all have strong content expertise.

My tour guides said, "We have lots of opportunity to meet with our teachers including Saturday morning tutoring." They added, "This is a small community; all teachers know me."

**Learner-Centered STEM.** Harmony developed its own STEM curriculum, [STEM Students on the Stage](#) (STEM SOSTM). Funded through a federal [Race to the Top-District](#) grant, the model incorporates hands-on, project-based and inquiry-based learning with the goal of not only increasing students' STEM knowledge and interest but also producing self-motivated and self-regulated learners ([See the Rtt-D feature on Harmony's plan here](#)).

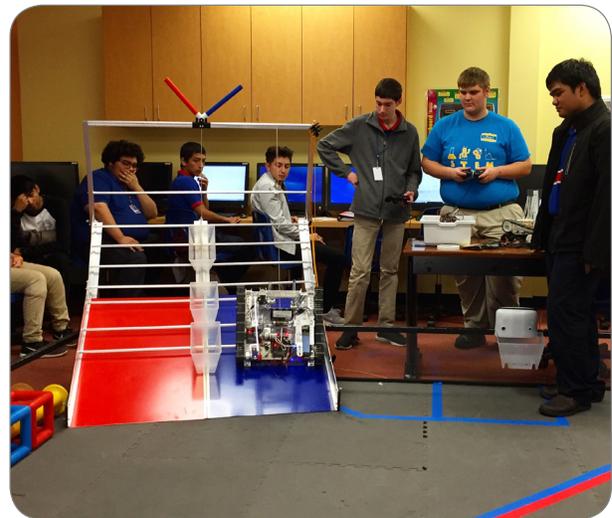
Physics labs feature 3D printers, [Other Mill](#) and resin printers. A guide showed me how he uses [Tinkercad](#) to design parts.

Every Harmony secondary school has a [First Robotics](#) team. Last year eight Harmony teams made it to the world championships. The robot below featured a grappling hook and winch for scaling the wall.



Central to STEM SOS is the [Buck Institute Gold Standard](#) approach to project-based learning. It starts in elementary school and is supported by a PBL platform. Students progress from short-term applications to interdisciplinary STEM projects and year-long, student-driven explorations.

**Early Boost.** In 2003, Texas Gov. Perry was frustrated after a meeting with business leaders. He asked how they could boost youth employability especially in STEM fields. I suggested a network of STEM and Early College high schools. The Texas High School Project (THSP), now [Educate Texas](#), was born with an initial goal of developing 15 Early College schools, 35 STEM schools and improving dozens of struggling high schools.



[Ten years later THSP](#) proved to be one of the most productive public-private partnerships in the country with 135 new ECHS and T-STEM academies serving more than 63,000 students — with more than 75 percent historically underrepresented and economically disadvantaged learners. [Results](#) have been impressive with high achievement, graduation, advanced placement, college attendance and college persistence rates.

With three schools and a proven model in 2004, the Harmony network was well positioned to take advantage of THSP resources and continues to earn the respect and praises of Educate Texas leaders like Executive Director John Fitzpatrick.

“Harmony is a great statewide public charter school success story in Texas. We love their model of rigorous academic coursework, project based learning and an emphasis on engaging extracurricular activities like robotics competitions and science Olympiads,” says Fitzpatrick. “Educate Texas is proud to have been an early supporter and funder of Harmony Public Schools and their visionary leader Soner Tarim.”

**Getting Smart** @Getting\_Smart Following

.@TVanderark is enjoying learning from @HarmonyEdu @hseaustin #students today! #STEMSOS

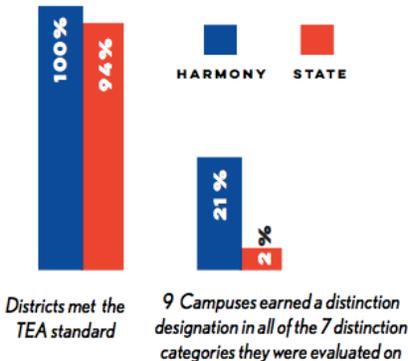
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**Results and recognition.** Texas boasts the country's second-highest cohort graduate rate, and Harmony Public Schools exceed the state average. In addition, Harmony has a 100 percent college acceptance rate and nearly half of Harmony students go on to STEM majors in college. We're looking forward to learning more about Harmony so we can share what it takes to get results like theirs. Early observations indicate it's the combination of strong, entrepreneurial leaders, a thoughtful and deliberate approach to cultivating and recruiting top talent, a creative and resourceful approaches to combining modular components and a real commitment to creating a culture that supports all of the above.

## ACADEMIC ACHIEVEMENTS

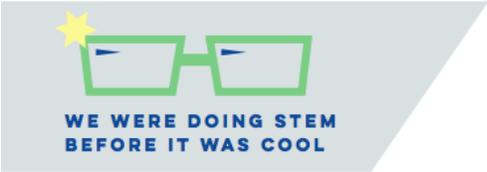
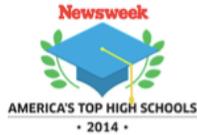
### TEXAS EDUCATION AGENCY EARNED DISTINCTION



### POSTSECONDARY READINESS DISTINCTION DESIGNATION



### NATIONAL RECOGNITION



**42% OF HARMONY STUDENTS  
CHOOSE STEM MAJORS IN COLLEGE**

This Smart Bundle explores the theme of Learner-Centered STEM by unpacking the Harmony STEM SOS model, sharing more about the school culture required to support this model and highlighting what personalized, project-based learning looks like for students and teachers.

The seven blogs in our Harmony Public Schools series collected in this Smart Bundle show that Learner-Centered STEM takes commitment. But schools and districts don't have to do everything at once. It's taken more than a decade for Harmony to build the [STEMSOS model](#) that allows the network to get the impressive outcomes it does.

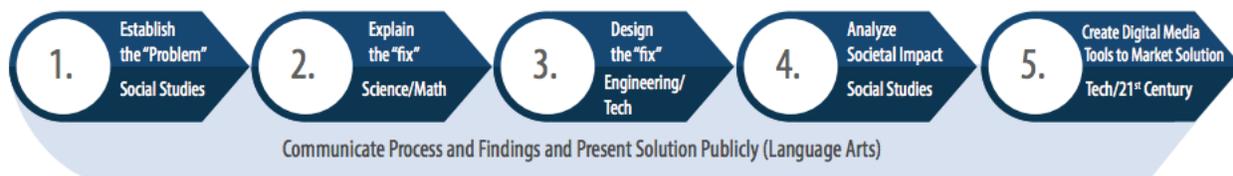
# 11 Key Elements of Learner-Centered STEM

Carri Schneider, Director of Knowledge Design, Getting Smart  
Tom Vander Ark, CEO, Getting Smart

The largest network of STEM schools in the country, [Harmony Public Schools](#), is a college pathway for youth from low income families — especially those interested in careers in science, technology, engineering and math (STEM). Following are eleven important elements of the Harmony school model that can inform a shift to Learner-Centered STEM in your school or district.

**1. Interdisciplinary by design.** The STEM theme is reflected in high school course offerings rich in higher-level science and math, but the most innovative aspect of the model is the interdisciplinary approach to STEM. This plays out in a number of ways. (See graphic below from [RTTT-D Overview of Harmony's program.](#))

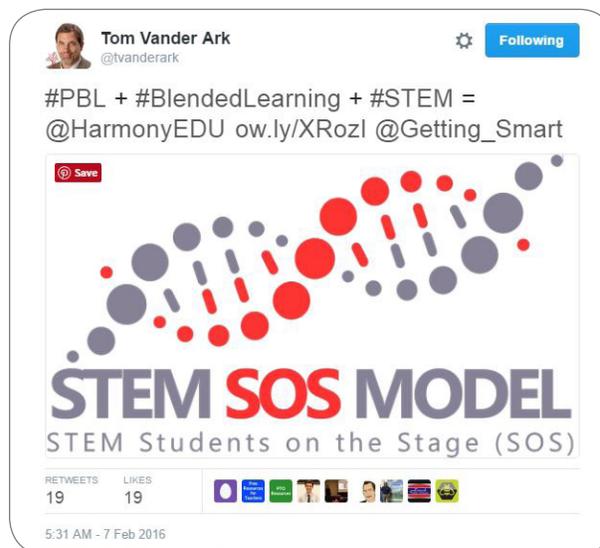
Figure 1. Example of Content Integration



During Tom’s visit, he observed six science experiments and in each case the team could not only describe the science at work but the history behind it. The young ladies below explained how Gallium replaced Mercury in thermometers after health effects were identified.

