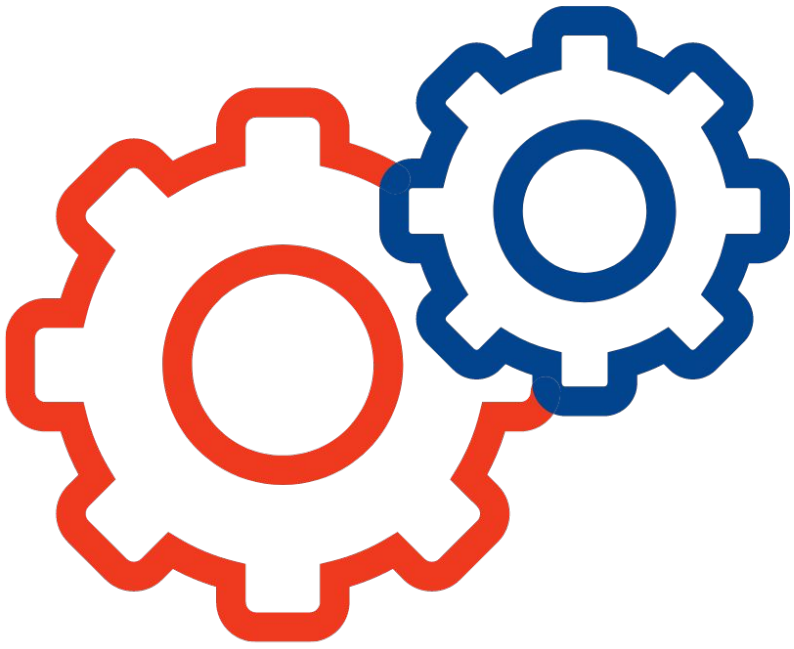
Competition Handbook

Updated October 2024



Competition Overview

Overview of SA Smart: Mayor's K-12 Smart City Challenge

By 2040, 1.1 million new people will call San Antonio home. While this future creates many challenges, it also creates opportunities. One opportunity is to drive student learning through smart city challenges. Join us as we create learning opportunities for students rooted in the challenges faced by our city.

What is SA Smart?

SA Smart is the Mayor's K-12 Smart City Challenge. Student teams in grades 6-12 will research a San Antonio-specific smart city problem and propose a strategy, product, or service as a solution.

What do participants experience during SA Smart?

SA Smart starts with a fall Virtual Launch. Then teams prepare an idea, register, and join a required late January or early February Launch Clinic. Through March, teams work on their Research Pitch Deck. Finalists are selected, and in April and May, finalists get help from mentors. In late May, finalists deliver their pitch at Mayor's Cup Competition Day.

Who can participate in SA Smart?

The competition is open to any 4-6 member San Antonio area team sponsored by a school or education service provider, for students in grades 6-12, with a teacher or responsible adult acting as their sponsor.

What will Competition Day be like?

SA Smart Competition Day will be a professionally run, high energy event where students present their research and recommendations. An awards ceremony will be held, and prizes awarded to the best performing team/s.

What will the prizes be?

The winning team will receive the Mayor's Cup. 2nd Place and possibly 3rd Place awards will be given based on bracket size. Digital badges will be awarded to all finalists. The teams with the top three scores will receive a voucher for additional entrepreneurship training from partner EPICenter. Additional prizes will be determined with sponsors.

Who is the SA Smart team?

SA Smart is a cooperative effort between the Mayor's office and local non-profit organizations. The program is led by SAMSAT. Other long-term partners include City of San Antonio Planning Department, City of San Antonio Innovation Department, Geekdom, CPS Energy, Education Service Center-Region 20, the Alamo STEM Ecosystem, and EPIcenter. A Steering Committee manages the effort, and they select judges for the final competition.

SPONSORS

CPS ENERGY

smart energy education

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SAMSAT MUSEUM

San Antonio Office of the Mayor

Program Partners

CITY OF SAN ANTONIO OFFICE OF SUSTAINABILITY

CITY OF SAN ANTONIO PARKS & RECREATION

CITY OF SAN ANTONIO PLANNING DEPARTMENT

CITY OF SAN ANTONIO OFFICE OF INNOVATION

geekdom

ALAMO STEM ECOSYSTEM
Bridging Youth, Community, & Workforce

ESC 20
Serving the Educational Community

Competition Resources

Competition resources and registration can be found at: www.sa-smart.org

Steps to Participation in SA Smart:

