

SIEMENS STEM DAY ACTIVITY

CITY LIFE

OBJECTIVES

Students will be able to:

- **Identify** a specific problem related to city planning and management
- **Design** a solution to a problem related to a city feature, using smart technologies
- **Create** a digital resource to communicate their work on a project.

THIS LESSON FOCUSES ON

Engineering Design Cycle

- Defining the Problem
- Designing Solutions

21st Century Skills

- Communication

OVERVIEW

Students will create a case study to demonstrate how to incorporate smart city technology into an assigned city. Small groups will select a specific city feature (e.g., traffic management, public transport, urban lighting, waste management) to which they apply a type of smart city technology, based on student research. They will create a digital resource to communicate how their solution would improve lives compared to the existing city infrastructure.

STEM incorporates Science, Technology, Engineering, and Mathematics to focus on real-world issues and problems guided by the engineering design process. This type of instruction supports students in developing critical thinking, collaboration, reasoning, and creative skills to be competitive in the 21st-century workforce.

Each Siemens STEM Day classroom activity highlights one or more components of the engineering design cycle and an essential 21st-century skill.

MATERIALS

- Computer with internet access
- **City Features and Smart Technologies Student Handout**—one per group

HAVE YOU EVER WONDERED . . .

How cities decide what kinds of technology to use when solving specific problems?

MAKE CONNECTIONS!

How does this connect to students?

City life can be challenging, and such challenges are exacerbated if a city's infrastructure is poor. For example, if traffic is not well-managed, students would spend time due to delays and have a higher risk of being involved in traffic accidents.

How does this connect to careers?

City Planners develop plans and programs that help communities account for population growth and enhance the physical elements in towns, cities, and counties.

Civil Engineers design and maintain roads, bridges, dams, and other city structures.

Data Scientists analyze and interpret digital data, such as the usage statistics of a utility, to assist a business or city in its decision-making.

How does this connect to our world?

According to the UN, by 2050 two-thirds of the world's population will live in cities, and that population is projected to continue growing exponentially. To ensure an acceptable quality of life, city planners and engineers are considering the integration of smart technology to accommodate evolving needs.

BLUEPRINT FOR DISCOVERY

1. Introduce students to the idea of smart cities by watching the following video: <https://youtu.be/bANfnYDTzxE>. Facilitate a brainstorming session in which students offer ideas of city features that can be enhanced by smart technology.
2. Divide students into even groups and instruct each group to choose a major global city. Ensure that a variety of cities are chosen.
3. Distribute a copy of **City Features and Smart Technologies Student Handout** to each group.
4. Instruct groups to research one of the features as it pertains to their chosen cities. They should record the current state of the feature as well as any issues around it.
 For example, congestion is an issue related to traffic management and locating landfills is an issue related to waste management.
5. Challenge groups to identify and research one or more smart technologies that could be used as a solution to the issues related to their city feature. They should record the current state of the technology as well as any issues their chosen city might have in acquiring it.
 For example, smart traffic light systems use cameras to detect vehicles so that a controller can time lights to optimize traffic flow which reduces delays. Smart waste bins feature visual displays and can connect to the cloud functionality and weight sensors. These bins can help divert waste that is usually sent to landfills into uses for compost and recycling.

6. Instruct groups to develop a digital resource communicating their plans to apply smart technology to the existing city infrastructure.
7. Provide an opportunity for groups to present their smart city plans to the class. Encourage students to provide feedback on successes and places for improvement. If time allows, challenge groups to revise their plans based on the feedback they receive.

TAKE ACTION!

- Students can write to a smart technology company to research possible future career opportunities.
- Students can write to the managers of their chosen city feature to research existing or planned use of smart technologies to solve specific problems in their own city.
- Students can explore additional steps in the engineering design process to investigate other issues and solutions related to their city feature.

NATIONAL STANDARDS

Science	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
Technology Education	<ol style="list-style-type: none"> 3. Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts, and make meaningful learning experiences for themselves and others: a. Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits, d. Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. 4. Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions: b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. 5. Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. 6. Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals: a. Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication, b. Students create original works or responsibly repurpose or remix digital resources into new creations, c. Students communicate complex ideas

<p>Technology Education</p>	<p>clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations, d. Students publish or present content that customizes the message and medium for their intended audiences.</p>
<p>English Language Arts</p>	<p>CCSS.ELA-LITERACY.SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</p> <p>CCSS.ELA-LITERACY.SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> <p>CCSS.ELA-LITERACY.SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</p> <p>CCSS.ELA-LITERACY.SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p>

CITY FEATURES AND SMART TECHNOLOGIES

City Features	Smart Technologies
<ul style="list-style-type: none">• environmental quality• green space• power generation• public safety• public transport• telecommunications• traffic management• urban lighting• waste management	<ul style="list-style-type: none">• artificial intelligence• augmented/virtual reality• blockchain• cloud technology• geospatial technology• internet of things (IoT)• sensors• smart dust• microcomputer/processor• smart devices (phone, TV, etc.)• software as a service• wearable technology