Across Harmony Schools, integration is deliberate but not forced — increasing relevance and boosting engagement. The scientific method and inquiry-based learning are applied to lessons in ELA and Social Studies. Lessons and projects are required to connect across the curriculum.

A big part of making this work is building an interdisciplinary culture that balances goal-orientation, which encourages student autonomy, and an open-minded approach to learning. This requires having simultaneous teacher flexibility and student accountability — no matter what path they take to reach their learning goals.



**2. Culture of support and collaboration.** Harmony schools are small (about 100 students per grade) and diverse, serving a high percentage of low-income students. Students thrive in an environment that offers individual student supports and maintains an overall culture that prioritizes social-emotional learning.

Students receive academic support in and out of class, including access to each core teacher who holds open “office hours” for dedicated PBL advisory, student progression and mastery support. Small groups of students meet with an advisor for about 30 minutes daily which results in strong, sustained relationships. Collaboration among students is also highly encouraged. Struggling students and those new to English take a reading intervention class in addition to English Language Arts. Tutoring is available before and after school and on Saturday mornings.

A character education class in middle grades reinforces behavioral norms. The [Second Step curriculum](#) supports communication, coping and decision-making skills that help them make good choices and avoid pitfalls such as peer pressure, substance abuse and bullying. All Harmony students put values into action by engaging in service learning.

Some Harmony schools serve a high percentage of students with special needs. Parents and students appreciate the safe, supportive environment where every student has a personalized plan.

**3. Blended tools to power personalization.** In Harmony schools, technology is thoughtfully used for accessing content, collaborating, creating projects and assessing learning. This extends both the learning day and learning opportunities across project-based STEM and other core content areas. Social Studies Curriculum Director Stephen Moss offers one example of many; “Last year I had a teacher actually teach from his kitchen table on a sick day. The students used Google Drive to write papers and the teacher monitored the writing process from home. The substitute teacher in front of the room supported classroom management, while kids didn’t miss a beat with their regular teacher.”

Harmony secondary students receive a Chromebook to power blended learning. Math students use [ALEKS](#) adaptive software and [Study Island](#) for ELA skills practice. Students use tools like [iMovie](#) and [Windows Movie Maker](#) for creating video presentations and create and collaborate using [Google Drive](#). They build digital publications, websites and create interactive brochures with QR codes. Adaptive assessment from [NWEA](#) are used to develop dynamic groups based on student learning needs, and common benchmark assessments across the network offer another set of data points to inform instruction.

Through authentic engagement with social media, students learn digital citizenship and 21st century skills by connecting with one another and the world. An online search for “Harmony STEM” will lead you to project pages on Facebook and around 50,000 student-created YouTube “trailers” for their PBL projects. Harmony calls this the “[Share and Shine](#)” approach to PBL, noting that “the more they share, the deeper they engage in STEM and become natural STEM advocates. All the attention and gratitude they get from the audience is just part of the bonus!” Technology is also a key part of demonstrations at STEM festivals and expos.



**4. Powerful, project-based learning.** STEM SOS is a rigorous, interdisciplinary, standards-focused and engaging teaching approach that is teacher-facilitated, student-centered and project-based. The Harmony approach maintains a focus on standards-based teaching while enriching and extending the learning through projects to promote collaboration and agency.

Developed to align with [Gold Standard PBL](#) essential design elements from [Buck Institute for Education](#), the Harmony approach to project-based learning (PBL) includes three levels. All students must complete four Level I projects a year in middle schools and high school, and high school students must also complete one Level II or Level III project each year. Students work with teachers to design a project plan using a rubric.

- Level I: Short-term projects target 21st century skills within the context of the curriculum.
- Level II: Long-term interdisciplinary projects connecting STEM curriculum to the humanities through rich, meaningful, and rigorous cross- disciplinary and multi-sensory projects that allow the application and development of critical 21st century skills.
- Level III: Student-driven projects, either individual or team, usually supported by a mentor or sponsor from the community. Level III projects include advanced research projects such as science fairs, advanced STEM challenges such as science Olympiad, rocketry and maker and robotics projects.

The online [Harmony PBL Showcase](#) is designed to promote and share exemplary student work that can serve as valuable learning and teaching tools for students, parents, teachers and other educators. Of the hundreds of currently available online project infographics, three are shown below.



**5. Maker and coding.** With the [Rise of Maker Ed](#), there are many cool ways to take STEM to a new level and Harmony is doing just that. A federal [Race to the Top-District](#) grant sponsored a big advance in maker equipment. The physics classroom below has a 3D printer, resin printer, [Other Mill](#), PASCO sensors linked to a projector through Apple TV and programmable robots. (The balsa wood bridge on the back left withstood more than 20 pounds of weight.)



**6. College and career readiness.** All Harmony students graduate with college credit and at least one college acceptance letter. College planning starts in eighth grade and is informed by more than six college visits in high school. An 11th grade English class focuses on essay development and counselors and advisors help with college and scholarship applications. Mature high schools offer two dozen Advanced Placement (AP) courses, and dual-enrollment partnerships are growing around the network with local community colleges such as Houston Community College, LoneStar College, Austin Community College, Redland Community College, El Paso Community College, UTPB, Lamar University and more. The popular [Project Lead The Way](#) program also offers dual credit at many Harmony campuses.

**7. Teacher facilitators.** Harmony's positive, collaborative culture benefits teachers as well as students. The teacher's primary role is that of facilitator. Teachers share expertise with one another to design interdisciplinary projects, and space is created for them to communicate and collaborate regularly. Working closely with one another and in collaboration with students, they often build their own expertise and facility with 21st century skills right alongside their students. Teachers offer engaging demonstrations to kick off lessons, and many use models like "flipped classroom" to maximize in-class application and extension activity time.

**8. Talent-development and recruitment strategies.** Harmony is committed to authentic and job-embedded professional learning opportunities for its staff. Harmony teachers are taken through their own project-based learning experiences to assume the roles of their students. Rather than outsourcing PD, "train the trainer" and "lead teacher" models rely on expert Harmony staff for coaching and mentoring. This approach leverages teacher leadership, builds ongoing capacity and makes the model more sustainable overall. Instructional coaches frequently visit campuses for mentoring support, conducting observations, co-planning, co-teaching, reviewing lesson plans, modeling best practices and leading professional learning communities.

Harmony relies heavily on recruiting new teachers and training them in the Harmony approach to project-based STEM. Their GYOT ("Grow Your Own Teacher") Program offers scholarship funds to Harmony alumni if they enter a college of education, as well as a job offer at a Harmony school upon completion. Harmony students are placed in the city of their choice with the promise of at least a two-year commitment to the position.

**9. Parent/guardian & community involvement.** Learning at Harmony looks different from most schools that families attended when they were students, so parent communication is a priority. Teachers and leaders help parents and students understand the benefits of learner-centered education and project-based learning. By visiting students and their families at home, Harmony teachers help build strong communication and a caring classroom: Teachers talk about student progress, programs and planning; parents provide priceless feedback and input and students improve both academically and socially.

