National Engineers Week

Future City Competition

2009–2010 PROGRAM HANDBOOK

NATIONAL ENGINEERS
WEEK FOUNDATION

APPROVED FOR LISTING
NASSP
2009–2010
STUDENT CONTESTS & ACTIVITIES

www.futurecity.org

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Acknowledgements

The National Staff would like to thank and acknowledge all the dedication and countless hours that the Regional Coordinators contribute to the Future City Competition through out the year. Without them the program would not exist. Special thanks this year to the following coordinators who worked diligently on the editing of this handbook.

Carol Dostal – Indiana Regional Coordinator
Jean Eason – North Texas Regional Coordinator
Dr. Lisa Huelskamp – Ohio Regional Coordinator
John Hutchens – South Carolina Regional Co-Coordinator
Kevin Powers, P.E. – New England Co-Coordinator

Welcome

Congratulations and welcome! You are part of a program that has thousands of volunteers who give hundreds of thousands of hours each year to encourage our young people to explore the world of engineering and engineering fields. We hope you find this program rewarding and beneficial. As a result of their participation, many of our alumni have excelled in engineering and other related fields.

The National Engineers Week Future City® Competition, which began in 1992–1993, is part of the rich history of the National Engineers Week Foundation and its 'DiscoverE®' (E for Engineering) campaign. 'DiscoverE' was launched in 1990 as the first formal national call to the engineering profession to engage in outreach with students in kindergarten through grade 12. From 5,000 engineers reaching 50,000 teachers and students that first year, now 'DiscoverE' engages some 50,000 engineers reaching 5.5 million students and educators. Engineering is generally not part of classroom learning. Through 'DiscoverE' engineers help students and teachers discover in hands-on ways the real-world applications of what they are learning in the classroom and. the benefits of engineering. Like all Foundation programs, Future City is 'owned' broadly by the engineering profession. Thank you for taking the time to participate and leading your students in this experience. If at any time you have questions, please contact your Regional Coordinator or the National office.

Sincerely,

The National Engineers Week Future City® Competition Staff
1420 King Street
Alexandria, VA 22314
Toll Free: 1-877-636-9578
info@futurecity.org

Sponsors

We would like to thank our many generous sponsors for their continued support of our program. Without them we would not be able to reach thousands of students each year.

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EA Play Label
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A special thanks to the
American Society of Civil Engineers and ExxonMobil
Chairs of 2010 National Engineers Week

National Special Awards

Special Awards are presented by technical societies, corporations, and government entities to recognize students' efforts in specific areas.

Award Name	Award Criteria	Sponsor
Most Innovative Design of Infrastructure Systems	Design that accommodates the most innovative systems (e.g., transportation, water and wastewater) for a community.	Founded in 1852, ASCE represents more than 123,000 civil engineers worldwide, and is America's oldest national engineering society. ASCE advances professional knowledge and improves the practice of civil engineering as the lead professional organization serving civil engineers and those in related disciplines. www.asce.org
Best Indoor Environment	Indoor environment that encompasses occupant comfort, productivity, energy efficiency or air quality.	ASHRAE is an international organization of 50,000 persons with chapters throughout the world. The Society is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air conditioning and refrigeration for the public's benefit. www.ashrae.org
Most Sustainable Buildings	In recognition of energy efficient buildings that minimize their impact on the outdoor environment and provide indoor environmental quality for building occupants.	ASHRAE is an international organization of 50,000 persons with chapters throughout the world. The Society is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air conditioning and refrigeration for the public's benefit. www.ashrae.org

Award Name	Award Criteria	Sponsor
Best Futuristic City	Use of futuristic engineering concepts into city's communications, energy, or transportation systems.	Founded in 1880, ASME International is a nonprofit educational and technical organization serving a worldwide membership and sets many industrial and manufacturing standards. www.asme.org
Best Communications System	Strategic placement of a communications system that is both efficient and accurate.	IEEE-USA advances the public good and promotes the careers and public policy interests of more than 215,000 engineers, scientists and allied professionals who are U.S. members of the IEEE. IEEE-USA is part of the IEEE, the world's largest technical professional society with 375,000 members in 160 countries. www.ieeeusa.org
Protecting the Public's Safety and Welfare through Competent and Ethical Engineering Practices	Community encouragement and enforcement of engineering practice standards and a code of ethics.	NSPE is the only engineering society that represents individual engineering professionals and licensed engineers (PEs) across all disciplines by promoting engineering licensure and ethics, enhancing the engineer image, advocating and protecting PEs' legal rights. www.nspe.org
Best Transportation System	Creative design of a transportation system that allows both mobility and transport of goods and services.	U.S. Department of Transportation (DOT) - Federal Highway Administration. DOT is at work building a safe and efficient transportation system for the 21st century - one that is international in reach, intermodal in form, intelligent in character, and inclusive in service. www.fhwa.dot.gov
Excellence in Systems Integration	Demonstration of excellence in the design of integrated systems of people, material, information equipment and energy.	Sponsored by the Institute of Industrial Engineers (IIE) The Institute of Industrial Engineers (IIE) is the world's largest professional society dedicated solely to the support of the industrial engineering profession and individuals involved with improving quality and productivity. Founded in 1948, IIE is an international, non-profit association that provides leadership for the application, education, training, research, and development of industrial engineering. With more than 15,000 members and 280 chapters worldwide, IIE's primary mission is to meet the ever-changing needs of its membership, which includes undergraduate and graduate students, engineering practitioners and consultants in all industries, engineering managers, and engineers in education, research, and government. www.iienet.org

Award Name	Award Criteria	Sponsor
Best Residential Zone	Strategic placement of residential zones that allow maximum return for quality of life issues.	The Chinese Institute of Engineers/USA (CIE-USA)Chinese Institute of Engineers CIE-USA is a professional non-profit and non-political organization founded in 1917 in New York by a group of talented and forward-looking Chinese engineers who graduated from American colleges and worked in American railroads and various industries. Chinese-American engineers in the US have played a significant role in the rapid growth of technology and communications throughout the United States. The total membership is around 10,000 nationwide. www.cie-usa.org
Best Use of Aerospace Technology in a Future City	Best Use of Aerospace Technology in a Future City.	The American Institute of Aeronautics and Astronautics is one of the oldest and largest aerospace-related associations. The AIAA has approximately 31,000 members across the nation and around the world. The National Capital Section (NCS), with approximately 3,000 members, is the largest section within AIAA. The mission of the AIAA National Capital Section is to serve the profession, by acting as a catalyst for information flow and creative exchange. AIAA-NCS supports the educational process which promotes future generations of aviation and space professionals by nurturing interest among students. www.aiaa-ncs.org
Best Use of Innovative Construction Materials and Techniques	• Use of innovative construction materials • Use of innovative construction techniques • Overall construction of design.	American Society for Quality - Design and Construction Division (ASQ). The American Society for Quality, a professional association headquartered in Milwaukee, Wisconsin, USA, creates better workplaces and communities worldwide by advancing learning, quality improvement, and knowledge exchange. A world of improvement is available through the American Society for Quality, providing information, contacts, and opportunities to make things better in the workplace, in communities, and in people's lives. www.asq.org
Best Representation of Manufacturer Supply Chains	The design that considers and accommodates the required manufacturing supply chains: supplies, manufacturing, sales, distribution, and the consumer.	Society of Women Engineers The Society of Women Engineers is the largest non-profit educational and service organization representing both student and professional women in engineering and technical fields. Its mission is to stimulate women to achieve full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving the quality of life, and demonstrate the value of diversity. www.societyofwomenengineers.org

Award Name	Award Criteria	Sponsor
Best Land Surveying Practices	The design that employs the best land surveying practices, taking into consideration the high standards used by surveyors to help protect the public's safety and welfare.	The National Council of Examiners for Engineering and Surveying The National Council of Examiners for Engineering and Surveying (NCEES) is a national non-profit organization composed of engineering and land surveying licensing boards representing all U.S. states and territories. www.ncees.org
Best Management of Water Resources	• Efficient design of water treatment and distribution for human consumption, agriculture, industry, recreation, and fire protection. • Responsible sewage collection and treatment for environmental protection and community aesthetics. • Innovative stormwater collection, treatment, and discharge back into the environment.	Bentley Systems, the world's leading company dedicated to providing comprehensive software solutions for the infrastructure lifecycle, believes in the vital role that infrastructure must play in sustaining the environment. With over 2,800 colleagues in over 50 offices worldwide and annual revenues surpassing $450 million, Bentley Systems has invested over $1 billion in research, development and acquisitions since 1993. Nearly 90 percent of the Engineering-News Record Top 500 Design firms are Bentley subscribers. www.bentley.com
Best Fire Protection Engineering	Society demands that buildings be free of threat from fire. Fire protection features may include structural fire resistance, detection and suppression systems, egress systems, alerting systems, and limitation of combustibles. The fire protection engineer ensures that these features all work together as a system to combat the single phenomenon - fire.	The Society of Fire Protection Engineers was established in 1950 and incorporated as in independent organization in 1971. It is the professional society representing those practicing the field of fire protection engineering. The purpose of the Society is to advance the science and practice of fire protection engineering and its allied fields, to maintain a high ethical standard among its members, and to foster fire protection engineering education. www.sfpe.org

Award Name	Award Criteria	Sponsor
Innovative Solutions for Water and Wastewater Utilities to Reduce Costly Reinvestment in America's Aging infrastructure	The award is judged using two main criteria: addressing an important challenge within the water and/or wastewater infrastructure related to pipes, plants, pumps, and /or green/natural systems and proposing improvements of water and wastewater infrastructure through sustainable methods.	WEF Water Environment Federation and ITT Industries. Founded in 1928, WEF is a not-for-profit technical and educational organization with members who work toward the preservation and enhancement of the global water environment. www.wef.org www.sjwp.org In addition to providing advanced technology products and services, ITT Industries, Inc is the world's premier supplier of fluid control systems and solutions. Headquartered in White Plains, NY, the company generated $6.8 billion in 2004 sales. www.itt.com
The City of the Future that Best incorporates Cultural and Historical Resources	The city whose design best incorporates historical & cultural sites, buildings, infrastructure and customs.	Cuban-American Association of Civil Engineers, Inc.(Association of Cuban Civil Engineers in Exile, Inc.) www.c-aace.org
Accessible City Award	Most Accessible Design for people with disabilities, the elderly, and others with mobility impairments. Design that accommodates the most innovative systems (e.g., transportation, parks and recreation) for a community.	Founded in 1946, Paralyzed Veterans of America is the only congressionally chartered veterans service organization dedicated solely for the benefit and representation of veterans with spinal cord injury or disease. Paralyzed Veterans is a dynamic, broad-based organization with more than 19,000 members in all 50 states, the District of Columbia and Puerto Rico. To learn more about Paralyzed Veterans, visit its Web site at www.pva.org
Most Sustainable Food Production System	Design that provides the best sustainable food production system while conserving soil, water, and energy.	ASABE - The American Society of Agricultural and Biological Engineers is an educational and scientific organization dedicated to the advancement of engineering applicable to agricultural, food, and biological systems. Founded in 1907 and headquartered in St Joseph, Michigan, ASABE comprises 9,000 members in more than 100 countries. Agricultural, Food and Biological Engineers develop efficient and environmentally sensitive methods of producing food, fiber, timber, and renewable energy sources for an ever-increasing world population. www.asabe.org

Award Name	Award Criteria	Sponsor
Best Future City Project Plan	Teams should develop a clear statement of what needs to be accomplished on their project, including a list of deliverables. They should also have a project budget and schedule or timeline for the completion of their work. Special consideration will be given to teams that list potential unexpected events/situations they though of that might present challenges for their project and what they did to prevent them.	With nearly 220,000 members in more than 150 countries, Project Management Institute (PMI) is the leading membership association for the project management profession. PMI is actively engaged in advocacy for the profession, setting professional standards, conducting research and providing access to a wealth of information and resources. www.pmi.org
Most Innovative Power Generation System	Creative concept for producing power for the city.	The Navy Nuclear Propulsion Program is responsible for the safe design, operation, and maintenance of all nuclear propulsion plants powering our Nation's submarines and aircraft carriers. www.cnrc.navy.mil/nucfield

Introduction

What Is Future City?

The National Engineers Week Future® City Competition (www.futurecity.org) is an example of problem based learning with computer simulation. It is an integrated, multidisciplinary, holistic approach to relevant issues and is a strong example of STEM (Science, Technology, Engineering, & Mathematics) education that addresses national and state academic content standards. The program asks 7th and 8th grade students from around the nation to team with engineer-volunteer mentors to create — first on computer and then in three-dimensional models — their visions of the city of tomorrow. The Future City Competition, organized under the National Engineers Week Foundation, has been operating under the National Engineers Week Future City Competition charter since 1992.

To truly affect the ways students and the general public perceive engineering it is important for engineers to use the right messages. Too often engineers focus their messages to young students on the process of becoming an engineer and overlook messages on the value of an engineering career. The National Engineers Week Foundation has been engaged with two projects specifically to research and develop messages around messages to convey that engineering is a helping profession. These messages also convey the value of teamwork and creativity. Learn more from 'Engineer Your Life' and 'Changing the Conversation' at www.eweek.org.

Future City Mission Statement:

The mission of the National Engineers Week Future City® Competition is to provide a fun and exciting educational engineering program for seventh- and eighth-grade students that combines a stimulating engineering challenge with an inquiry-based application to present their vision of a city of the future.

Educational Benefits of the National Engineers Week Future City® Competition:

The program offers students a fun way to learn about engineering and cities of the future while at the same time developing academic skills. The program is in keeping with the 21st Century Skills as described in Chapter 3.

The National Engineers Week Future City® Competition provides a platform for students to increase their:

- Logical thinking skills,
- Problem-solving skills,
- Ability to work in teams,
- Research and technical writing,
- Oral presentation skills,
- Application of coursework to practical problems,
- Technological skills, and
- An awareness of community and business issues on the local and global levels.

National Academic Content Standards

The Future City Competition components are strongly correlated to the National Academic Standards, particularly those connected to STEM education. These standards can be found in Appendix C.

State Academic Content Standards

It should also be noted that State Academic Standards are based on the National Academic Standards. For your state standards visit the Education World site at (www.educationworld.com/standards/state/toc/index.shtml.)

Importance Of and Overall Role of the Future City Engineer Mentor

Engineering is a professional discipline requiring the judgment necessary to adapt knowledge to practical purposes, the imagination to conceive original solutions to problems, and the ability to predict performance and cost of new devices or processes. Middle school students are familiar with the roles of the scientists from their science classes, but the Future City Competition may very well be a student's first contact with engineering.

