DiscoverE’s Future City Program
A Project-Based STEM Experience

NSTA Conference – Charlotte 2018
John M. Hutchens
University of South Carolina Aiken / Ruth Patrick Science Education Center
Internationally recognized project-based STEM learning experience.

Transformative Engineering Design Competition

Cross-curricular program available to 6th, 7th, and 8th grade students.
Goal: Introduce engineering to middle school students via authentic real-world question and project
Question: How can we make the world a better place?
Product: Students spend 4-5 months researching and creating cities that could exist at least 100 years in the future.
Team-based: 6th, 7th, and 8th grade students plus an educator and engineer mentor
Virtual City Slideshow

Students design a Virtual City using SimCity software and present their city’s progress via a slide show format.

Essay

Students describe the unique attributes of their city and provide a solution to a unique challenge: Design an innovative citywide system of public spaces that serve your city’s diverse population (1,500 words maximum).

City Model

Students build a physical model of a section of their city using recycled materials. In addition to highlighting their city of the future, the City Model must also show the solution to this year’s challenge and include at least one moving part.

City Presentation

Students give a 7-minute presentation discussing features of their Future City and their solution to the challenge, followed by a question and answer period of 5–8 minutes from the judges.

Project Plan

Students work with their team to complete a four-part project plan that will help them stay organized, focused, and on schedule as they complete their other project deliverables.

Must address an annual citywide sustainability challenge: Resilient Cities (2018-2019)
Future City Overview Videos

- Future City Overview Video: https://www.youtube.com/watch?v=reRAv9lcWnU
- Virtual City: https://www.youtube.com/watch?v=L6i-waowAsU
- Essay: https://www.youtube.com/watch?v=0BboNsfKLbw
- Model: https://www.youtube.com/watch?v=2R7xO13Xkw4&t=5s
- Presentation: https://www.youtube.com/watch?v=JaCgnclbexQ&t=3s
Framework: Project Management Cycle & Engineering Design Process
Framework: Engineering Design Process

This cross-curricular educational program gives students the opportunity to do the things that engineers do—identify problems; learn the specs and brainstorm solutions; design solutions; build it, test and retest; and share their results.

- Introduces students to the engineering design process.
- Gives students a roadmap that cuts through confusion and helps them work through a problem sequentially.
  - Students will realize that they can think like engineers and see themselves as problem solvers too.
  - Once they get the hang of the engineering design process by using it to build their Future City, students can apply it to all kinds of challenges.
- With this at its center, Future City is an engaging way to build students’ 21st century skills while they apply math and science concepts to real-world problems.
Framework: Project Management

• Project management is another organizing system that focuses on keeping the project team coordinated and moving forward.
• It dovetails well with the engineering design process, whose steps fit within the broader phases of project management.
• These two approaches to moving through a complex endeavor act as organizing bookends for students.
• **August/September:**
  – Teams go back to school and begin project.

• **October:**
  – Registration closes October 31st.

• **November:**
  – Teams begin submitting deliverables (due dates vary by region)

• **January:**
  – Regional Competitions

• **February**
  – Future City Finals in Washington, DC
Project-Based Learning Approach  Student Outcomes

- Increased responsibility for their learning
- Stronger problem solving skills
  - Become better problem solvers
- Improved communication skills
  - Develop writing & public speaking skills
- Increased retention of content
  - Apply science, technology, engineering and math (STEM) concepts
- Deeper understanding of professional environments
  - Develop good teamwork habits
  - Discover different types of engineering
  - Learn how their communities work
  - Become better citizens
Alignment with Academic Standards

Go to futurecity.org/resources (filter for Standards) and download PDFs showcasing how Future City aligns with:

• Common Core State Standards
• Next Generation Science Standards
• Benchmarks for Science Literacy
• National Education Technology Standards
• Principles and Standards for School Mathematics
## Future City Curriculum Connections & 21st Century Skill Development

<table>
<thead>
<tr>
<th>COMPETITION DELIVERABLES</th>
<th>Description</th>
<th>Math</th>
<th>Science</th>
<th>Research</th>
<th>Writing</th>
<th>Civics/City Planning</th>
<th>Public Speaking</th>
<th>Engineering Design Process</th>
<th>Problem Solving</th>
<th>Teamwork</th>
<th>Project Management</th>
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<tbody>
<tr>
<td>VIRTUAL CITY</td>
<td>Use SimCity software to experiment with city design and development.</td>
<td>✓</td>
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<tr>
<td>CITY ESSAY</td>
<td>Describe your city and solution to a citywide sustainability issue.</td>
<td>✓</td>
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<tr>
<td>CITY MODEL</td>
<td>Build a scale model using recycled materials.</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>PROJECT PLAN</td>
<td>Complete project plan to stay organized and focused throughout the project.</td>
<td>✓</td>
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<tr>
<td>CITY PRESENTATION</td>
<td>Present your city to a panel of judges at your regional competition.</td>
<td>✓</td>
<td>✓</td>
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For 81% of students, Future City was their first experience with engineering.
Student Outcomes

– After participating in Future City, 85% of students now see math and science as important to their future.