1. Review the Competition Schedule: www.sa-smart.org/schedule
2. Register your team: www.sa-smart.org/register
3. Review the Competition Rules & Scoring Rubric: www.sa-smart.org/competition
4. Download the Pitch Deck Template: www.sa-smart.org/competition
5. Review the curriculum (next section) and download:
   - ❏ Editable Teacher Slides
   - ❏ Editable Student Workbook
6. Watch SA Smart Career Chats: www.youtube.com/@sasmart

Competition Curriculum

Note to Teachers

Curriculum Overview

The SA Smart Project Guide is intended to support teams in generating ideas and developing a pitch deck that meets the SA Smart requirements. The curriculum is generic and can be used with any competition theme.

Below is an overview of each element of the curriculum guide that can serve as a checklist. Click to the right to access the editable teacher Google Slides and Student Handouts. Following this curriculum is not required. The intention to provide support to teachers implementing SA Smart as a class or afterschool project.

	Objective	Activities
Big Picture	Learn about SA Smart	Watch the Virtual Launch
	Learn about competition details & theme	Attend Competition Clinic.
	Learn about Pitches	Watch example business pitches and review winning SA Smart Pitch Decks
Getting Started	Create teams	Complete teamwork activities (see next pages) Assign Team Roles Plan It Out
	Find a Problem	Practice Problem Finding Apply Problem Finding to SA Smart and refer to SA Smart Resource Library and SA Smart Career Chats to identify focus areas.
	Generate a Solution	Practice Solution Generating Apply Solution Generating to SA Smart
Proposal Pitch Deck	Create Problem Slide	Focus and localize a problem related to the theme
	Create Solution Slide	Select a potential solution
	Create Narrative Slide	Describe the rationale and details of the solution
Research Pitch Deck	Create How it Works Slide	Research and describe the details of the solution
	Understanding Research	Learn about technical analysis and market research
	Create Technical Analysis Slide	Conduct technical analysis: how will it work?
	Create Market Research Slide	Conduct market research: do people care?
Final Pitch Deck	Create Next Steps Slide	Determine how to make your solution a reality
	Develop presentation	Finalize and practice pitch

Note to Teachers

Note about Getting Started Section

The “Getting Started” section includes activities to help find and generate a problem. The slides and corresponding student worksheets are meant to be used as whole class activities to encourage students in the way they should approach the challenge.

Problem Finding: Example themes are given to use as practice prompts that can be completed in teams or discussed as a class. Students can then use the “Problem Finding” and “Define the Focus” activities to generate problem statements that serve as a foundation for the SA Smart competition.

Generate a Solution: Use the provided teacher slides covering Solution Finding to provide tools that students may use to generate ideas when faced with a problem or challenge. Introduce each of the four tools-- reinterpret, debug, ideate, and merge, by reading from the appropriate title slide then initiating the activity from the corresponding pages in the student workbook. You may choose to have students complete the activities in their teams or as a whole class discussion.

Each of the four tools is intended to be practiced as instructed by the slides and student worksheets, and then used as needed to generate solutions related to the competition theme. For students looking to generate more solution ideas, an additional student worksheet is provided that utilizes SCAMPER. This is an acronym that directs students to use a variety of tools to generate more solutions.

Team Activity: Pipecleaner Tower

Students will work in teams to build the tallest tower using pipecleaners.

Group Size: 2 – 4 students

Materials

Materials Per Team of 3 – 4 students
❑ 15 Pipecleaners per team
For testing: measuring tape or yard stick

Instructions

1. Place pipecleaners into bundles of 15.
2. Group students into teams of 2 – 4 and provide with a bundle of pipecleaners.
3. Instruct students that each engineering team is tasked to build the "tallest free-standing structure" with the materials provided. Free-standing means the structure can not be held, taped, wedged between desks, etc. Ask for any clarification.
4. **Timing**: You can project an online timer for 12 minutes (or longer if time allows). If you have flexible time, you can watch the progress of students and stop the time once the majority of teams have made good progress.
5. **After working for 2-4 minutes:** tell students to freeze. *Your team had an unexpected budget cut, and one of your resources has been depleted. EACH team member must now put one arm behind his/her back! Keep building!*
6. **2-4 more minutes:** freeze again. *Your engineering company realized that the loss in resources were detrimental to the product. The manager has decided to expand your operations globally to bring in more business. Your team now operates in (insert favorite country here) allowing you to use both arms again. But now you are unable to speak the same language. Continue the task without any speaking!*
7. **1-2 minutes left:** freeze again. *Good news! Business is booming, and your company has hired translators. Complete the task with all your resources! Two minutes left!*
8. Countdown from ten and stop the activity.
9. Walk around the room and note the different shapes and designs of the towers. Determine the tallest tower and allow the team to explain their successful design. Emphasize that a sturdy base was critical to a tall tower.