The mentor should be involved in all phases of the program as an advisor to provide input and technical assistance. It is important to tie-in real life engineering experiences as students work on the program. Mentoring is about advising, teaching, coaching, and providing a guidance system. The mentor helps the student make the transition from the academic to the real world of engineering.

Students must do all the actual work, such as the computer design of the city, building the model, writing the research essay, and city narrative, and giving the verbal presentation.

Program Components Overview

1. ***Computer Design of a Future City.*** Students use *SimCity 4 Deluxe*™ software to design a city that has progressed at least 150 years in the future and has a population of at least 50,000. Students self-score their Future City computer design to ensure they have met all the required design elements. The teacher or engineer mentor must attest to the accuracy of this score sheet.

2. ***Model of Future City.*** Students select an area of their Future City to be represented in the model they build with following specific guidelines found in Chapter 2.

3. ***Research Essay.*** Students write a 700–1000 word essay citing at least 3 sources of information. The teacher or engineer mentor must attest that the essay was written entirely by the students.

4. ***Future City Narrative.*** Students write a 300–500 word City Narrative describing their Future City's key features. The teacher or the engineer mentor must attest that the narrative was written entirely by the students.

5. ***Oral Presentation.*** Students give a presentation describing key elements of their future city.

Chapter 1: Getting Started

This experience not only let me meet new people and make new friends, it also allowed me to explore the career of engineering."

— Gina (7th grade), New England Region

If you have not already done so, please visit the National Future City Web site under "Register" (www.futurecity.org/register) and register your school in the closest regional site. If you are not geographically near a regional site you may register under the National Program Manager.

After you register please take a few minutes for your students to take the online pre-competition survey on the Web site's homepage.

Organizing Materials

Materials needed to begin the program include the Future City Competition Program Handbook and one copy of *SimCity 4 Deluxe* which are provided upon registration.

Program Handbook – This handbook outlines the program components, guidelines, and rules. You should become familiar with its contents and keep it for reference. This material is also available on line from the Future City Web site (below).

SimCity 4 Deluxe – The city created with this software will provide the framework of the program including concepts of city planning, economy, sustainability, waste management, etc, as they pertain to engineering.

Tutorial CD-ROM (Optional) – The tutorial is an additional tool to guide you through the program components. You may request a free copy of the Tutorial from your Regional Coordinator or view it on the Future City Web site.

National Future City Web site – www.futurecity.org – The Web site can be a further resource offering electronic versions of all program materials including the *SimCity 4 Deluxe* Manual, examples of past winning research essays and narratives, and Competition forms. The Web site will have the most up-to-date information on the program.

If you need further assistance or have questions please feel free to contact your Regional Coordinator or the National Headquarters. The National Headquarter's toll-free number is 1-877-636-9578 or info@futurecity.org

Organizing Your Future City Students

National Engineers Week Future City® Competition is open to students from grades 7 and/or 8 who are from the same school or from a home school environment. Every registered school is eligible to participate at the regional level. However, at the Regional and National level a team is defined as the three presenting students, the teacher coach and the engineer mentor (while a person who works in the engineering community is preferred any technical professional can serve as a mentor). **For assistance in finding an engineer mentor please contact your Regional Coordinator.**

Single Team from One School or Classroom (Three Students)

a. Select the three student team members.

b. Meet with students to discuss the overall program.

c. Select an engineer mentor and coordinate a schedule.

d. Teacher coaches, parents, and engineer mentors can advise but the students should complete the work.

So what do you do if you have more than three students interested in the program?

Multiple Teams from One School or Classroom (Multiple groups of three students)

Check with your Regional Coordinator for the maximum number of teams allowed from each school that will be allowed to compete in the Regional Competition.

a. Meet with all your students to discuss the overall program.

b. Students can self-select their teams or you can assign teams; only one team from each top scoring school can advance to the final round of the Regional Competition.

c. Select an engineer mentor and coordinate a schedule. It is recommended that each team have an engineer mentor for guidance but one engineer can serve as a mentor for several teams.

d. Teacher coaches, parents, and engineer mentors can advise but the students should complete the work.

Large Group or Classroom Collective Effort (More than three students working together)

a. Explain the phases of the competition and that it will be a group effort to complete the project.

b. Once groups are identified, allow students to self-select (or the teacher can select) which component the students will focus their energies on, i.e., five or so students working on essay research, three or so students working on essay composition, etc.)

c. Those students who have self-selected as the three presenters (or have been chosen by teacher or peers) are the three "official student team members" for both the Regional and National Competitions.

d. Select and coordinate a schedule with your engineer mentor. When selecting an engineer mentor remember to communicate with them that they will be working with many different students throughout the course of the event or you may want to recruit more than one engineer mentor. If you need help recruiting an engineer mentor please contact you Regional Coordinator.

e. Teacher coaches, parents, and engineer mentors can advise but the students must do the work.

Suggested Timeline

The program runs nominally from September through January. Deadlines will be set by your Regional Coordinator. Regional Finals will be held by January 24, 2010. Below is a suggested timeline that can assist you in your planning.

September – November

Hold your initial meetings for the Future City team.

1. Decide your Future City team format:
   a. Single Team with three students.
   b. Multiple Teams from one School or Classroom with three students per team.
   c. Large Group or Classroom Collective Effort with more than three students per team.
2. Meet with your team(s) to share the components of the program.
3. Recruit and coordinate with your engineer mentor.
4. Introduce students to *SimCity 4 Deluxe*.
5. Work on Program Components:
   a. Plan the future City
   b. Use SimCity to design and simulate the future city
   c. Begin researching, outlining, and creating the rough draft of the 700 to 1000 word essay.

d. Begin gathering recyclable materials for your model

6. Submit the *SimCity 4 Deluxe*™ city design of Future City to Regional Coordinator. (Check with your Regional Coordinator for specific due date.)

October – December

1. Start building the physical model of your Future City.

   a. Decide what portion of the city you will build.

   b. Decide on the scale of your model.

2. Write a 300 to 500 word narrative describing your Future City.

3. Finish researching and writing the essay.

4. Submit the Research Essay and City Narrative to your Regional Coordinator. (Check with your Regional Coordinator for specific due date.)

5. Celebrate achievement of milestones and evaluate progress to date.

December – January

1. Create presentation.

2. Practice presentation.

3. In January, compete in the regional Future City Competition.

4. Celebrate achievements.

February

1. Eligible Regional Winning team will attend the Future City Competition in Washington, DC, February 13–16, 2010.

Chapter 2: Program Component Details

Computer Design of Future City (84 Points)

"Engineers are involved in every aspect of building a city. We discovered how necessary they are and now we know the reasons why."

— Tom, 14, member of the 2008-09 Future City Grand Prize Winning Team, Bexley Middle School, Bexley, Ohio

This section will explore in greater detail the different components of the program: (Computer Design, Research Essay, City Narrative, Model Design and Oral Presentation.) Directions for submission of these components, along with the deadlines, will be provided to you by your Regional Coordinator.

Instructions

Students will use *SimCity 4 Deluxe*™ software to design a virtual city. Each student should have a turn using the software.

One copy of the software will be provide to the school upon registering (after August 1, 2009) in either a PC or MAC format. Additional copies can be purchased for a small shipping and handling fee at www.futurecity.org beginning September 1, 2009.

Please refer to the *SimCity* User's Manual for information about the software. A copy of this manual is available on the Future City Web site for your convenience. A PowerPoint tutorial of the software is also available on the Future City Web site under Resources.

Technical support can be reached via the SimCity Web site www.simcity.ea.com or via Electronic Arts support line at 1-650-572-2810

Computer Design Criteria

Identify Decision Criteria & Discuss The Choices To Build Your Future City

One way to decide about what to build, where to build it, and how much to build is to list all the possible requirements that you would like to meet for the citizens in your city. For example do they need clean air, good schools, and low taxes?

- What are some of the things you think that a city might need to attract citizens?
- What are some things everyone might want in their city?
- What are some things that children may want in their city?
- What are some things adults may want in their city?
- What are some things you don't want in your city?

Students use SimCity 4 Deluxe™ software to design a city that has progressed at least 150 years in the future and has a population of at least 50,000.

The students must use a pre-designed region available on the Future City Web site. (http://www.futurecity.org/resources_simcity-starter-regions.shtm)

Follow the Computer Design Rubric to ensure your city has all the necessary components. For this you may find the optional Computer City Design Inventory List a helpful tool. Not all items on this inventory are required or needed in your city. It is a helpful tool to evaluate your city and also for the judges to locate specific features of your city.

As you complete the SimCity design, remember to choose a meaningful and unique name for your city. This city name will be included on all the forms and files you submit to the regional competition and should not change during the course of the program.

When the students have completed their city design and simulation have them evaluate their work using the Computer City Design Self Evaluation form. Please remember the teacher or the mentor must sign the form to attest to its accuracy.

For other helpful SimCity tips see Appendix D.

REMEMBER YOUR ETHICS
(See Honor Statement in Chapter 6)—Cheat codes or shortcuts are not allowed and will be cause for point deductions.

What a fun way to do school! What our students gained from this experience is invaluable."

— Joy Brown, Teacher, Alabama Region

Future City Research Essay (70 Points)

Instructions

Essay Assignment:

Students will research and write an essay of not more than 700–1,000 words on: **"Providing an affordable green living space for people who have lost their home due to a disaster or financial emergency."**

The living space should use sustainable materials, have a low-carbon emissions footprint, and achieve the "Green Ideals" of energy efficient building.

The living space design must consider the social, economic and ecological impact of the manufacturing and construction techniques. It should be constructed with the ideal of providing affordable homes to those facing disaster, financial crisis, and earning only 50% - 80% of the median income of the surrounding city.

The focus of this essay is meant to be on the green living space design. However, engineering is about more than designing a solution to a problem. The "problem" is often rooted much deeper in a societal need, or other less tangible issue. Engineering, in its purest essence, is about helping others, helping people, and making the world around us a better place. In order for students to see that aspect of engineering, the essay statement includes a societal need for the green building solution. With increasing numbers of people facing a housing crisis, because of homelessness or the recent foreclosure issues, this particular problem of designing a living space is rooted in assisting those facing a housing crisis. Therefore, we wish the student to focus on the living space design, but with the realization that the need was created from this housing issue. It is not meant for the student essay to focus on the housing crisis in depth, or any more than is addressed in the accompanying rubric.

Essay Requirements:

I. Select and define a living space of their choice (home, pod, orb, high rise, etc) using "green" materials, processes and standards. The living space must be easily expandable to accommodate various living requirements. It should also support the needs of the elderly or persons with disabilities. Students must:

- Define the living space type.
- Define the location of the living space within a city as pertains to quality of life, access to city amenities, and the needs of its citizens (e.g. homeless).
- Explain how the living space can be expanded (or reduced), the style of space created (stand alone, multi-family, clustered, etc.), and the expected life of the housing.
- Explain the target demographic of the housing.

II. Research and analyze existing green building sustainable processes, materials, and technologies. Current aspects of some of the following topics should be investigated:

- Residential design
- Manufacturing and construction processes
- Materials and technologies for a living space
- Interior and exterior design features
- Processes in each element of the construction that assure a low-carbon footprint
- Innovations to create the living space
- Impact on landfill by the construction materials selected
- Methods to maximize the use of sustainable materials while maintaining a level of comfort or lifestyle quality of the inhabitants
- Locally sourced or recycled materials

III. Develop and investigate a new technology or improvement to a technology researched above to incorporate into the residential space to insure sustainable/green design. The technology or innovation should aim to satisfy the Materials and Resources "Green Ideal" as outlined below. Explain:

- What specific innovation in Materials and Resources is achieved?
- How the innovation will function?
- What key sustainable methods or materials were incorporated in the design?
- How do these material choices enable your building to fit within the community?
- What is the impact of your material on construction waste?
- How does your green material choice impact the appearance (exterior or interior) of your building?
- What makes your material innovation a good economic, efficient and sustainable choice?
- What tradeoffs were made to accommodate the economics of constructing your green living space?
- What is the environmental footprint or impact of your design?

IV. Describe in detail:

- How is the living space easily maintained?
- How does this design improve the quality of life of the occupants?
- How does this design improve the quality of the community?
- What are the key features and benefits of your design and its impact on the community, residents, or environment?

V. Discuss the role of the engineer:

- Identify a discipline of engineering.
- How does the engineer contribute to the development of the living space or some of its components?

VI. Demonstrate written communication skills:

- The essay will be evaluated on written organization, grammar, and spelling.

Background Information

GREEN IDEALS:

Green building and LEED criteria are briefly encapsulated in the "Green Ideals" outlined below.

In general, green building is a far reaching process and methodology that encompasses the location, construction, and functioning of the building. While there are many topics designers, manufacturers and construction professionals of green buildings must consider (listed below), for the purpose of the essay requirement, students are asked to focus on Materials and Resources as outlined below.

Sustainable sites

- Access to public transportation
- Carpooling resources
- Reuse of existing buildings or developed land

Water

- Water use reduction features
- Water-efficient landscaping
- Innovative waste water technologies
- Storm-water management

Materials and resources

- Collection and storage of recyclables
- Reuse and recycling of previously used materials for construction
- Use of local materials
- Use of rapidly renewable materials
- Certified wood
- Zero- or low-VOC (volatile organic compound) paints, resins, glues and other materials
- Construction waste management
- Environmentally preferable materials

Energy and pollution

- Use of renewable energy
- Hot water
- High performance windows and insulation
- Lighting, heating, and cooling
- High-efficiency appliances
- Daylight views
- Reduce heat islands
- Light pollution reduction

Resources that may be used include:

- National Association of Home Builders' (NAHB) model green home building guidelines (www.nahbgreen.org).
- Leadership in Energy and Environmental Design (LEED) from the U.S. Green Building Council (www.usgbc.org).
- World Business Council for Sustainable Development (www.wbcsd.org).

Essay Tips and Examples:

For information and tips about researching and writing the essay, view the Future City Competition Tutorial CD-ROM. You can also review winning essays from previous years on the Future City Web site, www.futurecity.org.