Partnerships with community, business and industry and higher education institutions provide materials, advisors and access to the world. Harmony students participate in internships, externships and work-based learning experiences. School heads also have the flexibility to create local partnerships and pilot new strategies.

**10. Powerful partnerships.** Harmony schools thoughtfully leverage the numerous STEM business and industry opportunities in their home state of Texas to engage students with experts and real-world applications. This video of Houston students working directly with a NASA mentor at Johnson Space Center for a rocketry challenge (for a Level III PBL project) provides just one example of many.



Watch the Rocketry Challenge @NASA - STEM SOS Level 3 video through YouTube.

### 11. Leadership across the network.

From its origins, Dr. Soner Tarim sought to transform the way students, especially minorities, engage with math and science alongside a mission to mold responsive, productive and civic-minded individuals. Harmony schools share curriculum, platform, and professional development strategies. The network has proven adept at leveraging supportive grant programs. Over the last 15 years, Dr. Tarim’s talented team has incorporated all the important sector advancements into a Harmony school model that prepares youth to succeed in STEM fields and propel them into post-secondary opportunities.

Learn more about Harmony’s STEM SOS Model in the book “[A Practice-Based Model of STEM Teaching: STEM Students on the Stage](#)” and at [STEMSOS.org](http://STEMSOS.org).

Originally posted on February 24, 2016 [GettingSmart.com](http://GettingSmart.com)

# Putting the “Learner” in Learner-Centered STEM

Carri Schneider, Director of Knowledge Design, Getting Smart

High school freshman Arnold Langat investigated the role of radio-magnetic frequencies on the grazing habits of animals. He won the school network-wide science fair, took the leading prize at the Fort Worth Regional Science Fair and will now compete in the State Science Fair in San Antonio and on the world stage at the I-SWEEEP in Houston.

Of course not all students in [Harmony Public Schools](#) take the top prize, but each of the 30,000 students in 46 Harmony schools have the same opportunities as Arnold. That’s because they’re in a school that focuses on [Learner-Centered STEM](#) — a model of learning that is possible at scale for all students.



We invited the Harmony community to describe the [learner experience](#): what learning looks and feels like for students; how it differs from learning in a traditional classroom and why it makes Learner-Centered STEM a powerful way to learn.

## What Do Students Say?

We heard from students that it comes down to four things:

- Academic support
- Positive school culture
- Relationships
- Focus on college, career and life

**Academic Support.** *“It is a school that allows me to use my full potential. The classes are challenging and varied; the teachers are helpful and their techniques for teaching are the best. After school programs are interesting, educational and a fun way to expend your time. There are many students that don’t know how to speak, write or read English like me, and they provide a lot of help for us. They provide help for the students who have learning problems.”* — Lorena G., 11th grader at Harmony Science Academy-North Austin, 11th Grade

*“I have the opportunity to get one-on-one help from teachers and counselors. I can visit the counselor anytime I want.”* — Jesus R., Harmony Science Academy Brownsville, eighth grade

**Positive School Culture.** *“This is small and safe environment. Here everybody knows each other and the teachers are really helpful, as compared to other schools there are too many students for the teachers to really pay attention to every single one of them. To them you are just a number. I have been in*

Harmony since I was in the 4th grade and it's been great getting to know a lot of people. It is also the best place for me because you really form a bond with the friends that you make in school and you can learn together, and it's just a good place to be." — Gabriella O., Harmony Science Academy-North Austin, 10th Grade

"I choose Harmony because of all my friends and family that told me it was a good school. When I came, I saw that it was all true. Everyone was nice and helpful. It's a privilege to go to a school like this. Teachers treat you like a real person. School is fun and they have so many fun activities. I also love that they support no bullying which is a great policy." — Anonymous Harmony Student

**Relationships.** "There is a lot of diversity at the school. I have been exposed to many languages and cultures that I wouldn't have even heard of if I didn't go to Harmony school. I have also made a lot of friends that I have cultural ties with, something none of my friends that don't go to Harmony has been able to say. The classes are small so you really get to know your classmates and are able to interact with your teachers to do better in school. There are actually a lot of things to do at the school, we just have to work together and get them ourselves, which has perks to teach kids to work for something they want. Overall I have many stories and interesting experiences coming from my seven years at this school." — Naurin N., Harmony Science Academy-North Austin, 11th Grade

**Focus on College, Career and Life.** "Teachers and staff make sure I get a good education and care about my life and future which is an extra support to succeed in college and life." — Brenda, Harmony Science Academy-El Paso, 11th grade

"Harmony is a good place for me because it gives me opportunities that I want to achieve in my future career. I get an excellent explanation how the real world will be like." — E. Montano, Harmony Science Academy San Antonio student

"It helps me grow as a student and citizen." — Anonymous 12th Grade Student, Harmony Science Academy

## What Do Teachers Say?

Across the network, Harmony teachers described the learner experience in many ways, confirming what students had said about their own experiences as learners. They described Learner-Centered STEM as:

- "Student-centered and active learning through hands-on projects where students take charge of their own learning through research, collaboration and dialogue with peers."
- "Hands-on learning and relevance to daily life."
- "Student-led, problem-solving classrooms."
- "Structured chaos as students work on projects and discuss and collaborate."
- "Individualized learning opportunities."
- "Authentic research on weekly basis."
- "Students following their own interests and ideas and incorporating those things into their studies."
- "Student-driven and personal."
- "Peer-to-peer interaction via project-based learning."
- "Students aspiring to expand their views."
- "Personalized and highly STEM-focused."
- "Authentic and relevant."

## Strategies for Creating a Learner-Centered STEM Environment

A truly learner-centered model doesn't happen without instructional strategies that empower and engage students.

Harmony Instructional Coach Robert Thornton explains, *“Within classrooms that truly implement the Harmony model, learning looks like students engaging students within a safe intellectual environment that is planned, structured and supported by a teacher. At its best you will observe students who are excited to share their learning gains with their teacher (not right answers but actual, sometimes painful, strides forward in academic skill).”*

Harmony Project Director Burak Yilmaz adds, *“Learning looks fun and engaging in Harmony thanks to our unique PBL approach. From what I observe in the classrooms, it feels authentic and relevant to students. They feel like what they are learning matters and they feel and express their growth through projects both academically and socially. They get to be vocal about their learning and use data and arguments to support their reasoning. They get to form and test hypotheses and share their findings with peers and teachers. Their learning is experiential and dynamic, not static like memorizing mere facts and formulas as we typically see in traditional settings.”*

Creating and sustaining an environment like this takes dedication, time and energy. Teachers play a vital role in making the [Harmony vision](#) a reality for students.

We'll focus more on teachers and their role as learning facilitators in the next blog in our “Getting Smart on Learner-Centered STEM” series. By engaging with the Harmony community, we've learned that in a learner-centered model teachers and leaders must:

- Act as facilitators and guides
- Provide anytime, anywhere and on-demand support
- Embody core values
- Truly encourage students drive their own learning
- Create real-world and authentic learning experiences
- Leverage technology to personalize learning
- Commit to professional and personal growth

Make no mistake; being a student, teacher or leader in a Harmony Public School isn't easy. Expectations are high across the board. It's this balance of [“high press and high support”](#) that creates the conditions where both kids and adults thrive. Nearly every teacher with whom we connected had a story that confirmed why everyone is willing to put forth the effort. From the ELL student who struggled through middle school math and by 10th grade decided to pursue a STEM major in college to the student who was sure he could disprove Einstein and was encouraged to do so. There's the student who said she had never imagined she would take AP physics and went on to pass after completing a PBL STEM project she was so proud of she said she would share it with her grandchildren. There's also the student who started off disengaged and disinterested, and thanks to commitment and collaboration between his teachers and family gained confidence and motivation to succeed. He went on to win third place in the regional science fair and silver medal for his coding project using [Scratch](#).