Team Activity: Cup Challenge

Overview

Students will work in teams to make a tower of cups.

Group Size: 3 – 4 students

Time: 10 – 15 minutes

Materials

Materials Per Team of 3 – 4 students

- ❑ 6, 16 oz Plastic cups
- ❑ 1 Rubber band
- ❑ 8 ft. String **OR** 4, 2 ft. pieces of string
- ❑ Scissors

Prep Work

1. Prep materials per group.
2. Read directions below and determine if you wish to provide the solution to the students or let them figure it out on their own. If you provide the solution, cut the string into 4, 2 foot sections.

Cup Challenge

1. Give each team a set of materials. The cups starting position is all stacked together.
2. Challenge the students to stack 6 cups into a pyramid. Students can not touch the cups and each member must help move each cup. Set up an example tower shown.
3. **Cup Tower Rules**
   - Can not touch or pick up the cup
   - All team members must participate
   - If students become frustrated, provide them with hints
4. Solution: Cut the string into as many pieces as there are team members and tie the string around the rubber band. Each student on the team should have their own string. When they each pull on their string at the same time it will expand the rubber band large enough to be placed over the cup.

5. Create a new tower design to keep the challenge going.

Team Activity: Helium Stick Icebreaker

Learn how to communicate and work in a team.

Group Size: 3 - 4 students

Prior to Activity

1. Gather materials listed.
2. Build a long stick with straws and tape using at least 1 straw per student in the group.

You can also use a hula hoop so students are facing each other. Make sure to model constructive communication.

Make it harder by adding more students in a team!

Materials Per Group

- ❑ Straight straws
- ❑ Clear tape

or Straw Builders

Activity Instructions

1. Students form 2 lines facing each other.
2. Everyone holds arms out and points index fingers.
3. Lay straw stick across everyone's fingers. Adjust finger heights until stick is horizontal and everyone's fingers are touching the stick.

The challenge: Lower the stick to the ground! Rules include:

- Everyone's fingers must be in contact with the stick AT ALL TIMES. Must restart from the beginning if someone loses contact.
- No pinching or grabbing the stick

4. You will notice that instead of the stick going down, it will "magically" start to move upward! And of course the stick does not contain helium. The secret is that the collective upward pressure created by everyone's fingers tends to be greater than the weight of the stick. As a result, the more a group tries, the more the stick tends to 'float' upwards

Standards Alignment

Standards Alignment

What will students learn?
Students select and research a problem related to the competition topic. Their research will likely include STEM topics, and may also include civics and policy topics. Using a template we provide, they'll share their research results and recommend a strategy, product, or solution using a pitch template provided by our team. Students will also learn a lot about what it means to live in and help develop a smart city.

Additional topics:

- Developing and presenting a pitch deck to judges
- Conducting technical analysis of a proposed solution including cost analysis, research on how it works, and other analysis
- Conducting market research including developing interview questions, implementing a survey, and assessing results to describe trends in the market
- Learning from and meeting with subject matter experts including local entrepreneurs, scientists, engineers, city planners, politicians and others

What's the benefit for teachers?
The topic provides a foundation for real-world problem exploration by students. The competition design applies the concepts of Project-Based Learning (PBL) and of STEM and STEAM education. Teachers will see these concepts in action. Teachers can choose to grade program deliverables.

How does SA Smart align with standards?
The following pages provides an alignment to TEKS. The SA Smart experience varies by team depending on the competition theme, depth of research, topic selected, and other factors.

Standards Alignment: Middle School Science TEKS

As students learn about the competition theme, generate solutions, talk with experts, and conduct technical analysis, they will use a variety of scientific and engineering practices as well as learn and apply related scientific concepts. While the topics will vary, the following are the TEKS most closely aligned to the SA Smart competition.