Students should use a variety of sources of information, such as interviews, reference books, periodicals, and the Internet. Primary research would include interviewing people directly involved on a first-hand basis. Secondary research would include reading books, articles, and papers authored by experts. Students must attach to their essay a list of at least three sources upon which the students relied. ***(Wikipedia should not be used as a source of research.)***

Documentation Details

List the name of your Future City on each page of the Research Essay (NOTE: The name of the city must match the name that was scored on the Computer Design form). **DO NOT INCLUDE THE SCHOOL NAME OR TEAM NAMES ON THE ESSAY.** Place the word count at the end of the essay. Word count does not include the Title and reference list, but does include captions of graphics and illustrations. Be sure to keep a copy of the Essay Form, Research Essay, and Reference List.

The teacher or engineer-mentor must complete the Research Essay Form attesting that the essay was written entirely by the students. This form must be submitted with the students' essay and reference list as directed by the Regional Coordinator.

The form can be found in Chapter 6 of this handbook.

"Future City brings students together to work in teams, it creates group dynamics and it is cross-curricular touching math, science, engineering, language arts, art, social studies, economics, government, reading, writing and arithmetic. It's great to be number one but just giving the students this experience causes them to grow and mature in so many ways."

— Richard Flickinger, teacher at Leo Jr./Sr. High School in Leo, Indiana, the winning school in the 2008–09 Indiana Regional Competition.

Future City - City Narrative (20 Points)

Instructions

Students will write a 300–500 word City Narrative describing their Future City's key features and design attributes. The purpose of the City Narrative is to give the judges a quick overview of the Future City's infrastructure and its public services.

The City Narrative Rubric includes scoring criteria. Each page of the City Narrative should have the name of the Future City **ONLY**, do not include the school or students' names. Place the word count at the end. Word count does not include the Title. Be sure to keep back-up copies of the Narrative.

The Teacher or the Engineer Mentor must attest on the City Narrative Submission form that the narrative was written entirely by the students. The form can be found Chapter 6 of this handbook.

Future City Model (120 Points)

Instructions

Students will select an area(s) that best represents their future city in the model. The model does not have to be an exact building-by-building duplication of the Computer Design. Rather, the purpose of the model is to give a 3-dimensional, creative representation of the students' vision of their city.

The model will be judged on the following criteria:

a. Creativity (20 points)

b. Quality and Scale (20 points)

c. City Design (50 points)

d. Moving Part(s) (20 points)

e. Recycled Materials (10 points)

1. Future City Model Guidelines

a. The model must be built to scale as determined by the team.

b. The model must be no longer than 25" (W)x 50" (L) x 20" (H) including all support braces, material hanging below or beyond the tabletop and any fully extended parts, such as access doors or hinged pullouts.

c. Vertical oriented models are not accepted.

d. The total weight of the model cannot exceed 75 lbs. (National only.)

e. The model must contain one or more moving part(s). Any electrical power must be self-contained (e.g. a household battery and a simple circuit.)

f. Use of electrical floor or wall outlets is not allowed.

g. No perishable items may be used in building the model.

h. No live animals may be used in the model.

i. The total value of the materials used in the model, as well as those used in support of the presentation, (including visual aids, costumes, and other demonstration aids) may not exceed $100 and must be reported on the Competition Model Expense Form.

2. Model Identification Index Card

So that the judges can identify your team's information, bring a 4 x 6 inch index card for display next to the model. (NOTE: At the National Finals these cards will be displayed next to the model in a provided acrylic stand.) The 4x6 inch index card should have the following details:

a. The Name of the Future City;

b. The scale used for the model;

c. School Name; and

d. Names of the three presenting students, the teacher coach, and the mentor engineer.

Model Tips and Examples

For information and tips about model building, view the Future City Competition Tutorial. Contact your regional coordinator for pictures of examples of past models or see the picture of the National Winners' model at www.futurecity.org.

Building the Model to Scale

In engineering, scale is used to describe proportion. Proportion is how the size of one thing compares with another. There is no set scale for your model, the team decides the scale based on their design. They will need to create a scale key, such as, 1" = 1.0'.

Moving Part

The moving part is an excellent opportunity to explore the physics of simple sources of power, such as:

- Rubber bands
- Heat
- Light and/or solar power
- Weights
- Springs
- Pulleys
- Batteries and simple circuitry
- Paper folded, pop-up constructions

1. Transport

Each school (team) is responsible for getting their model to their Regional Competition. Regional Winners will work with the Regional Coordinator to ship their model to the National Finals.

2. Repair Supplies

Models often can sustain damage in transit. Teams are encouraged to bring repair kits containing tape, glue, etc to reattach or fix any broken part. The model needs to be sturdy and substantial enough for staff to move during the course of the competition without incurring damage.
NOTE: At the National Finals, teams will have time to repair their models during unpacking if needed. There can be no structural changes made after the Regional Competition.

Hints for Collecting Materials:

1. Flea markets and garage sales are excellent sources for old toys, bottles, tins, and buttons.

2. Younger brothers and sisters may be persuaded to part with toys they have outgrown. Old toys are excellent sources for materials, such as Lego® pieces, gears, Tinker Toys®, and blocks. (NOTE: all these items have value and would need to be listed on the Model Expense Form.)

3. Offices and businesses may have recyclable waste paper, wire, etc.

4. Builders and plumbers may have discarded pieces of pipe, wire, wood, etc.

5. Home improvement companies and remodelers may be willing to part with obsolete materials from houses they are remodeling. Old parts from stoves, cabinets, and plumbing fixtures may be sources for moving parts and provide unusual shapes for your buildings.

6. Find somebody who has just moved into the neighborhood or who receives a lot of parcels. These are good sources for boxes, cardboard, excelsior, and bubble wrap.

Oral Presentation (90 Points)

Instructions

The purpose of the presentation is to concisely describe specific design issues, innovations, features, and key aspects of the future city. Students will give a 5–7 minute presentation discussing their future city followed by a question and answer period from the Judges for an overall total not to exceed 15 minutes. Judges will also ask mandatory engineer-theme related questions. Students should practice answering the Judges' Sample Questions that are posted on the Future City Web site.

This presentation will be timed. If it exceeds 7 minutes, 5 points will be deducted from the team's overall score. While there is no penalty, per se, for taking less than 5 minutes, students should be aware that the more detailed the information they provide, the higher their potential score.

They should rehearse their presentation in front of an audience; be aware that your region may ask your students to use a microphone(s) and be on a stage.

The presentation will be evaluated and scored based on the Oral Presentation Rubric found in the forms section of this handbook. The students will be judged on Knowledge and Organization, Presentation Skills, and Teamwork.

Use of Visual Aids and Props

Demonstration Aids - the model is the primary demonstration aid used during the oral presentation. In addition, students may use visual aids, costumes, and other demonstration aids, as described below.

Display boards/charts— Aids may consist of either:

1. A single display not exceeding 60" (W) x 36" (H) (e.g., a single foam board resting on an easel).

OR

2. Two displays each not exceeding 30" (W) x 36" (H) each (e.g., two flip charts, each on separate easels).

3. The size does not include the easel or stand, if one is used.

Display boards/charts may consist of flip charts, foam boards, poster board, cardboard, etc. that could easily be supported on an easel. A team may use a multiple stack of display boards on an easel if they do not exceed the maximum dimension when displayed.

Audio/visual equipment

Not Allowed: Laptop computers, overhead projectors, and DVD/video players, MP3 Player, Discman, Walkman, IPods etc. may not be used for the presentation.

With the exception of handouts and costumes any visible item that is not part of the Future City Model will be deemed a visual aid and subject to the size limitations.

Costumes - includes anything the presenters wear or carry that enhances the role they are depicting in their presentation, for example: lab coats, hard hats, team t-shirts, cell phones, briefcases, etc.

Other Demonstration Aids - includes pointers, brochures (limited to one 8.5 x 11" sheet of paper), handouts, small mock-ups, etc used to assist with the presentation. All items in this category must collectively fit within a 6" x 6" x 12" volume (e.g., a shoe box).

The total value of ALL the materials used in support of the presentation, including the model, may not exceed $100. All materials must be documented on the Competition Expense Form.

Oral Presentation Tips and Examples

For information and tips about the Oral Presentation, view the Future City Competition Tutorial.

Preparing Your Presentation

As you prepare your presentation, consider the following questions:

- What does our team want the audience (the judges) to know?
- What is important about our City and the way we designed it?
- What do we have to say to people to help them understand what makes our City a good place to live?
- How do we want people to feel after they have heard our presentation?

Organizing the Presentation

- Introduction - What are you going to say to get people's attention?
- Tell your audience why what you are going to tell them is important for them to know.
- Tell your audience how your speech is going to be organized.
  - Identify your main idea.
  - Identify the points that support it. Remember, you can use your model to illustrate your points.
- Decide what examples you will use to emphasize your main points.
- Include personal stories about what was important as you created your Future City.
- Conclusion - Briefly summarize the main points you would like the audience to remember.

Creating and Using Flip Charts

- If you are using prepared flip charts, make sure your writing does not show through to the next page.
- Make your lettering BIG & DARK. (Use blue, black, brown, purple, or dark green markers.)
- Talk to your audience, not to the flip chart.

Practicing Your Presentation

- Practice your presentation many times before you give it to the judges.
- You should know your material well enough so that you don't have to read your notes. Create eye contact, i.e. look at your audience as you speak.
- Think of your presentation as an opportunity to tell your team's story. Relax and enjoy yourself.
- Practice using your model to illustrate your points.
- Try to think of the questions your audience might ask and think about what you might say to answer them.
- If you are using a pointer in your presentation, practice using it. Remember to look around you and take care not to accidentally poke anyone with it.

Using Peer Coaching to Improve Your Presentation

- You can use peer coaching to improve your team's presentation.
- Have the students practice with other team members.
- Perhaps every team member can have an opportunity to serve both as coach and as presenter. This method gives the team an opportunity to incorporate all team members' ideas into the final presentation.
- After each presentation, have peer coaches discuss the following points:

Peer Review

1. One thing that was strong about the content of the presentation.
2. Any points they didn't understand.
3. One thing they liked about the way their peers presented.
4. Anything they noticed about eye contact, posture, gestures, tone of voice, or pace of the delivery.
5. Anything they noticed about the way the presenters used and/or referred to the model.

Scoring

The Future City Competition requires students to complete program components worth a maximum of 400 points. Judges will evaluate each project (except for the student scored Computer City Design Self Evaluation), in accordance with the specific Rubric Guide, located in the forms section of this handbook and on the Future City Web site under Resources. Judges, based on the Rubric, will deduct points on the Scoring Deduction Sheet, also found in the forms section and on the Web site. **Judges' decisions are final.**

SCORING DEDUCTIONS

Penalty	Item	Description
5–10 pts.	Missing deadline for submission of the Computer City Design (Disk) and Computer Score Sheet. Deadline will be set by the regional coordinator.	The Computer City Design (CD-ROM) and Computer Score Sheet (pg. A-49) must be received in accordance with the deadline set by the regional coordinator.
5 pts.	Missing deadline for submission of the Essay and City Narrative. Deadline will be set by the regional coordinator.	The Essay and City Narrative must be received in accordance with the deadline set by the regional coordinator.
2 pts.	Computer Score Sheet incomplete.	A properly filled out Computer Score Sheet must be submitted with the Computer City Design (CD-ROM).
2 pts.	Essay Form incomplete or missing.	A properly filled out Essay Form must be attached to the Essay and City Narrative. Follow instructions on the form.
15 pts.	Competition Expense Form missing.	The Competition Expense Form with receipts attached to the back, must be brought to the competition.
5 pts.	Receipts missing from back of Competition Expense Form.	Receipts must be attached to the back of the Competition Expense Form. Follow instructions on the form.
1–5 pts.	Missing all or part of the Model ID.	The Model ID should be identified by a 4" x 6" index card with: future city name, school name, team members names (3 students, teacher, engineer-mentor), and scale used.
5 pts.	Exceeding presentation time.	Verbal presentation by team is 5–7 minutes. Presentation cannot exceed 7 minutes.
15 pts.	Exceeding model dimensions.	The maximum dimensions of the model are 20" (H) x 50" (L) x 25" (W). Height and width dimensions include all supporting structures, such as braces, and any model materials hanging below the tabletop.
15 pts.	Exceeding Presentation dimensions.	Support materials may consist of either: 1. A single display not exceeding 60" (W) x 36" (H) OR; 2. Two displays not exceeding 30" (W) x 36" (H) each. 3. The size does not include the easel stand, if one is used.

Awards and Prizes

Special Awards are provided by numerous engineering societies and organizations at both the regional and national levels. Please check the National Future City Web site and with your Regional Coordinator for the most current listing.

In eligible Regions*, the First place prize is a trip to the National Finals in Washington, DC.

- In 2010, Future City National Teams will arrive in Washington, DC on Saturday, February 13th and return home on Wednesday, February, 17th. The National Competition will be held February 14–16th.
- The Hyatt Regency Washington on Capitol Hill will host and house the winning teams.
- Future City will provide round trip transportation, (most economic), hotel accommodations for the team (3 student presenters, teacher coach, engineer mentor), and two meals, (one breakfast and one-lunch). All other expenses are the responsibility of the team.
- **The top prize at the National Finals, besides the trophy and medals, is a trip to U.S. Space Camp™ in Huntsville, Alabama, awarded by Bentley Systems, Inc. (Trip includes airfare and camp registration.)**
- The first runner up is awarded a $5,000 prize for the school's technology program, given by the National Society of Professional Engineers.
- The second runner up is awarded a $2,000 prize for the school's technology program given by IEEE-USA (Institute of Electrical and Electronics Engineers – USA.)
- All presenting team members will receive a Certificate of Participation.
- Prizes are not transferable or exchangeable. Prizes subject to the discretion of the awarding organization.

* **To be eligible to compete at the National level a Region must have registered a minimum of 25 schools by October 31, 2009.**

Chapter 3: Working Together

Involving Other Teachers

The National Engineers Week Future City® Competition is a problem-based teaching strategy with computer simulation that provides students with hands-on, inquiry-based experiences solving real-life problems utilizing an interdisciplinary approach. Teachers are encouraged to work together across disciplines using the Future City Competition to augment their existing curricula and lesson plans.

Involving Families

When communicating with your students' families, you can share that the program provides the 21st Century Skills as described below (http://www.21stcenturyskills.org):

1. Learning and Innovation Skills
    - Creativity and Innovation
    - Critical Thinking and Problem Solving
    - Communication and Collaboration
2. Information, Media and Technology Skills
    - Information Literacy
    - Media Literacy
    - ICT Literacy
3. Life and Career Skills

In addition to your school setting, this program encourages collaboration within the community, particularly with engineers and city planners.

Involving the Engineering Community

What is Engineering?