While Harmony Public Schools have the tools and technology to create next-gen learning experiences, it's not the 3D printers or Chromebooks that make the [STEMSOS model](#) work for students. It's a system that puts and keeps students at the center.

# 7 Traits of Learner-Centered Teachers

Carri Schneider, Director of Knowledge Design, Getting Smart

*“We guide students to understand the world around them and to ask questions. Our goal is to help students learn how to think critically, regardless of the content or subject area, so that they may take this skill and apply it in many different arenas. A teacher at Harmony must also be able to foster the inquisitive nature of students. We want our students to question the world around them, why it exists and functions as it does, and how we have the ability to alter it both positively and negatively. To accomplish this, our teachers must encourage questioning by students and partake in deeper discussions and inquiry with students.” — Megan Spears, Harmony Director of Academics, South Houston District*

To learn more about Harmony’s model, we connected with teachers, students and leaders across the network for the seven-part “Getting Smart on Learner-Centered STEM” series. Our last feature, [Putting the Learner in Learner-Centered STEM](#) focused on the learner experience from both the student and teacher perspectives. This feature dives more deeply into what it means to be a teacher in a learner-centered environment.

Based on responses from teachers and leaders in several Harmony Public Schools, we discovered that teaching in a learner-centered environment takes a real commitment to assuming new roles and responsibilities.

Learner-centered teachers must:

- Act as facilitators and guides
- Provide anytime, anywhere and on-demand support
- Embody core values that support deeper learning
- Truly encourage students to drive their own learning
- Create real-world and authentic learning experiences
- Leverage technology to personalize learning
- Commit to professional and personal growth

## Act as Facilitators and Guides

In a learner-centered model, teachers get to act more as facilitators and guides. Teachers find this shift motivating, empowering and validating of their professionalism.

Teachers described their roles as facilitators and guides like this:

- *“The role of a teacher is to create an atmosphere that generates autonomous student learning. When this happens students are happy, parents are happy and administrators are happy.”*
- *“With personalized learning, the role of teachers also shifted from traditional teaching to facilitator of learning. Teachers are creating opportunities for students to work in groups, collaborate, experiment, discuss and revise. With students at the center of their learning, teachers are becoming more of a support person guiding their progress and learning. This has also led to more data driven decision making.”*
- *“Our roles are different from those in other public schools. We are given learning opportunities everyday. A new strategy, a new way of teaching a skill, etc. Our curriculum lends itself to flexibility, and a teacher can modify assignments to meet the needs of all student learning.”*

- *“Teachers are the facilitators. They are the gateway for the students in all things academic and personal. They are role models, and that is what I find most rewarding. I feel rewarded every single day, and learning/teaching feels personal.”*

### **Provide Anytime, Anywhere & On-Demand Support**

*“Once thing that always strikes me about teachers at Harmony is their dedication to their students. If you walk the halls of the school after hours, it would be difficult to find a school that doesn’t have at least a couple of classrooms where students are meeting with teachers and other students. This goes beyond students who are seeking help, and includes students who simply are looking to better their work, or extend their learning further than is possible during the regular school day. Our teachers provide both academic and personal support to students often seven days a week, providing opportunities for students to not only work on their academic pursuits, but opportunities to have a safe environment and location to go to during non-school hours. Teachers, counselors, and administrators on campuses are often seen going the extra mile to help students in whatever way possible. For example, we have a group of students currently working to complete a high mileage challenge as part of the Shell EcoCar Challenge that are working into the wee hours of the night six to seven days a week to work out the kinks in their design and the function of their vehicle. This requires the support and supervision of staff members throughout this process. This is a level of dedication to students that is impressive and touching at once.” — Math Teacher, Harmony Public Schools*

When learning is anytime and anywhere, so is teaching. In other words, expectations aren’t high just for students in a learner-centered model; expectations are high for teachers too. Many of the teachers we connected with described their job as “demanding” and “challenging,” but were quick to pair that with words like “rewarding” and “worth it.” They explained that while all teachers have a long history of working outside of school hours, in a learner-centered model this goes beyond planning and grading. Teachers also have to make themselves available to students “anytime and anywhere.” Students and teachers are encouraged to connect on an ongoing basis — not only when there is a problem.

True commitment to high achievement for all learners requires a strong system of on-demand support and diverse opportunities for connection. At Harmony this means everything from one-on-one meetings and tutorials to formal office hours and scheduled advisory periods. It also means less formal opportunities to connect like hopping on a Google Hangout with your teacher, meeting on a Saturday morning or even at the student’s home. It means creating pre-recorded webinars and tutorials that are available on demand for students if they’re working late at night. It means having a “my door is always open” policy.

### **Embody Core Values That Support Deeper Learning**

It takes a staff commitment to core values to ensure that a positive, learner-centered school culture is built and maintained. For students to achieve [deeper learning](#) outcomes like critical thinking, problem solving, collaboration, communication, self-directed learning, an “academic mindset” and mastery of core content, adults in the system have to develop and strengthen the same knowledge, skills and dispositions.

We heard from several teachers who embody these core values perfectly:

- *“More than being an educator, a teacher at Harmony is a friend who provides guidance and help at any moment. As a teacher what I love the most is when I can truly help a student with something he or she is struggling on. By cooperating with them and allowing them to voice their own opinions, I can better understand their situations and form meaningful bonds with them, in which I am offering the most help that I can. I feel as though I truly deserve my title as a teacher at this position in Harmony. What’s different about my job in Harmony is that here I can personally connect with and really get to know my students. I can help them both education and life wise. This is very important to me and to the students too.”*

- *“Being a teacher at Harmony is like having a big family in which your ideas are valued, cared and implemented, you feel like it is your school home and part of you.”*
- *“My role as a teacher includes being a role model, a disciplinarian, a motivator, a mentor and an adviser. We have students that come from all different types of homes with problems within our community. Most of students need positive pep talks to keep them engaged in their studies. Some students just need someone to care about them and believe in them; others need a disciplined environment that keeps them on task.”*
- *“The students are backed by experienced teachers who care about the individual more so than the class. Each student feels like their learning is personal and in my classroom I make sure each student feels they are capable of overcoming all obstacles.”*

### **Truly Encourage Students to Drive Their Own Learning**

*“To me, I feel special when I engage my students. Thanks to the STEMSOS model, I can engage my students and have opportunities to meet with my students one-to-one after schools. When I see my students grasp the idea or accomplish something, that is the moment I find most rewarding. This happens a lot due to the projects we assign our students. In the end, each and every one of my students becomes the expert of their project and related topics.”* — Teacher, Harmony Public Schools

In a truly learner-centered environment, teachers hand over many traditional responsibilities. For example, students at Harmony often set the agenda for their own meetings and teacher conferences using their own goals, concerns and achievement data. Teachers at Harmony believe this is a key part of helping students reach their full potential. Giving students autonomy develops [habits of success](#) and [mindsets](#) that researchers continue to confirm are important components of lifelong learning and success.

For teachers, learner-centered models require flexibility. While of course there are goals, standards and frameworks to guide instruction, teachers do not follow a lock-step progression based on the school calendar. As one teacher explained, “We teach at our own pace according to what the kids need. Classes are not expected to be teaching the same thing at the exact same time. We are more focused on re-teaching when necessary and more concerned with kids showing they’ve mastered the information before we move on.”

It’s no surprise that motivating learners also comes down to real-world and authentic learner experiences. At Harmony, this means internships and partnerships with local and regional businesses. Students participate in clubs, academic and STEM competitions, fairs, presentations and expos. Sometimes individual student interests grow from an independent activity to a full club or group. One teacher described how one student’s interest in electronics formed the basis of an electronics club that the teacher helped establish and other students joined. The teacher explained his reasoning, “I respect my students’ thoughts and I listen to their interests. If I can help them, then I help them.”