Middle Science TEKS	
7.11	The student understands how human activity can impact the hydrosphere. A: analyze the beneficial and harmful influences of human activity on groundwater and surface water in a watershed
8.11	The student knows that natural events and human activity can impact global climate. B: use scientific evidence to describe how human activities, including the release of greenhouse gases, deforestation, and urbanization, can influence climate
8.12	The student understands stability and change in populations and ecosystems. A: explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems
6.1, 7.1, 8.1	A: ask questions and define problems based on observations or information from text, phenomena, models, or investigations B: use scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems E: collect quantitative data using the International System of Units (SI) and qualitative data as evidence F: construct appropriate tables, graphs, maps, and charts using repeated trials and means to organize data G: develop and use models to represent phenomena, systems, processes, or solutions to engineering problems
6.2, 7.2, 8.2	B: analyze data by identifying any significant descriptive statistical features, patterns, sources of error, or limitations C: use mathematical calculations to assess quantitative relationships in data D: evaluate experimental and engineering designs
6.3, 7.3, 8.3	A: develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories B: communicate explanations and solutions individually and collaboratively in a variety of settings and formats
6.4, 7.4, 8.4	A: relate the impact of past and current research on scientific thought and society, including the process of science, cost-benefit analysis, and contributions of diverse scientists as related to the content B: make informed decisions by evaluating evidence from multiple appropriate sources to assess the credibility, accuracy, costeffectiveness, and methods used C: research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers

Standards Alignment: High School Science TEKS

High School Science TEKS	
Practice 1	A: ask questions and define problems based on observations or information from text, phenomena, models, or investigations B: apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems E: collect quantitative data using the International System of Units (SI) and qualitative data as evidence F: organize quantitative and qualitative data using scatter plots, line graphs, bar graphs, charts, data tables, digital tools, diagrams, scientific drawings, and student-prepared models G: develop and use models to represent phenomena, systems, processes, or solutions to engineering problems
Practice 2	A: identify advantages and limitations of models such as their size, scale, properties, and materials B: Analyze data by identifying significant statistical features, patterns, sources of error, and limitations. C: Use mathematical calculations to assess quantitative relationships in data. D: Evaluate experimental and engineering designs.
Practice 3	A: Develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories. B: Communicate explanations and solutions individually and collaboratively in a variety of settings and formats
Practice 4	A: Analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student. B: Relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content. C: Research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.
I.6(G)	evaluate evidence from multiple sources to critique the advantages and disadvantages of various renewable and nonrenewable energy sources and their impact on society and the environment
I.8(D)	construct and communicate an evidence-based explanation of the environmental impact of the end-products of chemical reactions such as those that may result in degradation of water, soil, air quality, and global climate change
E.6	B: Relate how water sources, management, and conservation affect water uses and quality. C: Document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability E: Analyze and evaluate the economic significance and interdependence of resources within the local environmental system.
E.10	A: Identify sources of emissions in air, soil, and water, including point and nonpoint sources
E.11	A: Evaluate the negative effects of human activities on the environment, including overhunting, overfishing, ecotourism, all-terrain vehicles, and personal watercraft. B: Evaluate the positive effects of human activities on the environment, including habitat restoration projects, species preservation efforts, nature conservancy groups, game and wildlife management, and ecotourism.
E.12	A: Evaluate cost-benefit trade-offs of commercial activities such as municipal development, food production, deforestation, over-harvesting, mining, and use of renewable and non-renewable energy sources. C: Analyze how ethical beliefs influence environmental scientific and engineering practices such as methods for food production, water distribution, energy production, and the extraction of minerals.
E.13	A: Describe past and present state and national legislation, including Texas automobile emissions regulations, the National Park Service Act, the Clean Air Act, the Clean Water Act, the Soil and Water Resources Conservation Act, and the Endangered Species Act.

Standards Alignment: Reading & Writing

SA Smart teams will learn to effectively communicate their ideas through the process of putting together and presenting a pitch deck. Students will also need to interview mentors and conduct market research.

TEKS	
7.1, 8.1 HS E1.1, E2.1, E3.1, E4.1	Communicate ideas effectively through speaking and discussion
7.11 (B), 8.11 (B) HS E1.10(B), E2.10(B), E3.10(B), E4.10(B)	Compose informational texts, including multi-paragraph essays that convey information about a topic, using a clear controlling idea or thesis statement and genre characteristics and craft
7.11(D), 8.11 (D)	Compose correspondence that reflects an opinion, registers a complaint, or requests information in a business or friendly structure
HS E1.10(D) E2.10(D), E3.10(D), E4.10(D)	Compose correspondence in a professional or friendly structure
7.12, 8.12 HS E1.11, E2.11, E3.11, E4.11	Use research skills to plan and present in written, oral, or multimodal formats