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standard of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

ENGINEERING DESIGN PROCESS

The following is a general description process engineers follow in designing a product or service. This description is a guide – engineers do not necessarily follow it step-by-step. But, note how well your Future City project follows this process. The engineering design process is cyclical and can begin at any step, or move back and forth between steps numerous times. In real life, engineers often work on just one or two steps and then pass along their work to another team.

WHAT PROBLEM ARE YOU TRYING TO SOLVE?

- Something that doesn't work
- Something that can be done better
- Something that's not being done at all (wouldn't it be great if….)

WHAT ARE THE REQUIREMENTS OR CONSTRAINTS?

- Physical constraints (size, weight, environment, materials)
- Who or what is the user? What do they need?
- Who is the customer? What do they want?
- What will it cost? What is the budget?

WHAT ARE THE POSSIBLE SOLUTIONS?

- What are some solutions?
- Brainstorm ideas
- How well do these ideas meet some or all of the requirements?
- What trade-offs can you make?

FIND THE BEST SOLUTION

- Find the most likely solutions
- Develop a plan
- Make lists of materials and resources you will need
- Research answers to questions

TEST IT – IMPROVE IT

- Test your solutions using computer simulations and scale models
- Decide what works, what doesn't work, and what could work better
- Modify your design
- Test it again

BUILD IT

- Satisfy yourself you have the best design
- Follow your plan and create it. Once you complete the "Build It" stage, you can go back and start the process over again to refine your technology or respond to changing requirements.

Suggested Activities

1. Have the students interview different types of engineers and share the information with the teammates.

2. Arrange a field trip to an engineer's office, the water treatment center, waste management facilities, city planner/engineer office, US Green Building Council (local chapter), etc…

3. Invite your engineer-mentor and other professionals to talk to the students about STEM careers. Encourage the students to prepare questions and interview the speaker.

4. Observe how your own community works by interviewing city staff, reading the newspaper, and/or watching televised news reports.

Careers in Engineering

Engineering is the profession that puts scientific knowledge to practical use. It is the discipline and profession of acquiring and applying technical, scientific and mathematical knowledge in order to design and implement materials, structures, machines, devices, systems, and processes that safely realize a desired objective. The word engineering comes from the Latin "engineer", which means to design or create. The basic job of any engineer is to work with the amazing array of machines and systems that provide food, water, shelter, energy, and a vast array of products within our complex modern world. Engineers not only develop these systems but also keep them running and work to make them better. They work on the design, select the materials, manage costs, and often supervise the teams of workers who complete the project. There are many different specialties within the engineering field. Here are just a few.

Aerospace Engineering

Even the sky is not a limit in aerospace engineering! Today's aerospace engineers design, develop, test, and supervise the manufacture of aircraft, spacecraft, satellites, and missiles. They are working to make space colonization a reality and reduce the time needed to travel around the world. Aerospace engineers apply their specialized knowledge of aerodynamics, thermo-fluid mechanics, propulsion, structures, dynamics, control, and performance to a wide variety of problems encountered in the design of vehicles or systems. They develop new technologies for use in aviation, defense systems, and space systems. They can also apply their expertise to the design and development of new earthbound vehicles-racecars, hydrofoil ships, deep-diving vessels for oceanographic research, and high-speed rail systems.

Agricultural and Biological Engineering

Agricultural and biological engineers use biology and technology to provide our growing population with the necessities of life: safe and abundant food and water, a healthy environment, timber and fiber for shelter and clothing, and renewable energy sources. They are experts in producing crops and livestock in ways that protect our air, soil and water and in turning agricultural crops and waste into usable products like medicines, fuels and packaging materials. If we ever send a manned space mission to Mars, it will be agricultural and biological engineers who design the astronauts' greenhouses and food production systems!

Architectural Engineering

Architectural engineering is a specialized degree that focuses on the planning, design, construction, and operation of engineered systems for all kinds of buildings-from skyscrapers and football stadiums to residences, hospitals, courthouses, shopping malls and much more.

Automotive Engineering

Automotive engineers work on the most complicated and exciting consumer product manufactured. They integrate complex parts into a single system while meeting a plethora of standards-from safety to durability, environmental, and performance standards and tests-and dealing with an electrical interface to a mechanical interface to hydraulics to a combustion engine to thermal properties. To make matters more challenging, automotive engineers bring out new models every two to three years to give consumers the latest and greatest technology. The technology and computer power of automobiles today outpaced NASA's space shuttle.

Biomedical Engineering

The objective of biomedical engineering is to enhance health care by solving complex medical problems using engineering principles. Those who specialize in this field want to serve the public, work with health care professionals, and interact with living systems. This broad field allows a large choice of sub-specialties. Many students say they choose biomedical engineering because it is people-oriented. Subspecialties include bioelectrical, biomechanical, biochemical, rehabilitation, clinical, and genetic engineering.

Chemical Engineering

What do toothpaste, gasoline, medicines, plastics, environmental protection, skin care products, and clean drinking water have in common? They all draw on the knowledge and resources of chemical engineers to make them available. Chemical engineers apply principles of chemistry to solve problems involving the production or use of chemicals and biochemicals. This includes research and development, as well as converting scientific discoveries into marketable products.

Civil Engineering

Civil Engineers work to design and build solutions to ensure the future demands of society. They meet the challenges of pollution, traffic congestion, drinking water, energy needs, urban redevelopment, and community planning. They design roads, bridges, irrigation systems, water treatment plants, transit systems, airports, and much more.

Computer Engineering

Computer engineers are vitally important in almost everything that we do. Computer engineers develop cutting-edge video software, come up with a better phone to text friends, or invent a new hand-held device. In the medical field, computer engineers create programs that track patient records, control x-ray and MRI machines, and offer surgeons visual maps of the operations they are performing. Opportunities abound as a computer engineer, from medicine to national security, from education to entertainment.

Electrical Engineering

Electrical engineers design, construct, and maintain products, services, and information systems that run our world. Electrical engineers work in areas such as power generation systems, telecommunications, and consumer electronic industries, but also work in aerospace, medical, and semiconductor fields.

Fire Protection Engineering

Fire protection engineering is the application of science, engineering principles and experience to protect people and their environments from the destructive effects of fire. Fire protection engineers work for the government, insurance agencies, hospitals and health care facilities, fire departments, and 40 percent work in consulting.

Heating, Ventilation, Air Conditioning and Refrigeration Engineering

HVAC and refrigeration engineers meet the requirements of energy conservation and the demands for a clean environment, while designing, installing or operating air-conditioning and refrigeration systems to maintain human comfort or to process and store food. To accomplish this balancing act, HVAC&R engineers must be familiar with all fields of engineering, from electrical and controls to structural and lighting.

Industrial Engineering

Doing things better, faster, cheaper, and conserving resources is the world of the industrial engineer. And they do it in every industry from manufacturing to medicine and entertainment. Industrial engineers work to implement, evaluate, and improve systems and processes, and make the best use of resources-people, money, knowledge, information, equipment, material, and processes-to produce a better product or service. Industrial engineers work to shorten lines at theme parks, help to get passengers on and off airplanes quicker, reduce the cost of producing cars and computers, reduce worker fatigue and increase productivity in assembly lines, and reduce distribution time and expenses.

Manufacturing Engineering

Manufacturing engineering is about converting ideas into realty. Every product we buy, whether it's toothpaste, cell phones, automobiles, computers, clothing, or toys has to be manufactured. Manufacturing engineers work with design engineers and a whole host of company specialist from marketing to accounting to logistics to purchasing-to produce a finished product efficiently, cost-effectively, ergonomically, and safely, while complying with governmental safety and environmental standards. The goal is to produce a product at a quality level and price that the consumer will want. That's a tall order, but it's an exciting discipline and one that is tangible and hands on.

Materials Engineering

Materials engineering is an interdisciplinary field involving the properties of matter and its applications to science and engineering. This field of engineering investigates the relationship between the structure of materials at atomic or molecular scales and their macroscopic properties. A big part of the materials engineering field today focuses on nanomaterials, those materials less than 100 nanometers, and has ushered in a new area of science.

Mechanical Engineering

Mechanical engineers are responsible for virtually everything you see or use during the course of your day. In fact, if something moves or uses energy, a mechanical engineer was probably involved in its design or production. The advancements made by mechanical engineers range from lifesaving medical devices, athletic equipment, and personal computers to air conditioners, automobile engines, and electric power generation plants. (Not to mention, mechanical engineers also design the machines that produce these products.)

Nuclear Engineering

Nuclear engineers harness the power of the atom to benefit humankind. Nuclear engineers meet the challenges of electricity, space exploration, water and food supply issues, environment and pollution, medical tests and treatments, and transportation. They design nuclear power plants, medical equipment, power systems for naval vessels and spacecraft, and much more.

Sports Engineering

Sports engineering is a growing business in the United States and around the world. This field is heavily dependent on the development of new products that enhance performance and increase safety. Engineering breakthroughs have had a significant impact on a wide range of sporting equipment-from bindings on skis to golf clubs, baseball bats, race cars, exercise equipment and much more. In addition, an understanding of engineering and physics principles has also contributed to dramatic improvements in technique in many sports. These improvements have, in turn, made sports more exciting by helping athletes break through performance barriers to set new records.

Telecommunications Engineering

Telecommunications engineers analyze, design, install, and maintain telecommunications systems. These include wireless systems, local area networks, cable networks, cellular systems, fiber optics, microwave and satellite links, road traffic informatics, and satellite communications systems. Two new and exciting specialties within Telecommunications engineering is wireless engineering- dealing with radio broadcasts, television, cell phones, wireless network access-and avionics, which includes all instruments, sensors, and electronic equipment and the electrical systems that link them to each other and to aerospace vehicle-control systems.

Professional Engineers

Professional Engineers compromise the professional center of the industry. A professional engineer (PE) is one who has been licensed by the state. Generally, to become a PE, you must graduate from an engineering program approved by your state's licensure board, work for four years under the guidance of a professional engineer, and then pass a written exam called the Principles and Practices of Engineering.

Chapter 4: Assessment

Rubrics for

- Computer Design
- Model
- Essay
- Presentation

Computer Design

	City Layout Criteria	0 (Points)	1 (Points)	2 (Points)	3 (Points)	4 (Points)	5 (Points)	Score
1	What are the property values within the city?	Majority (> 50%) of the city is "light red" - very low values	Majority (> 50%) of the city is "red" - low values	Majority (> 50%) of the city is "dark red" - low to medium values	Majority (> 50%) of the city is "dark green" - medium values	Majority (> 50%) of the city is "green" - medium to high values	Majority (> 50%) of the city is "light green" - high values	5
2	Is there adequate police coverage within the city?	Little (<50%) police coverage	Some (approx 50% to 95%) police coverage	Adequate (>95% to 99%) police coverage - not all populated areas covered	Complete (100%) police coverage - all populated areas covered			3
3	Is there adequate fire coverage within the city?	Little (<50%) fire coverage	Some (approx 50% to 95%) fire coverage	Adequate (>95% to 99%) fire coverage - not all populated areas covered	Complete (100%) fire coverage - all populated areas covered			3
4	Are there factories located in the city?	No factories	One (1) type of factory	Two (2) different types of factories	Three (3) different types of factories	Four (4) different types of factories	Five (5) or more different types of factories	5
5	Are there high-tech industries located in the city?	No high tech industries	One (1) type of high-tech industry	Two (2) different types of high-tech industry	Three (3) different types of high-tech industry	Four (4) different types of high-tech industry	Five (5) or more different types of high-tech industry	5
6	Are there agricultural areas located within the city?	No farms	One (1) or two (2) farms	Three (3) or four (4) farms	At least five (5) farms			3
7	Are there sufficient form(s) of garbage disposal for the city?	No forms of garbage disposal	One (1) form of garbage disposal	Two (2) forms of garbage disposal	Three (3) or more forms of garbage disposal			3
8	Is there a sufficient number of recycling facilities located within the city?	No recycling centers	One (1) or two (2) recycling centers	Three (3) or four (4) recycling centers	Five (5) or more recycling centers			3

Computer Design (continued)

	Social Services	0 (Points)	1 (Points)	2 (Points)	3 (Points)	4 (Points)	5 (Points)	Score
1	What is the average life expectancy of the Sims over the past 10 years?	Average life expectancy of 40 or below	Average life expectancy 40 to 49	Average life expectancy 50 to 69	Average life expectancy of at least 70			3
2	What is the average education level of the Sims over the past 10 years?	Average education level below 80	Average education level 80 to 119	Average education level 120 to 159	Average education level at least 160			3