### **Leverage Technology to Personalize Learning & Expand Access**

A learner-centered environment leverages technology to boost access and outcomes by customizing student experiences based on powerful student data. Teachers in learner-centered environments don’t just use technology for its own sake and certainly aren’t being replaced by programs and devices. In fact, teachers in these blended-learning environments are more important than ever. They use data from online programs and assessments to get a clear sense of student learning and differentiate instruction accordingly. Teachers use student data to form intervention and enrichment groups and provide flexible, dynamic, small-group instruction. One teacher explains, “Technology allows me to utilize online learning tools for students. I can see the progress and needs of each of my students via various dashboards and online reports.” Student data is used on a classroom, school and network level to inform the ongoing development of curriculum, as well as overall elements of the STEM SOS model.

Blended learning creates efficiency in the day and frees up classroom time for collaboration, experiments, demonstrations and project-based learning. Technology also offers powerful tools for collaboration. In a learner-centered model, the ability to offer ongoing and meaningful feedback is essential. Harmony uses tools like Google Docs for collaborative writing and ongoing feedback while student work is still “in development.” As one teacher explained, “Students utilize Google Slides to submit their in-progress presentations or YouTube for videos in the development stage. I can easily comment and share my feedback with the groups via the slides or Edmodo during the process, in other words, as they are actively working. No need to wait for a week or two until the students finish the project and share it with me. This allows me to steer them in the ‘right’ direction in a timely manner.”

Gaining proficiency with technology and various tools also helps students develop unique skills for college and career. They graduate with experiences in filming, editing audio and video, as well as creating their own websites to showcase their work.

Because Harmony schools serve a high population of economically disadvantaged students, access is a real issue. To bridge the “digital divide,” computer labs are available for students after school. All Harmony campuses are also 1:1 in grades 6-12, and students have Chromebooks (funded by a RttT-D grant) that they can take home.

### **Commit to Professional and Personal Growth**

*“Teachers may need special skills to be able to design gold standard PBL, but implementing such PBL lessons requires a lot of practice and coaching. That is why Harmony created a teacher support structure with mentor teachers, instructional coaches, data analysts, and curriculum directors. Mentor teachers are experienced lead teachers who are PBL champions at each campus. New teachers take advantage of their expertise. Instructional coaches are district level regional support people who are experts in PBL facilitation and project implementation. They train, co-plan, co-teach, observe, and lead PLCs with teachers periodically throughout the year. And finally curriculum directors are central office level administrators who did majority of the heavy lifting in curriculum and PBL design work and they also train coaches and teachers to sustain the train the trainer model. During PD days, teachers are placed in different groups based on their experience and prior training history to make sure they get the right training that they can put to use in their classrooms. So PD is also personalized and catered to the individual needs of teachers.”* — Burak Yilmaz, RttT-D Project Director, Harmony Public Schools Central Office

While all the traits outlined above are important to teaching in a learner-centered school, committing to professional and personal growth is probably the most important. No two days look the same. There’s always a new tool to learn or a new student interest to research. There are developments in the STEM fields to share and the ongoing curation of resources to support student learning.

Ultimately, teachers in a learner-centered model must commit wholeheartedly to being learners themselves. This means setting personal and professional goals, seeking out opportunities to build new knowledge and skills and requires Harmony leadership to make and keep professional learning a priority so teachers have the support they need to thrive. This takes many forms: lead teachers, online PD modules created in-house, coaching and mentoring, training sessions, formal professional development days, informal opportunities to collaborate, two weeks of summer training, workshops, etc. Even with all these opportunities, many teachers acknowledge that they still need more.

Because we believe teachers benefit from the same blended, competency-based learning opportunities that we know are best for students, we appreciate Harmony’s goal to model PD after student learning environments. Megan Spears explains, “Much of the professional development allows teachers to learn and grow in a similar environment we ask them to provide to their students. Many sessions are

collaborative, with teachers sharing ideas and working together to achieve certain goals. Our teachers need to be able to foster a collaborative environment in their classrooms, and in order to do this they need to understand what a successful collaborative environment looks like. Also, since our students are often taught in an environment that provides them the ability to interact and collaborate with their peers, our teachers need to be able to drive class periods designed in this way, and to ensure that learning is taking place and that management of time and behavior is maximized."

Because Harmony teachers are expected to have content expertise, leadership also supports development in STEM fields. One teacher explained, "Harmony supports us for anything to improve ourselves. They support us to take our master degrees, or any workshop in our area. For example, I asked to Harmony to join MIT's Master Trainer program. Harmony accepted my request and paid for it. I took an online education for 16 weeks from MIT for being an APP Inventor Master Trainer and I went to MIT to take three days on-site education and I became an MIT APP Inventor Master Trainer. So I am able to educate other Harmony teachers about App Inventor with MIT's curriculum. Our Director of Instructional Technology from the Central Office offered me to take Code.org trainer certificate too."

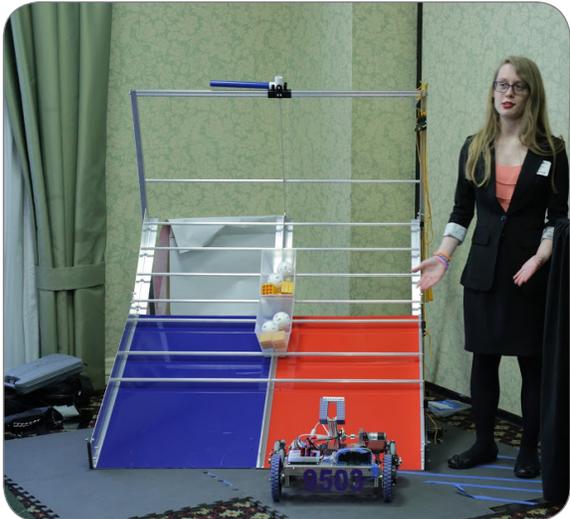
Being a learner-centered teacher requires new roles, new responsibilities, new experiences and new approaches. Above all, it requires setting and meeting high expectations for your students and yourself. As Ahmet Cetinkaya, Harmony Public Schools Director of Accountability explains, "As a teacher at Harmony you have an end goal in mind at the beginning of the year. You do whatever it takes to achieve that personal goal. There is a culture of dedication and high expectations for ALL that drives what we do and motivates us."

# Learner-Centered Leadership Means Teachers and Students Lead, Too

Carri Schneider, Director of Knowledge Design, Getting Smart



Watch the Students Study the Upper Atmosphere with Near-Space Project video through YouTube.



How do you create and sustain learning environments where more than 30,000 kids each year are engaged in deeper, project-based learning like the students above?

There are many features of the STEMSOS model that can inform and inspire teachers and leaders who are interested in shifting to a student-centered, [deeper learning](#) model. [Students told us](#) that in these environments the most important things are academic support, a positive school culture, strong relationships and a focus on college, career and life. [Teachers told us](#) that being a learner-centered teacher requires acting as a facilitator, providing on-demand support, embodying core values that support deeper learning, leveraging technology to personalize learning, committing to professional and personal growth, creating authentic learning experiences and truly encouraging students to drive their own learning.

So what do leaders have to say about creating and sustaining a learner-centered education model like STEMSOS?

Just as teaching in learner-centered school requires letting go of traditional notions of what it means to teach, leading in a learner-centered school means letting go of traditional notions of what it means to lead.

In [Preparing Leaders for Deeper Learning](#), we acknowledge that leading in project-based, blended and competency-based learning environments requires leaders to be proficient in a number of new and varied roles beyond traditional managerial and executive responsibilities. Leaders creating and sustaining next-gen learning environments like Harmony Public Schools must be proficient in setting and conveying a vision, innovating and managing change, leading for deeper learning outcomes and engaging and scaling deeper learning.

Harmony leaders show evidence of these skills in many ways. Yet, our work with Harmony has revealed two core requirements of learner-centered leadership: teacher leaders and student leadership.