– 83% of students reported that they learned how to use engineering to solve real-world problems.

– 68% of students said Future City helped them see themselves as engineers someday.

– 89% of students reported that Future City helped them appreciate all of the engineering that goes into a city.
49% of student participants are girls.
Future City Skills – Engineering Design Process

Program evaluations found a statistically significant improvement in students’ ability to apply engineering design process skills to real-world problems.
Future City Skills – City Planning

• 85% of students said FC helped them to learn and appreciate everything that goes into planning and maintaining a city.
• 62% became more aware of civics issues like politics and taxes.
Future City Skills – Writing

• 66% of educators report an improvement in research and writing skills.
• 60% of students reported that Future City enabled them to use their creative writing skills.

• Research city-wide issues
  - Tomorrow’s Transit
  - Rethink Runoff
  - Fuel Your Future
  - Public Spaces
  - Age Friendly Cities
Future City Skills – Math

- Build Model to Scale
- $100 Budget

“Future City allows students to explore science and math .... The research, and infrastructure information, engineering basics, mathematical scale is something I could facilitate for every student in grade seven.”
Future City Skills – Creativity

- 81% of students claimed Future City gave them an outlet for their creativity and imagination.

“I learned how to convert my creativity and imagination into realistic designs and plans.”
Future City Skills – Public Speaking

Adults and students report improvement in students’ presentation skills

“My daughter did not want to present, but she stepped up and presented with confidence. Now she’s not scared to present in front of people.”
Percentage of participants who reported Future City enhances ability to work in teams:

- 82% of students
- 84% of teachers
- 90% of parents
- 89% of mentors
Future City Skills – Teamwork

- 85% of students reported that they liked working with their Future City teams.
- 82% reported that Future City helped them to see the value of working with a team to solve problems.

“Future City enables students with different skill sets to work together: the writer, the builder, the idea person.”
Future City Skills – Self-confidence

• 66% of students said Future City boosted their self-confidence.

• 81% of students said Future City taught them that they could create something on their own, without the direction of an adult.

• 84% of parents said their children became more confident working in a self-directed manner.
Cost: $25 per organization

- Register 1 team or 100 - price stays the same!
  - (# of teams allowed varies by region)
- Maximum $100 budget for model & presentation.
- Accessibility sets Future City apart from other STEM competitions.
- US teams who win their Regional Competition and qualify for Finals are provided airfare, food, and hotel accommodations for three students, the educator, and the mentor.
Reaching Underserved Populations

- 33% of participating schools have 50% or more of their student body enrolled in the free/reduced lunch program.
- 14% have 50%-74% enrolled
- 19% have 75% or more enrolled
Resources Available

- Future City [Website](#) 
  - Includes Background Info and Activities 
- Teacher Guides 
- Mentor Guides 
- Judge Guides 
- Rubrics 
- Technical Support 
- Webinars
We need kids like us to come up with ideas for sustainable energy sources and food and water in the future because we're the ones who are going to be running the future.

- Leah Ormsby, 8th grader from Albany, NY
Regional Opportunities

**South**
- Alabama
- Florida (South)
- Florida (Tampa Bay)
  - Florida (North East*)
- Georgia
- Kentucky
- Louisiana
- North Carolina
- South Carolina
- Tennessee
- Texas – North
- Texas – Houston

**Northeast**
- Mid Atlantic
- New England
- New Jersey
- New York – Albany
- New York – NYC
- New York – Western
- Pennsylvania – Central
- Pennsylvania – Philadelphia
- Pennsylvania - Pittsburgh

**West**
- Arizona
- California – Northern
- California – Southern
- Colorado
- Idaho
- Nevada
- New Mexico
- Washington (Seattle)
  - Washington (Inland NW*)

**Midwest**
- Illinois – Chicago
- Indiana
- Iowa
- Great Plains
- Michigan

**International**
- Canada
- China
- MiddleEast

Registration is open March-October
More information available at www.futurecity.org

* Indicates a sub-region
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