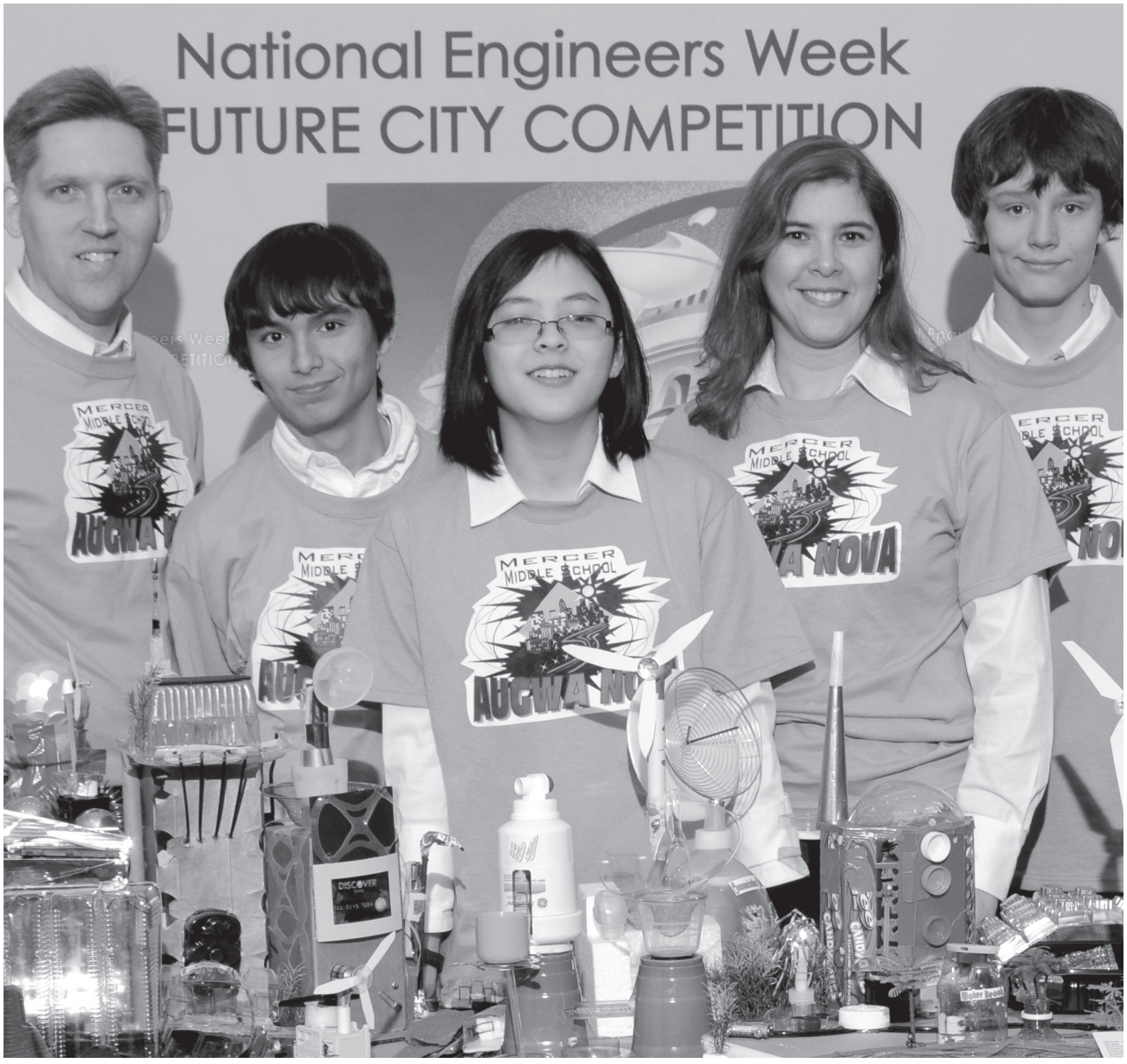
	Energy and Pollution Criteria	0 (Points)	1 (Points)	2 (Points)	3 (Points)	4 (Points)	5 (Points)	Score
1	Is there power to all areas within the city?	Few areas (< 50%) have power	Some areas (approx. 50% to 95%) have power	Most areas (> 95% to 99%) have power	All (100%) areas have power			3
2	Is there water to all areas within the city?	Few areas (< 50%) have water	Some areas (approx. 50% to 95%) have water	Most areas (> 95% to 99%) have water	All (100%) areas have water			3
3	Is water pollution under control within the city?	Majority (> 50%) of the city is "red" - high water pollution	Majority (> 50%) of the city is "light red"	Majority (> 50%) of the city is "orange"	Majority (> 50%) of the city is "light orange"	Majority (> 50%) of the city is "yellow"	Majority (> 50%) of the city is "light yellow" - low water pollution	5
4	Is air pollution under control within the city?	Majority (> 50%) of the city is "red" - high air pollution	Majority (> 50%) of the city is "light red"	Majority (> 50%) of the city is "orange"	Majority (> 50%) of the city is "light orange"	Majority (> 50%) of the city is "yellow"	Majority (> 50%) of the city is "light yellow" - low air pollution	5

Computer Design (continued)

	Transportation Criteria	0 (Points)	1 (Points)	2 (Points)	3 (Points)	4 (Points)	5 (Points)	Score
1	Are the Sims using the following Public Transportation Systems? 1. Bus 2. Subway 3. Monorail 4. Passenger Train 5. Ferry	No public transportation systems	Sims using one (1) public transportation system	Sims using two (2) public transportation systems	Sims using three (3) public transportation systems	Sims using four (4) public transportation systems	Sims using all five (5) public transportation systems	5
2	Does the passenger train, bus, or subway system provide adequate coverage throughout the city?	No bus, passenger train, or subway system in the city	Bus, passenger train, or subway system covers only part (<50%) of the city	Bus, passenger train, or subway system covers most (>50%) of the city				2
3	What is the average commute time for the Sims over the past 10 years?	Commute time of 60 minutes or more	Commute time of 60 minutes or less	50 minutes or less	40 minutes or less	30 minutes or less		4
4	Are the Sims using the freight truck system?	No freight truck system used	Minimal freight truck system usage, majority (>50%) of usage "white"	Adequate freight truck system usage, majority (>50%) of usage "grey"	Significant freight truck system usage, majority (>50%) of usage "blue"			3
5	Are the Sims using the freight train system?	No freight train system used	Minimal freight train system usage, majority (>50%) of usage "white"	Adequate freight train system usage, majority (>50%) of usage "grey"	Significant freight train system usage, majority (>50%) of usage "blue"			3
6	Is there an airport in the city?	No airport is present	A landing strip is present	A small municipal airport is present	An international airport is present			3
7	Is there an seaport in the city?	No seaport present		A developed seaport is present				2

Computer Design (continued)

	Recreation Criteria	0 (Points)	1 (Points)	2 (Points)	3 (Points)	4 (Points)	5 (Points)	Score
1	Are there different types of recreation areas within the city?	No recreation areas	One (1) to three (3) different types of recreation areas	Four (4) to six (6) different types of recreation areas	Seven (7) to Eleven (11) different types of recreation areas	Twelve (12) to fourteen (14) different types of recreation areas	Fifteen (15) different types of recreation areas	**5**
2	Have the Sims received any rewards?	No rewards	One (1) reward	Two (2) rewards	Three (3) rewards	Four (4) rewards	Five (5) or more rewards	**5**
								84



Future City Model Rubric

0 No Points	2 POOR	4 FAIR	6 GOOD	8 VERY GOOD	10 EXCELLENT
Requirements missing	Poor-Fair quality. Fulfills at least 20% of requirements.	Fair-Average quality. Fulfills at least 50% of requirements	Average quality. Fulfills at least 90% of requirements.	Above average quality. Fulfills 100% of requirements.	Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. CREATIVITY (20 points)	0	2	4	6	8	10
1. Illustration of Futuristic Designs • Buildings and/or structures • Infrastructure (mag-lev, space elevator) • Location (outer space, underwater, ice cap, desert) • Plausible and recognizable as a city	No futuristic designs that are plausible.	Includes 1-2 futuristic designs that are plausible.	Includes few futuristic designs, 1-2 are plausible.	Several futuristic designs, few plausible.	Many futuristic designs, most plausible.	Highly futuristic. Very plausible.
2. Appearance • Use of color, graphics, shapes, etc. • Realistic elements (flora, fauna, landscapes) • Pleasing, not distracting	Not complimentary, distracting.	Fulfills at least 20% of requirements: Fair aesthetics, somewhat distracting.	Fulfills at least 50% of requirements: Fair aesthetics, not distracting.	Fulfills at least 90% of requirements: Good aesthetics enhance the model.	Very good aesthetics enhance the model.	Excellent aesthetics enhance the model.
II. QUALITY & SCALE (20 points)	**0**	**2**	**4**	**6**	**8**	**10**
3. Quality Workmanship and Age Appropriateness • Age appropriate for 7-8th grade • Quality construction • Reasonably durable	Poor quality.	Mediocre quality.	Fair to good quality.	Good quality. Age appropriate.	Very good quality. Age appropriate.	Excellent quality. Age appropriate.
4. Model Scale: _____ • Consistent scale throughout model • Applied horizontally and vertically • Appropriate scale chosen to create a good city model	Inappropriate, inconsistent scale.	Inconsistent scale for majority of model.	Fair scale choice. Some inconsistencies.	Good scale choice. Consistently applied.	Very good scale choice; city elements easy to identify. Consistent application.	Exceptional scale, layout; City elements easy to identify. Consistent application.

Future City Model Rubric (continued)

0 No Points	2 POOR	4 FAIR	6 GOOD	8 VERY GOOD	10 EXCELLENT
Requirements missing	Poor-Fair quality. Fulfills at least 20% of requirements.	Fair-Average quality. Fulfills at least 50% of requirements	Average quality. Fulfills at least 90% of requirements.	Above average quality. Fulfills 100% of requirements.	Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

III. CITY DESIGN (40 points)	0	2	4	6	8	10
5. City Design and Livability • Well planned design and layout (neighborhoods, green spaces, streets) • Accessibility, functionality, mixed-use • Eco-management: sustainability, landscape	Fails to include expected requirements.	Little planning.	Some planning.	Planned design, accessible, mixed-use. Considers environment.	Well planned design. Accessible and mixed-use areas. Considers environment.	Excellent planning, accessibility, and environmental management.
6. Zones & Interconnectivity • Variety of city zones, structures, infrastructure components • Interconnectivity of zones and components • Transportation: pedestrian, personal, public, goods & services	Zoning unclear.	One zone, few structures. Little interconnectivity.	At least one zone, variety of structures. Some interconnectivity, but some awkward design.	1-2 zones, variety of structures. Some good interconnectivity.	Two or more zones. Good variety of structures. Good interconnectivity.	Two or more zones, good variety of structures. Very good interconnectivity.
7. Futuristic Technologies • Examples of futuristic technologies, components • Scientifically sound	No futuristic examples	1-2 futuristic examples. Artistic, but not scientifically sound.	Few futuristic examples. At least one scientifically sound.	Some futuristic examples which are scientifically sound	Several futuristic examples, many of which are scientifically sound.	Highly futuristic, but based on sound scientific principals.
8. Innovative Solutions • Examples of solutions to problems: transportation, environment, services, etc. • At least one original, innovative solution	No solutions.	One solution, not innovative.	At least one solution. Somewhat innovative.	More than one solution. Innovative and plausible.	More than one solution that is innovative.	Several innovative solutions.
9. Affordable Living Structure Illustration • Incorporating essay topic into model • At least one example of affordable living space • Strives to meet "Green Ideals" of building	No living structures.	One living space. Not clear whether affordable, green.	One living space. Appears either affordable or green.	At least one affordable living space. Somewhat green.	At least one affordable living space. Green.	More than one affordable living space. Very green.

Future City Model Rubric (continued)

0 No Points	2 POOR	4 FAIR	6 GOOD	8 VERY GOOD	10 EXCELLENT
Requirements missing	Poor-Fair quality. Fulfills at least 20% of requirements.	Fair-Average quality. Fulfills at least 50% of requirements	Average quality. Fulfills at least 90% of requirements.	Above average quality. Fulfills 100% of requirements.	Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

IV. MOVING PART COMPONENT (20 points)	0	2	4	6	8	10
10. Moving Part Innovation and Quality • At least one moving part • Quality workmanship, durability • Repeatability of movement • Innovative execution	No moving parts.	One moving part. Fair quality. One time movement.	One moving part. Good quality.	At least one moving part. Good quality. Repeatable movement. Somewhat innovative.	More than one moving part. Very good quality. Repeatable movement. Innovative.	More than one moving part. Excellent quality, repeatable movement, highly innovative.
11. Moving Part Relationship to the Design or Function of the City • At least one moving part • Closely related to function of the city	No moving parts.	Moving part cosmetic; not relevant to city design.	Moving part loosely related to city design.	Moving part relevant to city design.	At least one moving part intrinsic to city design.	More than one moving part essential to city design.

V. USE OF RECYCLED MATERIALS (10 points)	0	2	4	6	8	10
12. Use of Recycled Materials • Most of model made from recycled materials • Variety of materials, imaginative or unusual materials • Creative modification or application of materials	No recycled materials used.	Few recycled materials. Some creative materials. No modifications.	At least 50% recycled materials. Little or no variety. Some attempt to modify.	More than 75% recycled. Some variety. Some creative materials. Some creatively modified.	More than 75% recycled. Good variety. Many creative materials and modifications.	Almost all recycled. High level of creative and creatively modified materials.

Essay Rubric

City Layout Criteria			0 (Points)	1 (Points)	2 (Points)	3 (Points)
I. Selection of Living Space:						
Select and define a living space of their choice using "green" materials, processes and standards to address a societal need.						
1	Does the essay define the living space and its location as it pertains to the citizens in need (e.g. homeless)?	a.	Living space is NOT defined	Living space is defined/named		
		b.	Location is NOT identified	Location is briefly identified	Location is well identified	
		c.	Does NOT address the needs of the citizens	Briefly relates to the needs of the citizens	Adequately relates to the needs of the citizens	Relates well to the needs of the citizens
2	Does the essay explain how the living space can adapt to various sizes and styles, and what is the expected lifespan of the living space?	a.	NO explanation of variation in size, style or lifespan	One of the three characteristics is briefly addressed	Two characteristics are briefly addressed	Three characteristics are briefly addressed
		b.	NO in depth explanation of any characteristic	In depth explanation of at least one characteristic	In depth explanation of all three characteristics	
3	Does the essay discuss the target demographic of the living space/housing?		Living space target demographic is NOT identified	Target demographic is briefly discussed	Target demographic is adequately discussed	Target demographic is well discussed
II. Research:						
Research of existing green building sustainable processes, materials, and technologies.						
4	Is there evidence of research into existing green building technologies and criteria used today?	a.	NO evidence of research	Research of one green technology	Research of at least two green technologies	
		b.	Research is NOT in depth	Research of one green technology topic is in-depth	Research of at least two green technology topics is in-depth	
		c.	NO examples are presented	Examples are presented		

Essay Rubric (continued)

City Layout Criteria			0 (Points)	1 (Points)	2 (Points)	3 (Points)
III. Green Materials and Resources:						
Develop and investigate a new technology or improvement to a technology to incorporate into the residential space to insure sustainable/green design. The technology or innovation should aim to satisfy the "Green Ideals".						
5	Does the essay describe innovation in "Green" materials and resources and how they function?	a.	A "Green" material/resource innovation is NOT identified	A "Green" material/resource innovation is identified		
		b.	NO description of how the material/ resource innovation will function	Material/resource innovation function briefly described	Material/resource innovation function adequately described	Material/resource innovation function well described
		c.	NO examples are presented	Examples are presented		
6	Does the essay describe how the chosen materials will enable the living space to adapt to the community?		NO description of how the living space adapts to the community	Brief description of how the living space adapts to the community	Adequate description of how the living space adapts to the community	How the living space adapts to the community is well described
7	Does the essay discuss the impact of the chosen materials on construction waste?		NO discussion of impact on waste	Brief discussion of impact on waste	Adequate discussion of impact on waste	Impact on waste is well discussed
8	Does the essay describe the impact of the chosen materials on the living space aesthetics (interior and exterior)?		NO description of the living space aesthetics	Brief description of the living space aesthetics	Adequate description of the living space aesthetics	The living space aesthetics are well described
9	Does the essay describe what makes the chosen material an economic, efficient and sustainable choice?	a.	Economy and efficiency are NOT discussed.	Economy and efficiency are briefly discussed	Economy and efficiency are adequately discussed	Economy and efficiency are well discussed
		b.	Sustainability is NOT discussed	Sustainability is briefly discussed	Sustainability is adequately discussed	Sustainability is well discussed
10	Does the essay describe the tradeoffs made between economic, efficient and sustainable in the selection of the chosen building materials?		Tradeoffs between economics, efficiency, and sustainability are NOT discussed	Tradeoffs between economics, efficiency, and sustainability are briefly discussed	Tradeoffs between economics, efficiency, and sustainability are adequately discussed	Tradeoffs between economics, efficiency, and sustainability are well discussed
11	Does the essay discuss the environmental footprint or impact of the living space?		NO discussion of environmental footprint	Brief discussion of environmental footprint	Adequate discussion of environmental footprint	Environmental footprint is well discussed