### Cultivating Teacher Leaders

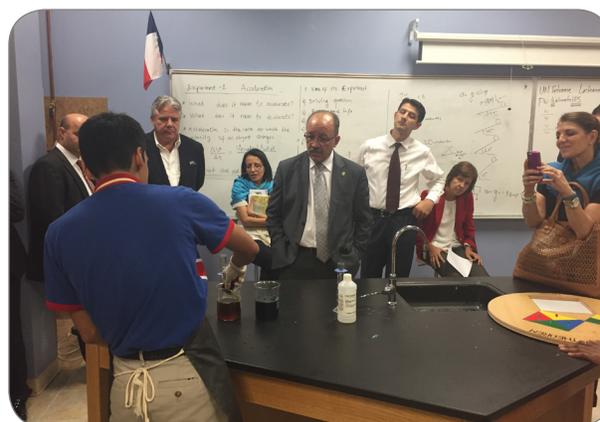
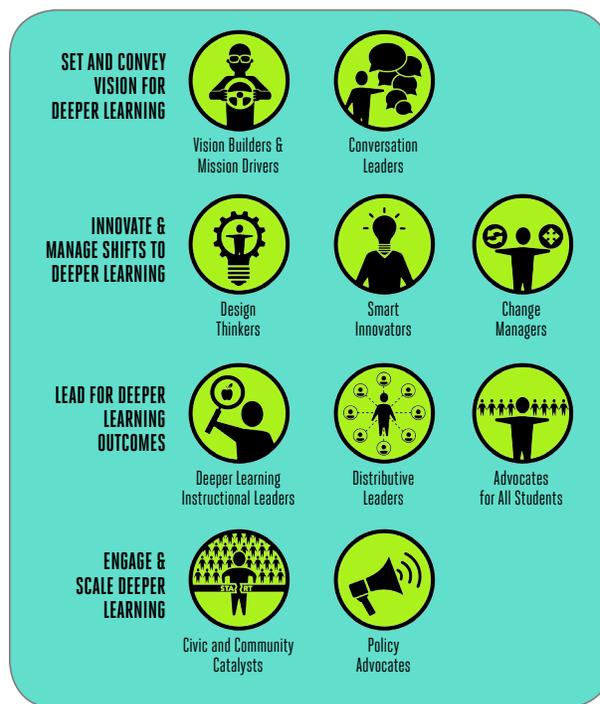
Harmony leaders believe in cultivating leadership talent by investing in their own teachers and giving them opportunities to develop leadership skills. In this “build your own leader” model, most current administrators originally worked as teachers. The transition from teacher to leader happens much more quickly and more organically than in traditional *teacher > assistant principal > principal* career ladders. There are multiple paths toward leadership for teachers including project coordinators, mentor teachers, department chairs, system course leaders, curriculum writers, PBL trainers, academic deans, etc. One teacher described these possible paths: *Teacher > Lead Teacher > Core Area Department Chair > Core Area District Coach and Teacher > Project Leader > System Course Leader > Dean of Students > Principal.*

Building-level leaders identify unique talents and expertise of their teachers and then work with district and central office level administration to leverage that expertise through opportunities such as leading professional development, working on curriculum, serving in formal leadership roles, etc. The Harmony Aspiring Leaders Academy (HALA) program supports Harmony staff as they take on leadership roles in the system. HALA is a cohort-based, professional development opportunity that focuses on three strands: Principal, Dean of Students and Dean of Academics. The program consists of four full-day PD sessions with fully reimbursable travel expenses.

In addition to on-the-job leadership training and the opportunity to contribute to the overall success of Harmony Public Schools, teachers who assume additional leadership roles earn a financial stipend.

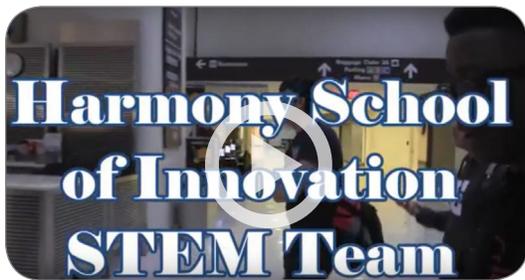
### Building Student Leaders

Harmony leaders don't just create opportunities for their teachers to lead. They create opportunities for their students to lead, too. The STEMSOS model is built on the belief that all students





Watch the Harmony Staff and Students Attend T-STEM Conference 2016 video through YouTube.



Watch the Harmony STEM Team at USA Engineering & Science Festival 2016 video through YouTube.



Watch the ISWEEEP 2016 Highlight video through YouTube.

should graduate equipped to thrive in college and career. This means both academics and character development are prioritized. Spend time in a Harmony school and you'll see lots of evidence of students developing leadership skills — from leadership camps to the more than 50,000 student projects on YouTube.

Thanks to an emphasis on project-based learning, Harmony students complete rigorous projects each year with the support of their teachers. They present them annually at the Texas STEM conference individually, together and sometimes with teachers.

Harmony students also present at public STEM expos, events and national education and industry conferences. Their presentations show educators, leaders and the business community what is possible when a school invests in learner-centered STEM. Examples of these events include SxSWedu, Energy Day Festival, Sally Ride Science Festival, NSTA STEM Forum & Expo, Plasma Science Expo by American Physical Society and USA Science & Engineering Festival.

Harmony students organize and run the STEM public day of I-SWEEEP as part of the Celebration of STEM Education Week in Texas, which has been proclaimed by the Texas governor every year since 2013. Over 100 Harmony students put on an amazing STEM show for nearly 5000 visitors from around the nation and across the globe during the public day.

Harmony's nationally recognized Learner-Centered STEM model, STEMSOS, receives attention from many educators, philanthropic organizations, think tanks, startups, politicians and community leaders both nationally and internationally. As a result, Harmony schools welcome many visitors throughout the year. These visits are run by student leaders who not only help give tours, but also arrange other student groups to demonstrate what deeper learning looks like at Harmony. The next Harmony feature highlights more about how Harmony engages with people outside the network to create powerful partnerships with families, the community, and business and industry to make Learner-Centered STEM a reality.

# 18 Ways to Power Learner-Centered STEM Partnerships

Carri Schneider, Director of Knowledge Design, Getting Smart



Watch the El Paso Students Build Solar Car for School Project video through YouTube.



Sometimes learning science in schools means reading from a textbook, memorizing the periodic table, or building yet another baking soda and vinegar volcano.

Other times, learning science means building and [sending a weather balloon more than 100,000 feet into near-space](#) with your classmates, [launching a rocket with NASA](#) or constructing a solar car with the help of professional mechanics and engineers and racing it at the Texas Motor Speedway.

The latter is the case at Harmony Public Schools — the 46 schools at the center of our series [Learner-Centered STEM](#). In partnership with Harmony, we’ve discovered and shared [11 key elements of the STEMSOS model](#) and the implications for [students](#), [teachers](#) and [leaders](#) in their unique project-based, deeper learning environment. But it’s not just the kids and adults inside the schools that make Learner-Centered STEM a reality. Learner-Centered STEM takes powerful partnerships with people outside classroom walls. Here are 18 examples of Harmony partnerships we hope will inform and inspire you to create powerful partnerships in your own school or district.

1. Create a STEM Advisory Board that draws from various sections of the community including business leaders, technical experts, teachers, professors, engineers, researchers, etc. Consider holding monthly or bi-monthly meetings like Harmony.
2. Establish ongoing professional partnerships with local and regional businesses with STEM expertise. Harmony partnerships include Lockheed Martin, Bell Helicopter, Texas Instruments, Bechtel, etc. Harmony has also established a partnership with the Army Educational Outreach Program (AEOP). A recent presentation from Dr. Ryan, GEMS Program Coordinator at the U.S. Army Institute of Surgical Research, served as a tool for information and recruitment for the GEMS program that places students into selective summer programs. Over the past two summers, more than a dozen Harmony middle school students were chosen to participate.