Essay Rubric (continued)

City Layout Criteria			0 (Points)	1 (Points)	2 (Points)	3 (Points)
IV. Function and Value of the Living Space:						
Provide in-depth discussion of the function of the living space design or component(s) and its influence on the occupants and community.						
12	Does the essay discuss the durability and maintenance of the living space?		NO discussion of durability and maintenance is provided	Brief discussion of durability and maintenance is provided	Adequate discussion of durability and maintenance is provided	Durability and maintenance are well discussed
13	Does the essay provide a description of the improvements to the quality of life of the living space occupants (including elderly and disabled)?		NO description of improvement in the quality of life for the occupants.	Brief description of improvement in the quality of life for the occupants.	Adequate description of improvement in the quality of life for the occupants.	Improvement in the quality of life for the occupants is well described
14	Does the essay discussion include benefits of the living space design and its impact on the community and environment?	a.	NO discussion of benefits to the <u>community</u> provided by the living space	Brief discussion of the benefits to the <u>community</u>	Adequate discussion of the benefits to the <u>community</u>	The benefits to the <u>community</u> are well discussed
		b.	NO discussion of benefits to the <u>environment</u> provided by the living space	Brief discussion of the benefits to the <u>environment</u>	Adequate discussion of the benefits to the <u>environment</u>	The benefits to the <u>environment</u> are well discussed
V. Role of the Engineer:						
Identify an engineering discipline and its role in developing the living space design or components of the living space.						
15	Does the essay discuss the role of one engineering discipline in the development of the living space?	a.	An engineering discipline is NOT identified	An engineering discipline is identified		
		b.	The role of the engineer in developing the living space or its components NOT discussed	The role of the engineer in developing the living space or its components is briefly discussed	The role of the engineer in developing the living space or its components is adequately discussed	The role of the engineer in developing the living space or its components is well discussed

Essay Rubric (continued)

	City Layout Criteria		0 (Points)	1 (Points)	2 (Points)	3 (Points)
VI. Written Communications:						
Assessment of the overall written presentation.						
16	Well Written		Poorly written and organized	Satisfactorily written and organized	Exceptionally written and organized	
17	Grammar		Many grammatical errors	Some grammatical errors	No grammatical errors	
18	Spelling		Many spelling errors	Some spelling errors	No spelling errors	
19	Length		Fewer than 700 words or more than 1000 words	Between 700 and 1000 words		
20	List of References	a.	Less than three appropriate references	At least three appropriate references		
		b.	References are NOT correctly listed	References are correctly listed		
Total Essay Points (0–70 points)						

Team Presentation of Future City Design and Model Rubric

0 No Points	2 POOR	4 FAIR	6 GOOD	8 VERY GOOD	10 EXCELLENT
Requirements missing	Poor-Fair quality. Fulfills at least 20% of requirements.	Fair-Average quality. Fulfills at least 50% of requirements	Average quality. Fulfills at least 90% of requirements.	Above average quality. Fulfills 100% of requirements.	Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. CREATIVITY (50 POINTS)	0	2	4	6	8	10
1. Organization • Clear intro, body, and conclusion. • Body logically organized • Supporting statements evident • Transitions between sections	No organizational pattern. No transitions; missing conclusion; very little information.	Listed information ; little or no support or transitions. Intro, body, conclusion somewhat unclear.	Fair amount of information, structure of presentation body is present; missing either or both introduction or conclusion; few transitions	Good amount of information and generally good organization. Could use smoother transitions and better supporting facts.	Organized with transitions; broad range of information but could use more details.	Extremely well organized, clear transitions; very broad information range with excellent support; creative introduction, conclusion.
2. Presentation Content • City features, benefits, and aesthetics described • Geography, demographics or distinctive characteristics • Discusses infrastructure such as transportation, energy, waste disposal or pollution control • Innovations in technology and futuristic concepts explained	No city benefits, aesthetics, technology or innovation mentioned.	Few benefits or innovations discussed. Little explanation or not believable.	Fair description of the city. Some distinctive benefits and innovations explained. Somewhat futuristic and believable.	Good overall description of the city. Many distinctive benefits and innovations explained. Somewhat futuristic and believable.	Very good description of city. Many benefits and innovations explained. Futuristic and believable.	Excellent description of city. Highly innovative technology applied throughout. Explained in detail. Futuristic and believable.
3. Essay Topic (affordable green building) • Discusses essay topic: design affordable living spaces using sustainable and green techniques. • Explains how the yearly theme influenced the city design	No discussion of affordable, green living spaces or other program components.	Refers to essay briefly; little or no discussion of other program components.	Briefly discusses essay topic and solution. No real supporting facts. Explains how their city design incorporates the theme.	Discusses the essay topic and solution; some supporting facts. Solution is adequate, somewhat innovative. Somewhat explains how their city design incorporates the theme.	Discusses the essay topic and solution. Good supporting facts. Solution innovative or futuristic. Fully explains how their city design incorporates the theme.	Discusses the essay topic and solution with excellent supporting facts. Excellent explanation of how their city design incorporates the theme.
4. Knowledge of Engineering Roles & Design Process • Discusses the engineering field and/or engineering roles • Understands engineering design process: problem definition, tradeoffs, testing, etc. • Has applied process to FC project	No discussion of engineering.	Mentions engineering, but lacks understanding of roles or design process.	Briefly discusses and understands engineering and role of engineer. Little discussion of engineering process.	Discusses and understands engineering role and presents some knowledge of engineering process.	Good understanding of engineering role and engineering process. Attempts to apply engineering process to part of the project.	Excellent understanding of engineering and engineering process. Applies engineering process throughout the project.

Team Presentation of Future City Design and Model Rubric (continued)

0 No Points	2 POOR	4 FAIR	6 GOOD	8 VERY GOOD	10 EXCELLENT
Requirements missing	Poor-Fair quality. Fulfills at least 20% of requirements.	Fair-Average quality. Fulfills at least 50% of requirements	Average quality. Fulfills at least 90% of requirements.	Above average quality. Fulfills 100% of requirements.	Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. CREATIVITY (20 POINTS)	0	2	4	6	8	10
5. Questions and Answers • Answers questions with confidence • Accurate, complete answers	Unable to answer questions.	Answers a few questions accurately. No supporting facts.	Answers at least 50% of the questions accurately, few supporting facts.	Answers 90% of questions with accuracy and some supporting facts.	Answers 100% of the questions accurately with some supporting detail.	Fully, accurately and confidently answers 100% of the questions with many supporting details.
II. DELIVERY/PRESENTATION SKILLS (30 POINTS)	**0**	**2**	**4**	**6**	**8**	**10**
6. Presentation Skills • Verbal skills: Fluent, clear, audible delivery • Verbal skills: Correct grammar and appropriate language use • Non-verbal skills: Upright posture with practiced use of visual aids • Overall confident, direct, and animated delivery	Poor skills throughout the presentation.	A few verbal and nonverbal skills are fairly well done but needs more practice to improve in most areas	Fair to good skills for the majority of the presentation.	Good use of most of the verbal and nonverbal skills; somewhat confident and direct.	Very good verbal and nonverbal skills by most of team throughout most of the presentation.	All verbal and nonverbal skills demonstrated with excellence throughout the entire presentation. Very confident, direct, and animated delivery.
7. Model as a Demonstration Aid • Model is a key element of entire delivery • Creatively uses model to illustrate city features • Model enhances, rather than distracts, from presentation	Little or no use of the model as a demonstration aid.	Model referenced but does not enhance presentation	Model is used and is partially effective and fairly enhances presentation. Little innovation shown.	Good use of the model as an illustration of city design and function; little illustration of innovations.	Very good model use; integrated smoothly into the presentation and helped to illustrate city design, function and innovations.	Extremely creative, integrated use of model; contributed significantly to the understanding of city design, function and innovations.
8. Visual and Other Aids • Standard visual aids (posters, charts) neat, well-prepared • Additional visual aids (props, costumes, handouts) enhance, rather than distract, from overall presentation • Delivery with all visual aids is well practiced and confident	No visual aids or visual aids distract from presentation	Poorly designed visual aids, do not enhance presentation	Fair to good visual aids ; somewhat add to presentation. Fair to good design and construction.	Good visual aids that generally added to the presentation; well designed and good use of visual aids to enhance the presentation.	Very good visual aids that enhanced the presentation of the city design and function. Well used, designed, and constructed.	Excellent, well designed, constructed and creatively used visual aids that integrated well into the presentation and enhanced understanding city design and function.

Team Presentation of Future City Design and Model Rubric (continued)

0 No Points	2 POOR	4 FAIR	6 GOOD	8 VERY GOOD	10 EXCELLENT
Requirements missing	Poor-Fair quality. Fulfills at least 20% of requirements.	Fair-Average quality. Fulfills at least 50% of requirements	Average quality. Fulfills at least 90% of requirements.	Above average quality. Fulfills 100% of requirements.	Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

III. TEAMWORK (10 POINTS)	0	2	4	6	8	10
9. Teamwork During Presentation and Q&A • Team members supported each other • Team members shared time equally • Team members displayed an equal amount of knowledge • Full complement of team members (three students)	Little or no collaboration or support among team members.	A small amount of collaboration among team members but more support of one another is needed; one or two tend to dominate during both presentation and Q&A.	Some collaboration, some support and sharing among some team members. Amount of knowledge is unequal. One or two tend to dominate during either the presentation or Q&A.	Good collaboration; support and sharing among most members. Full complement of three team members. Some team members have more knowledge and dominate.	Very good collaboration, support and sharing among the team on both Q & A and presentation. Equivalent knowledge level for most of team. Full complement of three team members.	Excellent collaboration, support and sharing among all of the team members on everything. Equivalent knowledge level for all. Full complement of three team members. No one team member dominates.

Chapter 5: Rules

Official Competition Rules

General

1. National Engineers Week Future City ® Competition is for 7th and 8th grade students only, enrolled in a public, private, parochial, or home school. Students must be from the same school.

2. Schools may register for only one region per year. If they wish to transfer to a different region, they must petition and obtain the approval of both Regional Coordinators and the National Program Manager. Teams must commit to a specific region by October 31.

3. You may have as many students working on the project as you wish, but only 3 students can represent your educational institution by giving their team's presentation at the regional and national final competitions. In addition, there must be 1 teacher (any educational professional) and 1 engineer mentor (because of the nature of the competition a mentor from the engineering community is preferred , but a mentor can be anyone involved in a technical profession) for an official team of 5 members.

4. The team members that compete in the national finals must be the same team members that won the regional competition. At the time of registering your team(s), for the regional competition, you may select one student that can act as an alternate for both the regional and national competitions. The alternate can only be utilized if one of the original three presenters cannot compete due to illness or family emergency. The alternate can only compete upon the approval of the Regional Coordinator (Regional) and the National Program Manager (National).

5. At least 25 schools must be registered in a region in order for that region's winner to advance to the National Finals.

6. Home-school parents must submit a home-school affidavit to their Regional Coordinator stating that the students are covering material in the 7th & 8th grade.

7. If deadlines are missed at the Regional or National level points will be deducted from the score.

8. Only one team from each of the top scoring schools can advance to the final round of the Regional Competition.

9. All team members must sign the honor statement and submit it in accordance with the schedule set by the Regional Coordinator.

Computer Design

10. Students must use a pre-designed region available on the Future City Web site. (www.futurecity.org/resources_simcity-starter-regions.shtm)

11. Do not use SimCity Cheat Codes.

Research Essay and Narrative

12. Students must submit a reference page citing at least 3 sources of information with the essay. (NOTE: You may not use Wikipedia as a reference.)

13. The Research Essay word count is between 700 to 1000 words not counting title and bibliography, captions do count toward the word count. The City Narrative should be between 300 to 500 words not including title.

Presentation

14. Student presentations may not exceed 7 minutes. When the timer signals time, the team must stop their presentation. Teams who continue will have points deducted.

15. Laptop computers, overhead projectors, and DVD/video players, battery operated audio equipment (MP3 player, Discman, Walkman, iPods, etc.) may not be used for the presentation.

16. Visual aids, such as flip charts, foam boards, poster boards, etc., must not exceed the following limitations: one visual aid displayed at a time (e.g. a single paper of a flip chart resting on an easel) can be up to 60" (W) x 36" (H), two visual aids displayed concurrently (e.g., two posters each on a separate easel) can be up to 30" (W) x 36" (H). The size limitations do not include easel stands.

17. With the exception of the handouts and costumes, any visible item that is not part of the Future City Model will be deemed a visual aid, subject to the size limitations mentioned above.

18. Other Demonstration Aids - includes pointers, brochures (limited to one 8.5x11" sheet of paper), handouts, small mock-ups, etc. used to assist with the presentation. All items in this category must collectively fit within a 6" x 6" x12" volume (e.g., a shoe box).

Model

19. No perishable or food items may be used for building materials. Use of live animals is also prohibited. If water is used on the model it must be self-contained or drainable.

20. The model must be no larger than 25" (W) x 50" (L) x 20" (H), including all supporting braces, materials hanging below or beyond the tabletop, and all fully extended parts, such as access doors and hinged pullouts.

21. Vertically oriented models are not accepted.

22. Models may not weigh over 75 pounds. Overweight models will have points deducted. (Weighed at National.)

23. The model must contain one or more moving parts.

24. Any electrical power source must be self-contained. (e.g. a household battery and sample circuit.) Uses of electrical wall or floor outlets are not allowed.

25. The total value of the materials used in the model, as well as those used in support of the presentation (including visual aids, costumes, and other demonstration aids) may not exceed $100.

26. All materials used must be listed on the competition expense form and their value documented.

27. Failure to comply with the Future City Model size and expense constraints will result in the loss of up to 50 points, as indicated on the Scoring Deduction Sheet, located in the forms section of this handbook.

Deadlines

The Regional Coordinators will set deadlines for the receipt of the following:

1. Computer City Design (and optional Computer Design Map).

2. Computer Score Sheet

3. Research Essay and Research Essay Submission Form

4. City Narrative and the City Narrative Submission Form.

Deadlines will NOT be extended for any reason. Points will be deducted from the score of teams who submit items after the deadline.

Regional Competitions, at which the Future City models are displayed and the oral presentation given are scheduled by the Regional Coordinators in January.

Regional Coordinators will notify participating schools of the date, time, and location of their Regional Competition. Teams must bring the following items.

1. Future City Model and Model Identification Index Card

2. Competition Expense Form, receipts, and related documentation

3. One copy each of the Research Essay and Research Essay Submission Form

4. One copy each the City Narrative and the City Narrative Submission Form

Each Presenter (3 students) as well as the Teacher and Engineer Mentor must bring a completed and signed Media Wavier Form.

IMPORTANT NOTICE

To maintain the competitive integrity of the Future City Competition, at least 25 schools must register in a Region in order for that Regional winner to advance to the National Finals. If a region falls short of this benchmark the Regional Coordinator will contact schools no later than October 31.

Chapter 6: Forms

- Home School Affidavit
- Computer Evaluation
- Computer Design Inventory
- Essay Form
- City Narrative Form
- Expense Form
- Media Waiver Form
- Honor Statement

2010 National Engineers Week Future City® Competition

Home School Affidavit

I verify that (print the names of students participating in the competition)

_____

_____

_____

are currently enrolled in the 7th or 8th grade at a home school in (state) _____

Further, I verify that the home school attended by the above named students is in compliance with all home school laws in (state) _____

_____ _____

Signature of Home School Administrator Date

Action Item for Home School Administrator:

- Mail or E-mail signed form back to your Future City regional coordinator no later than October 31, 2010.
- You can locate your regional coordinator's contact information at: www.futurecity.org/contact_region_state.asp

2009–2010 National Engineers Week Future City® Competition

Computer City Design Self-Evaluation Sheet

(0–16 points)

Students must use *SimCity 4 Deluxe* software to create their future city.

The Computer City Design and completed Computer Evaluation Sheet must be submitted to your regional coordinator.

Use instructions on the reverse of this sheet to help you evaluate your future city.

Future City Name						
City Size	Small		Medium		Large	
Teacher Name						
Engineer-Mentor Name and Employer:						
Engineer-Mentor Address						
Engineer-Mentor E-mail						
Engineer-Mentor Professional Society Affiliation:						
School Name						
School Address						
School Phone Number			School Fax Number			
Teacher E-mail Address						

Verified for Accuracy (Signed by teacher or engineer-mentor) Date

Computer Evaluation of Your Future City			
Each "yes" is worth 2 points -- Maximum number is 16 points			
	Enter Values	Yes	No
1. Has your city progressed at least 150 years (year 150) into the future? Above?			
2. Does your city have a population of at least 50,000?			
3. Is your city clear of any loans?	N/A		
4. Are your residential, industrial, and commercial tax rates all Under 8%? List your max tax rate for each.	R =		
	I =		
	C =		
5. Does your city have a balanced budget? Your budget is balanced if your income is greater than your expenses.	Income		
	Expenses		
6. Are the Sims happy with your performance as Mayor of your City? (Four or more City Opinion Polls are Green).	N/A		
7. Are there no complaints from your Sims about traffic problems?	N/A		
8. Do you have at least 2 connections to neighboring cities in your region?			
Add number of check marks in the Yes column and multiply by 2	Total Point (0–16)		
Computer Evaluation Sheet Total Points (0–16)			
Insert numbers in "Enter Values" column.			

2009–2010 National Engineers Week Future City® Competition

Essay Form

This form must be attached to your Research Essay. If your Regional Coordinator requires more than one copy of your Research Essay, this form must be attached to each copy.

Future City Name		
Teacher Name		
School Name		
School Address		
School Phone Number	School Fax Number	
Teacher E-mail Address		
Student Name		Grade Level
Student Name		Grade Level
Student Name		Grade Level

Check the boxes below to verify that the attached was written by the students.

- ☐ Essay – be sure to place the word count at the end.
  (Length should be between 700 to 1000 words)
- ☐ List of References

Verified for Accuracy

(Signed by teacher or engineer-mentor) Date

2009–2010 National Engineers Week Future City® Competition

City Narrative Form

This form must be attached to your City Narrative. If your Regional Coordinator requires more than one copy of your City Narrative, this form must be attached to each copy.

Future City Name		
Teacher Name		
School Name		
School Address		
School Phone Number	School Fax Number	
Teacher E-mail Address		
Student Name		Grade Level
Student Name		Grade Level
Student Name		Grade Level

Check the box below to verify that the attached was written by the students.

☐ Narrative – be sure to place the word count at the end.
(Length should be between 300 and 500 words.)

Verified for Accuracy

(Signed by teacher or engineer-mentor) Date

2009–2010 National Engineers Week Future City® Competition

Competition Expense Form

Future City Name	
School Name	
Teacher Phone Number	E-mail Address

Check the boxes below to verify the completion of each item.

- ☐ Reviewed official competition rules and instructions.
- ☐ List all materials used in the building of your city model AND materials used to support your oral presentation. Easels do not need to be included as a competition expense. If necessary, add an additional sheet of paper.
- ☐ Insert check mark in box for origin of physical model and presentation materials: purchased, donated, or recycled.
- ☐ No laptop computers, overhead projectors or videos can be used for the presentation.
- ☐ Staple receipt copies to the back of this form. Make photocopy of form and receipts for team records.
- ☐ Bring this completed form to the regional competition.

Description of Physical Model Materials	Purchased	Donated	Recycled	Expense/Value
Sub Total A – Physical Model Expenses:				

Description of Presentation Materials	Purchased	Donated	Recycled	Expense/Value
Sub Total B – Presentation Materials Expenses:				

Sub Total A _____ + Sub Total B _____ + Total Expenses _____

_____ _____

Verified for Accuracy (Signed by teacher or engineer-mentor) Date

2009–2010 National Engineers Week Future City® Competition

Competition Expense Form Instructions

Provide a complete list of all items used in the construction of your city model and creation of your presentation materials, including actual cost or reasonable estimates for donated items.

Students are encouraged to recycle common materials, such as plastic tubs, glass jars and metal containers. These type of recycled items may be assigned a zero cost value. Other used or donated items must be assigned a fair market or salvaged value. Fair market or salvaged value may be determined by pricing found at a yard sale, auction, classified ads, surplus store, etc.

Examples

Purchased Items:		**Expense/Value**
(1)	4 x 8 plywood sheet - $10 (but only used half)	$5.00
(1)	Electric motor	4.26
(2)	Nine volt batteries	5.00
(1)	Presentation Board (30" x 48")	5.00
(5)	Color printouts for presentation board	5.00

Donated Items:		**Expense/Value**
(1)	Assorted paint from parents' garage	$2.00
(1)	Toy train	.50
(1)	Scrap wood for framing from friend's garage	2.00
(1)	Set of business cards – used photo printing paper	3.00
(1)	Pair of goggles	2.00

Donated Items:		**Expense/Value**
(3)	Two liter soda/pop bottles	-0-
(1)	Egg Carton	-0-
(2)	Scratched CD-ROMS	-0-
(1)	Cake dome lid (minus the icing)	-0-
(5)	Empty cereal boxes	-0-

2010 National Engineers Week Future City® Competition

National Finals Media Waiver Form

By signing below, we give our consent to National Engineers Week to use the student's name, photograph and likeness in order to promote the National Engineers Week Future City® Competition. We understand that the student may be called upon by journalists to answer questions about his/her involvement in the National Engineers Week Future City® Competition, and we will also allow the student to speak to any media via phone or television.

Date	FC Regional Site	
Student Team Member Name		
Parent Name (one only)		
City	State	Zip

Parent's Signature

Date	FC Regional Site	
Student Team Member Name		
Parent Name (one only)		
City	State	Zip

Parent's Signature

Date	FC Regional Site	
Student Team Member Name		
Parent Name (one only)		
City	State	Zip

Parent's Signature

2009–2010 National Engineers Week Future City® Competition

Model/Presentation Scoring Deduction Form

Future City Name	
School Name	
Room	Time

	Possible Deductions	Total Deductions	Comments
Combined Model and Presentation Costs <= $100 • "City Model Expense Form" must be completed and signed by teacher or mentor. • List all materials used in building model AND in supporting the presentation, including props, handouts, costumes, pointers, audio equipment, etc. 1. Purchased materials – should have receipts for major items 2. Donated or borrowed materials – fair market value (like E Bay, garage sale price) 3. Large or expensive used items – fair market value 4. Recycled items - $0.00 5. School uniform, street clothes, competition T-shirt, easels - $0.00	Expenses >$100 **OR** Missing Form -15 pts		
	Incomplete form -5 pts • Missing major expense item • Unfair market value • Missing receipts • Unsigned form		
Model ID 4 x 6 Card Should contain: 1. Future City name 2. School name 3. Information on the scale used 4. Student team members' names 5. Teacher and mentor names	Missing ID card - 5 pts **OR** Missing any info (each missing item) - 1 pt		
Model Size Maximum dimensions (includes all supporting structures, doors, drawers and any materials hanging below the table top): 25 inches (width) 50 inches (length) 20 inches (height) 75 lbs weight limit	Exceeding maximum in any direction at any time during the presentation - 15 pts		
Presentation Materials Size Maximum dimensions – two options (either, but not both): 1. Single display: 60 inches (width), 36 inches (height) 2. Two displays (each): 30 inches (width), 36 inches (height) • Dimensions do not include easels • Displays can include multiple display boards stacked on the easel, but not more than two displays in use at any one time • Additional demonstration aids (pointers, brochures, handouts, props, etc.) collectively must fit within a 12x6x6" volume (e.g. a shoe box). • The maximum weight for the model and all supporting materials is 75 lbs.	Exceeding maximum in any direction - 15 pts		
Presentation Time Formal (rehearsed) presentation is 5-7 minutes followed by Q&A, total not exceeding 15 minutes.	Exceeding maximum time (7 min) - 5 pts		
Unsportsmanlike conduct Rude behavior or disruption of judging by any team member or guests	-20 pts		
Destruction of another team's materials	Disqualified		

2009–2010 National Engineers Week Future City® Competition

Honors Statement

We the undersigned do affirm that we have read and complied with the rules of the 2009-2010 National Engineers Week Future City ®Competition, and that the work we are presenting to represent our school is our original work and that the work was done by the students and utilized the Teacher and the Engineer Mentor only as advisors to the project.

Student Print Name 1	Sign	Date
Student Print Name 2	Sign	Date
Student Print Name 3	Sign	Date

Teacher

Mentor

_____ ,20 _____

Appendix A: Certificate of Participation

CERTIFICATE OF PARTICIPATION

presented to

_____

in recognition of participation
in the 2009-2010
National Engineers Week
Future City® Competition

Future City Competition

Presented to

_____

in recognition of participation in the 2009-2010 National Engineers Week Future City® Competition

_____ _____

Appendix B: Educational Resources

American Association for the Advancement of Science, Project 2061 1200 New York Avenue, NW Washington, DC 20005 202-326-6666 www.project2061.org	**JETS** **Junior Engineering Technical Society** 1420 King Street Suite 405 Alexandria, VA 22314 703-548-5387 www.jets.org	**National Council for Geographic Education** 1710 16th Street, NW Washington, DC 20009 202-360-4237 www.ncge.org
American Society for Engineering Education 1818 N Street, NW Suite 600 Washington, DC 20036 202-331-3500 www.asee.org	**MATHCOUNTS** 1420 King Street Alexandria, VA 22314 703-299-9006 www.mathcounts.org	**National Science Foundation: Division of Elementary, Secondary and Informal Education** 4201 Wilson Boulevard Room 885 Arlington, VA 22230 703-292-8620 www.nsf.gov
Association for Supervision and Curriculum Development 1703 North Beauregard Street Alexandria, VA 22311 800-933-2723, press 2 www.ascd.org	**NASA Education Program** Office of Human Resources and Education NASA Headquarters Washington, DC 20546 www.hq.nasa.gov/office/codef/education	**National Science Teachers Association** 1840 Wilson Boulevard Arlington, VA 703-243-7100 www.nast.org
Association of Science – Technology Centers 1025 Vermont Avenue, NW Suite 500 Washington, DC 20005 202-783-7200 www.astc.org	**Nanoscale Informal Science Education Network** Museum of Science Science Park Boston, MA 02114 617-589-4411 www.nisenet.org	**National Trust for Historic Preservation** 1785 Massachusetts Avenue, NW Washington, DC 20036 202-588-6000 www.nthp.org
Center for Civic Education 5145 Douglas Fir Road Calabasas, CA 91302 818-519-9321 www.civiced.org	**National Association of Secondary School Principals** 1904 Association Drive Reston, VA 20191 703-860-0200 www.nassp.org	**U.S. Department of Education** 400 Maryland Avenue, SW Washington, DC 20202 800-872-5327 www.ed.gov/index.jsp
CUBE – Center for Understanding the Built Environment 5328 W. 67th Street Prairie Village, KS 66208 913-262-8222 www.cubekc.org	**National Building Museum** 401 F Street, NW Washington, DC 20001 202-272-2448 www.nbm.org	**Urban Land Institute** 1025 Thomas Jefferson Street, NW Suite 500 West Washington, DC 20007 202-624-7000 www.uli.org

Appendix C: National Education Standards

Benchmarks for Science Literacy

The full text of the Project 2061 Benchmarks, maintained by the American Association for the Advancement of Science. www.project2061.org/publications/bsl/online/index.php

National Educational Technology Standards

The International Society for Technology in Education (ISTE), in partnership with organizations and educators across the U.S. has developed standards defining what technological knowledge and skills students should learn. These national standards are coupled with student performance indicators by grade level. www.iste.org

Principles and Standards for School Mathematics*

The electronic version of the National Council of Teaching of Mathematics latest standards was released concurrently with the print version in April 2000. http://standards.nctm.org/document/chapter6/index.htm

National Science Education Standards*

The National Academy Press has the full text of the science standards online. These standards were created by the National Research Council, National Academy of Sciences. www.nap.edu/readingroom/books/nses/html/

National Standards for Technological Literacy

The International Technology Education Association (ITEA) has published Standards for Technological Literacy: Content for the Study of Technology. ITEA is the largest professional educational association focused on experiential technology education in the academic arena for grades K-12. www.iteaconnect.org