3. Form an MOU with at least one local college to create dual-credit offerings for students and give them access to field experts such as professors, university researchers and labs.
4. Leverage business and industry for mentors, project consultants, internship hosts, etc. One recent Harmony example is a project in which students, trained by mechanics and engineers, learn the required skills to build a solar car. The students pictured above are visiting Tesla Motors for an electric car project.



5. Invite the community to volunteer at exhibitions, fairs and other events.
6. Communicate opportunities for student presentations to the local community.
7. Create extracurricular activities and clubs in partnership with business and industry. Harmony partnerships include NASA and Bechtel, who provide mentors outside the regular school day to work with students in robotics, rocketry and other high student-interest programs.



8. Organize a fundraiser to generate dollars for STEM internships and activities. Harmony's first annual Gem Ball organized by the Advisory Board Committee raised \$8,000 for summer internships this year.
9. To help provide high-quality feedback and improve student learning, invite industry and field experts to judge events and competitions. Create opportunities for students to participate in national STEM competitions for additional motivation. Harmony Science Academy in Houston is among only 18 schools in the U.S. and Canada to be involved in this year's Student Spaceflight Experiment Program (SSEP). SSEP teams design experiments and write research proposals for testing scientific phenomena in a weightless, micro-gravity environment. Around 80 teams (nearly the entire school) submit their own research proposals for a chance to ship their experiment to the International Space Station for six months and present their findings at the National Smithsonian Museum in Washington, DC.
10. Connect teachers to field experts to review and help design STEM projects, rubrics and evaluation tools.
11. Keep an open door policy. Invite policy-makers and influencers into your schools to see learner-centered STEM in action.
12. Focus on authentic career preparation early and often. Hold "Career Day" activities and invite participants to share insights into their careers and related training through in-person or virtual presentations. One such event at Harmony was the [two-day Viva Technology event](#) in partnership with Shell Oil engineers, Great Minds in STEM and volunteer college students from University of Houston and Rice University. Students, parents and teachers learned about STEM fields and the steps necessary to succeed in them. Harmony also creates space for students to take advantage of opportunities. One example includes the [partnership with INROADS](#), which allows students to learn more about corporate internship opportunities and how to get placed in paid positions out of high school.

13. Get learners out into real-life lab settings. A recent Harmony example involved field trips to the Environmental Protection Agency lab and Conoco Phillips office. Students had a chance to see a government operated institution and lab and compare it to that of a privately owned and operated company. Students were able to compare and contrast approaches to foundational environmental concepts and the implementation of sustainable practices. Other Harmony examples include students attending forensic technologies training at the Drug Enforcement Agency (DEA) labs.



14. Make “outreach” a job description. Harmony has a dedicated staff member at every campus whose job is reaching out to the community to share opportunities and build relationships.
15. Remember, parents are among your biggest assets. The PTO/PTA should be one of your most important organizations. At Harmony, this means parents support academics and event coordination. Invite parents with jobs in STEM fields to work with their own children and their peers. This can range from the parent who is a certified welder to the parent who is the university engineering professor.
16. Inform and empower parents through parent education nights so they can in turn support their students. Harmony has learned that parents engage when schools reach out to them in meaningful ways, such as providing a parent night that covers the ins and outs of financial aid applications at the high school level or hosting other schools for an academic competition.
17. Invite the community — not just parents — to showcases, events and exhibitions to learn from students and celebrate their successes.
18. Don’t reinvent the wheel; just keep improving it. Share resources across your school, district or network. Catalog best practices and create ways to share them widely. Create opportunities for peer-to-peer learning among teachers and leaders in your school, district and network. At Harmony, this means [teacher-led professional development](#), strong professional learning communities and lots of opportunities to [build teacher leadership](#).

# Conclusion

Dr. Soner Tarim, CEO and Co-Founder, Harmony Public Schools

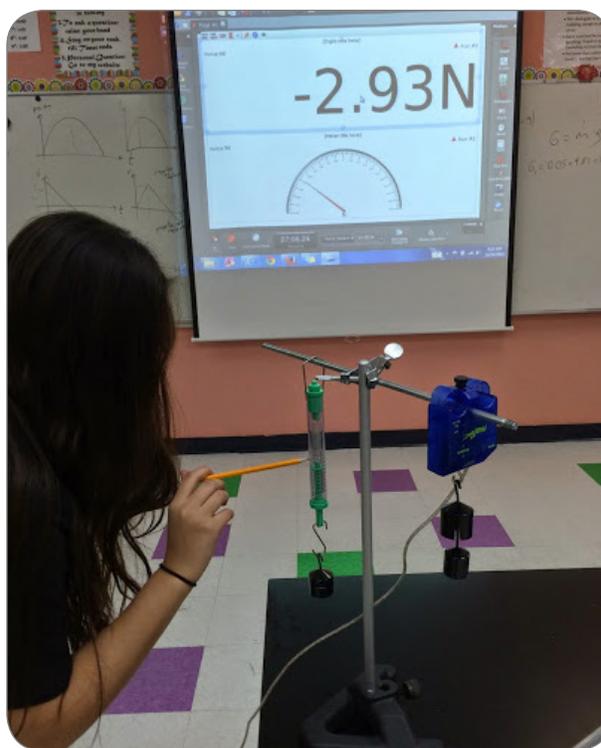
## Redesign Schools with Learner-Centered STEM

*“Every kid starts out as a natural-born scientist, and then we beat it out of them. A few trickle through the system with their wonder and enthusiasm for science intact.” — Carl Sagan*

As one of the founding members of [Harmony Public Schools \(HPS\)](#), I dove into the public charter school movement like a curious child. With great enthusiasm, we hoped to generate an innovative approach to cultivating the talent pipeline in the ever growing and demanding STEM fields. Due to high demand, HPS continues to grow and to thrive. We’ve had unprecedented success in STEM education and college and career readiness. We’re proud to say that in the history of charter schools, Harmony is the only example of a network growing from 200 students to 31,000 in 15 years (with an even larger waiting list of nearly 38,000 kids in Texas).

How did we get here?

Harmony was founded by a group of immigrant graduate students to tackle the problem of high school graduates being ill prepared for college education. In my years as a graduate teaching assistant at Texas A&M, it occurred to me and my fellow Aggies that public education could definitely use a new approach, one with innovative leadership and a laser focus on STEM education. We came to this realization after mentoring and tutoring hundreds of college and high school students to help them and share our passion for science with them. These young people deserved a much more rigorous set of STEM experiences. We decided to start a new school designed to give all students an education that kept their sense of wonder and enthusiasm for science intact.



## Integrated and Personalized STEM Education

An interdisciplinary STEM approach to student-centered learning has always been at the forefront of Harmony’s school design ever since its inception. This is reflected in the mission statement we wrote 16 years ago. In those early days, STEM education was not as widely recognized as it is now, so I was often asked, “Why STEM?” It was not even an acronym back then. Harmony is a pioneer in STEM education — we’ve been doing it since before it was “cool.”

Getting where we are today was definitely not easy. Our model went through many cycles of refinement by trying new and different things. Our goal was to create a scalable model that could be replicated nationally. Being such a large statewide network allowed us to design and test the [STEM SOS model](#) on a large scale, and we have seen impressive results. Our [Race to the Top – District](#) grant has been instrumental in creating and scaling this model. Now that we have a strong model with a proven track record of success, we are super excited to share it with the world and help other school systems create similar powerful, personalized learning environments for all students.

[Project-Based Learning at Harmony Public Schools](#) is a great brief put together by District Reform Support Network after several site visits with RTT-D grantees facilitated by the Department of Education. Earlier in this blog series, Tom and Carri captured [11 Key Elements of Learner-Centered STEM](#) based on Tom’s visit to Harmony Public Schools earlier this year. The instructional framework and the key components within this model are important considerations, but equally important, if not more, is the design thinking around the [learner experiences](#) and [teacher experiences](#) covered in previous posts in this series. For a comprehensive, all-inclusive resource of STEM SOS model, I encourage you to read our book [A Practice-based Model of STEM Teaching: STEM Student on the Stage \(SOS\)](#), which was collectively authored by Harmony educators — the true practitioners of this model.

**School Redesign Shaped by Dynamics of Global Economy**

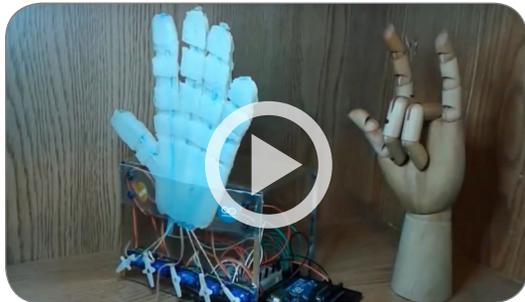
The astonishing statistics around the job markets, US economy, and workforce needs helped shape Harmony’s vision for learner-centered STEM. According to a report by the [Center on Education and the Workforce at Georgetown Public Policy Institute](#), total employment in the U.S. is expected to increase by almost 24 million over 10 years, from 141 million in 2010 to 165 million by 2020. In addition to these 24 million newly created jobs, 31 million job openings are predicted due to baby boomer retirements bringing total of available jobs to 55 million in the economy through 2020. Among occupational clusters, the fastest growing jobs have been and will continue to be in healthcare, community services, and STEM. Although our nation’s demand for STEM professionals is expected to double in comparison to all other occupations, relatively few American students are choosing careers in STEM.

At Harmony, we vowed to change this. 42 percent of Harmony graduates in the class of 2015 chose a STEM major in college. This rate was about 19 percent five years ago. We believe that because our nation’s future economic prosperity is closely linked with student success in the STEM fields, STEM education must be elevated as a national priority.



Watch the STEM SOS PBL Level 2 Physics of Ice Skating video through YouTube.

Engaging all students in STEM requires a personalized learning approach where standards-based content is mastered through projects designed to tackle relevant problems and nurture student interest. Memorizing formulas and principles in math, physics, and chemistry is almost never appealing to today’s learners who can’t see the meaning, relevance or connection to the world we live in. Learning must be connected to the personal interests of each student. Harmony’s PBL model, created with eight essential elements from the [Buck Institute for Education Gold Standard PBL](#), integrates core content and teaches standards-based knowledge and skills through a rich portfolio of projects where student voice and choice is highly evident. For instance,



Watch the STEM SOS Level 3 - Robotic Hand (Engineering Design with Arduino) video through YouTube.



Watch the STEM SOS Model - STEM Fest Preparation @HSA El Paso video through YouTube.

you can see a student in a physics class doing a project on how principles of [angular momentum](#) applies to ice skating, or a student in a biology class with a project studying [protein synthesis](#) and how it revolutionized medical manufacturing and personalized medicine or a student in an elective technology applications class designing a [robotic hand](#) and talking about how it contributed to biomedical engineering.

### Creating a STEM Culture in Schools

Harmony uses project-based learning as a major lever to personalize learning for all students. PBL allows students and teachers to take a deep dive into a problem or concept at hand and explore it in greater depths. Doing research, working in teams, designing solutions, building prototypes, documenting progress and communicating findings are all key activities students go through with each project, thereby practicing and mastering the [deeper learning competencies](#) and [Next-Gen Science Standards](#) needed in a 21st century workplace.

Now imagine a school where all students are doing long-term interdisciplinary projects throughout the year and publicly presenting them in the spring at an open house where the entire community is invited to learn about the school and celebrate student success. Visit any Harmony campus in February or March and you are guaranteed

admission to one of these STEM festivals where literally hundreds of students set up stations to showcase their learning through PBL projects. These public events have been a great way for Harmony to create a culture of learning in STEM and instrumental in engaging key stakeholders in the community. As an example, see how students prepare for a community-wide public STEM expo in El Paso and segments from actual STEM festivals in [San Antonio](#) and [Houston](#). More examples can be found [here](#) on the STEMSOS website.

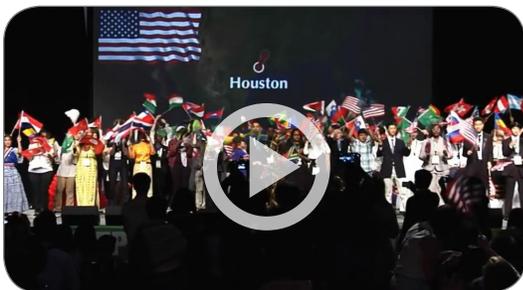
### Shaping Globally Competitive Graduates

Skills most valued in today's economy include leadership, communications and analysis. Because these are the most in-demand competencies in the labor market, employers and industry leaders want students capable of making sound decisions, communicating effectively, analyzing information and data and managing projects and teams. The demand for physical skills continues to decline, and even non-STEM fields increasingly require STEM skills. These are best taught in learner-centered classrooms where deeper learning is happening every day with meaningful projects tackling the relevant issues of our society and speaking to the interests of our learners.

Harmony's share and shine approach empowers students and makes STEM engagement socially desirable for students of all ages. Our school and district leaders create a plethora of opportunities for students to get on stage and share their learning and demonstrate their marketable skills in both



Watch the ISWEEEP intro 2013 video through YouTube.



Watch the ISWEEEP Highlights video through YouTube.



Watch the T-STEM Conference 2016 - Part 3 video through YouTube.



Watch the T-STEM Conference 2016 - Part 1 video through YouTube.

competitive and noncompetitive settings through regional, statewide, national and international events. Harmony created **I-SWEEEP**, a transformative science project Olympiad providing a competitive edge to students on a global scale.

### Empowering Teachers to Lead

Today's youth interact with technology in ways previous generations would never have dreamed possible. The digital revolution has transformed everything from labor to leisure. STEM literacy is no longer optional. Our country and the state of Texas need highly qualified STEM teachers to prepare our kids for the high-wage, high-demand jobs of the future. The teacher shortage, especially in STEM areas, is a big problem across the country. At the top of just about every educator's wish list is more math, science and technology teachers to replace those lured away by private industry in a booming economy. With this well-documented shortage in mind, it is critical to invest in our talented STEM teachers and empower them to lead projects and initiatives as a way to value their professional learning needs and to retain them. **Learner-centered leadership** requires teachers and students to lead as well. A Harmony example includes sessions prepared and co-presented by teachers and students at a statewide educator conference. Check out this 4-part [video playlist](#) to see student and teacher leaders in action.

### Call to Action

All innovative and visionary educators agree: We need to transform our education system so all children everywhere have access to a great education that allows them to find their passion and fulfill their human potential. I founded Harmony to address this very problem and made it my life's mission to transform our education system into a learner-centered one. The current education system, based on a Prussian factory model, teaches to a batch of students in a standardized way but not to an individual in a personalized way. This industry model of education was the right fit for decades in the 20th century because graduates would take manufacturing jobs at factories that didn't require higher order skills. Back then the basic literacies were just fine, but the world has changed dramatically.

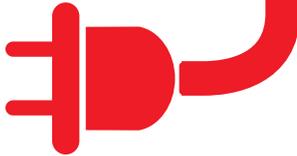
We now live in an international and globally competitive economy. In order to survive and become successful in this knowledge economy, every student has to maximize their learning. When we have millions of job openings in this country and millions of graduates not qualified to fill those jobs, we have an education problem. We need a new system — a student-centered one that can be customized to each student's needs. But as Einstein once said, "we can't solve problems by using the same kind of thinking we used when we created them." We need a new way of thinking when we redesign our schools. We have the power and the means to make this transformation possible. Let's take action for our children.

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