***** Copies of these standards as applied to the Future City Competition may be downloaded at www.futurecity.org.

Benchmarks for Science Literacy Project 2061

		Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
The Nature of Science						
1A	The Scientific World View	X	X	X		X
1B	Scientific Inquiry	X	X	X	X	
1C	The Scientific Enterprise	X	X	X	X	X
The Nature of Mathematics						
2A	Patterns and Relationships	X	X	X	X	X
2B	Mathematics, Science, and Technology	X	X	X	X	X
2C	Mathematical Inquiry	X	X	X	X	X
The Nature of Technology						
3A	Technology and Science	X	X	X	X	X
3B	Design and Systems	X	X	X	X	
3C	Issues in Technology	X	X	X	X	X
The Physical Setting						
4A	The Universe		X	X		X
4B	The Earth	X	X	X		X
4C	Processes that Shape the Earth	X	X	X		X
4D	Structure of Matter		X	X	X	X
4E	Motion		X	X		X
4F	Forces of Nature	X	X	X		X
The Living Environment						
5A	Diversity of Life	X	X	X		X
5B	Heredity		X			X
5C	Cells		X			X
5D	Interdependence of Life	X	X	X		X
5E	Flow of Mater and Energy	X	X	X		X
5F	Evolution of Life	X	X	X		X
The Human Organism						
6A	Human Identity	X	X	X		X
6B	Human Development	X	X	X		X
6C	Basic Functions	X	X	X		X
6D	Learning	X	X	X		X
6E	Physical Health	X	X	X		X
6F	Mental Health	X	X	X		X

Benchmarks for Science Literacy Project 2061 (continued)

		Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
Human Society						
7A	Cultural Effects on Behavior	X	X	X		X
7B	Group Behavior	X	X	X		X
7C	Social Change	X	X	X		X
7D	Social Trade-Offs	X	X	X		X
7E	Political and Economic System	X	X	X		X
7F	Social Conflict	X	X	X		X
7G	Global Interdependence	X	X	X		X
The Designed World						
8A	Agriculture	X	X	X		X
8B	Materials and Manufacturing	X	X	X	X	X
8C	Energy Sources and Use	X	X	X		X
8D	Communication	X	X	X		X
8E	Information Processing	X	X	X	X	X
8F	Health Technology	X	X	X		X
The Mathematical World						
9A	Numbers	X	X	X	X	X
9B	Symbolic Relationships	X		X	X	X
9C	Shapes	X	X	X	X	X
9D	Uncertainty	X	X	X	X	X
9E	Reasoning	X	X	X	X	X
Historic Perspective						
10A	Displacing the Earth from the Center of the Universe		X	X		X
10B	Uniting the Heavens and the Earth	X				
10C	Relating Matter & Energy and Time & Space	X	X	X		
10D	Extending Time	X				
10E	Moving the Continents		X	X		
10F	Understanding Fire		X	X		X
10G	Splitting the Atom	X		X		X
10H	Explaining the Diversity of Life	X	X	X		X
10I	Discovering Germs		X	X		X
10J	Harnessing Power	X	X	X		X

Benchmarks for Science Literacy Project 2061 (continued)

		Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
Common Themes						
11A	Systems	X	X	X		X
11B	Models	X	X	X		X
11C	Constancy and Change	X	X	X		X
11D	Scale	X	X	X	X	X
Habits of Mond						
12A	Values and Attitudes	X	X	X		X
12B	Computation and Estimation	X	X	X	X	X
12C	Manipulation and Observation	X	X	X	X	X
12D	Communications Skills	X	X	X		X
12E	Critical-Response Skills	X	X	X	X	X

National Education Technology Standards Objectives Satisfied by Each Deliverable in the Program

		Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
1	**Basic operations and concept**					
	Students demonstrate a sound understanding of the nature and operation of technology systems.	X	X	X		X
	Students are proficient in the use of technology.	X	X	X	X	X
2	**Social, ethical, and human issues**					
	Students understand the ethical, cultural, and societal issues related to technology.	X	X	X		X
	Students practice responsible use of technology systems, information, and software.	X	X	X		X
	Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.	X	X	X		X
3	**Technology productivity tools**					
	Students use technology tools to enhance learning, increase productivity, and promote creativity.	X	X	X	X	X
	Students use productivity tools to collaborate in constructing technology enhanced modes, prepare publications, and produce other creative works.	X	X	X	X	X
4	**Technology communication tools**					
	Students use telecommunication to collaborate, publish, and interact with peers, experts, and other audiences.	X	X	X		X
	Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.	X	X	X		X
5	**Technology research tools**					
	Students use technology tools to locate, evaluate, and collect information from a variety of sources.		X	X	X	X
	Students use technology tools to process data and report results.	X	X	X		X
	Students evaluate and select new information resources and technological innovation based on the appropriateness of specific tasks.	X	X	X	X	X
6	**Technology problem-solving and decision-making tools**					
	Students use technology resources for solving problems and making informed decisions.	X	X	X	X	X
	Students employ technology in the development of strategies for solving problems in the real world.	X	X	X	X	X

Performance Indicators For Technology-Literate Students

	Prior to completion of grade 8, students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
1	Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)	X	X		X	
2	Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)	X	X	X	X	X
3	Exhibit legal and ethical behaviors when using information and technology and discuss consequences of misuse. (2)	X	X	X		X
4	Use content-specific tools, software, and simulation (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3,5)	X	X	X		X
5	Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum (3,6)	X		X		X
6	Design, develop, publish, and present products (e.g. Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom (4,5,6)	X	X	X		X
7	Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom (4,5)	X	X	X	X	X
8	Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems (5,6)	X	X	X	X	X
9	Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and practical applications of learning and problem solving. (1,6)	X	X	X		X
10	Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information, sources concerning real world problems (2,5,6)	X	X	X		X

Performance Indicators For Technology-Literate Students

(continued)

	Students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
1	**…develop an understanding of the characteristics and scope of technology**					
	New products and systems can be developed to solve problems or to help do things that could not be dome without the help of technology	X		X	X	
	The development of technology is a human activity and is the result of individual or collective needs and the ability to be creative.	X		X	X	
	Technology is closely linked to creativity, which has resulted in innovation.			X	X	X
	Corporations can often create demand for a product by bringing it into the market and advertising.			X		X
2	**…develop an understanding of the core concepts of technology.**					
	Technological systems include input, processes, output, and, at times, feedback.	X		X	X	
	Systems thinking involves considering how every part relates to others.	X	X	X	X	X
	An open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback.	X	X	X		
	Technological systems can be connected to one another.	X	X	X	X	X
	Malfunctions of any part of a system may affect the function and quality of the system.	X	X	X		X
	Requirements are the parameters placed on the development of a product or system.	X	X	X		
	Trade-off is a decision process recognizing the need for careful compromises among competing factors.	X	X	X		X
	Different technologies involve different sets of processes.	X	X	X		
	Maintenance is the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.	X	X	X	X	
	Controls are mechanisms or particular steps that people perform using information about the system that causes systems to change.	X				

Performance Indicators For Technology-Literate Students
(continued)

	Students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
3	**…develop an understanding of the relationships among technologies and the connections between technology and other fields of study.**					
	Technological systems often interact with one another.	X	X	X		X
	A product, system, or environment developed for one setting may be applied to another setting.	X	X	X	X	X
	Knowledge gained from other fields of study has a direct effect on the development of technological products and systems.	X	X	X	X	X
4	**…develop an understanding of the cultural, social, economic, and political effects of technology.**					
	The use of technology affect humans in various ways, including their safety comfort, choice and attitudes about technology's development and use.	X	X	X	X	X
	Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences.	X	X	X	X	X
	The development and use of technology pose ethical issues.	X	X	X		X
	Economic, political, and cultural issues are influenced by the development and use of technology.	X	X	X		X
5	**…develop an understanding of the effects of technology on the environment.**					
	The management of waste produced by technological systems in an important societal issue.	X	X	X	X	X
	Technologies can be used to repair damage caused by natural disasters and to breakdown waste from the use of various products and systems.	X	X	X		X
	Decisions to develop and use technologies often put environmental and economic concerns in direct competition with one another.	X	X	X	X	X
6	**…develop an understanding of the role of society in the development and use of technology.**					
	Throughout history, new technologies have resulted from the demands, values, and interests of individuals, businesses, industries, and societies.	X	X	X		X
	The use of inventions and innovations has led to changes in society and the creation of new needs and wants	X	X	X		X
	Social and cultural priorities and values are reflected in technological devices.	X	X	X		X
	Meeting societal expectations is the driving force behind the acceptance and use of products and systems.	X	X	X		X

Performance Indicators For Technology-Literate Students
(continued)

	Students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
7	**…develop an understanding of the influence of technology on history.**					
	Many inventions and innovations have evolved by using slow and methodical processes of tests and refinements	X	X	X		X
	The specialization of function has been at the heart of any technological improvements	X	X	X	X	X
	The design and construction of structures for service or convenience have evolved from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.	X	X	X	X	X
	In the past, an invention or innovation was usually developed with the knowledge of science.		X			
8	**…develop an understanding of the attributes of design.**					
	Design is a creative planning process that leads to useful products and systems.	X		X	X	X
	There is no perfect design.	X		X	X	X
	Requirements for a design are made up of criteria and constraints.	X		X	X	X
9	**…develop an understanding of engineering design.**					
	Design involves a set of steps, which can be performed in different sequences and repeated as needed.	X		X	X	X
	Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.	X		X	X	X
	Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.	X		X	X	X
10	**…develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving**					
	Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system.	X		X	X	
	Invention is a process of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it.	X		X	X	
	Some technological problems are best solved through experimentation.	X		X	X	

Performance Indicators For Technology-Literate Students
(continued)

	Students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
11	**…develop abilities to apply the design processes.**					
	Apply a design process to problems in and beyond the laboratory-classroom.	X		X	X	X
	Specify criteria and constraints for the design.	X		X	X	X
	Make two-dimensional and three-dimensional representations of the designed solution.	X	X	X		
	Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.	X		X	X	
	Make a product or system and document the solution.	X	X	X	X	
12	**…develop the abilities to use and maintain technological products and systems.**					
	Use information provided in manuals, protocols, or by experienced people to see and understand how things work.	X	X	X	X	
	Use tools, materials, and machines safely to diagnose, adjust, and repair systems.	X	X	X	X	
	Use computers and calculators in various applications.	X	X	X	X	
	Operate and maintain systems in order to achieve a given purpose.	X		X	X	
13	**…develop the abilities to assess the impact of products and systems. Design and use instruments to gather data.**					
	Design and use instruments to gather data	X				
	Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.	X				
	Identify trends and monitor potential consequences of technological development.	X				
	Interpret and evaluate the accuracy of the information obtained and determine if it is useful.	X				
14	**…develop an understanding of and be able to select and use medical technologies.**					
	Advances and innovations in medical technologies are used to improve health care.		X	X		X
	Sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.		X	X		X
	The vaccines developed for immunization use require specialized technologies to support environments in which a sufficient amount of vaccines is produced.		X	X		X
	Genetic engineering involve modifying the structure of DNA to produce novel genetic make-ups.		X	X		X

Performance Indicators For Technology-Literate Students
(continued)

	Students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
15	**…develop an understanding of and be able to select and use agricultural and related biotechnologies.**					
	Technological advances in agriculture directly affect the time and number of people required to produce food for a large population.	X	X	X		X
	A wide range of specialized equipment and practices is used to improve the production of food, fiber, fuel, and other useful products and in the care of animals.		X	X		X
	Biotechnology applies the principles of biology to create commercial products or processes.	X	X		X	
	Artificial ecosystems are human-made complexes that replicate some aspects of the natural environment.					
	The development of refrigeration, freezing, dehydration, preservation, and irradiation provide long-term storage of food and reduce the health risks caused by tainted food.	X	X		X	
16	**…develop an understanding of and be able to select and use energy and power technologies.**					
	Energy is the capacity to work. Energy can be used to do work, using many process.		X	X		
	Power is the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.		X	X		
	Power systems are used to drive and provide propulsion to other technological products and systems.		X	X		
	Much of the energy used in our environment is not used efficiently.	X	X	X		X
17	**…develop an understanding of and be able to select and use information and communication technologies.**					
	Information and communication systems allow information to be transferred from human to human, human to machine, and machine to human.	X	X	X		X
	Communication systems are made up of a source, encoder, transmitter, receiver, decoder, and destination.	X	X	X		X
	The design of a message is influenced by such factors as the intended audience, medium, purpose, and nature of the message.	X	X	X		X
	The use of symbols, measurements, and drawings promotes clear communication by providing a common language to express ideas.	X	X	X		X

Performance Indicators For Technology-Literate Students
(continued)

	Students will…	Computer Design	Essay*	Physical Model	Model Shipping	Oral Presentaion
18	**…develop an understanding of and be able to select and use transportation technologies.**					
	Transporting people and goods involves a combination of individuals and vehicles.	X	X	X	X	X
	Transportation vehicles are made up of subsystems, such as structural, propulsion, suspension, guidance, control, and support, that must function together for a system to work effectively.	X	X	X	X	X
	Governmental regulations often influence the design and operation of transportation systems.	X	X	X	X	X
	Processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions are necessary for the entire transportation system to operate efficiently.	X	X	X	X	X
19	**…develop an understanding of and be able to select and use manufacturing technologies.**					
	Manufacturing systems use mechanical processes that change the form of materials through the processes of separating, forming, combining, and conditioning them.	X	X	X		X
	Manufactured goods may be classified as durable and nondurable.	X	X	X		X
	The manufacturing process includes the designing, development, making, and servicing of products and systems.	X	X	X	X	X
	Chemical technologies are used to modify or alter chemical substances.	X	X	X		X
	Materials must first be located before they can be extracted from the earth through such processes as harvesting, drilling, and mining.	X	X	X		X
	Marketing a product involves informing the public about it as well as assisting in selling and distributing it.		X	X	X	X
20	**…develop an understanding of and be able to select and use construction technologies.**					
	The selection of designs for structures is based on factors such as building laws and codes, style, convenience, cost, climate, and function.	X		X	X	X
	Structures rest on a foundation.	X		X		X
	Some structures are temporary, while others are permanent.	X		X		X
	Structures rest on a foundation. Some structures are temporary, while others are permanent. Buildings generally contain a variety of subsystems.	X		X		X

APPENDIX D: *SIMCITY 4 DELUXE*™

Familarizing the Students with the *SimCity 4 Deluxe* Software

Spend several sessions letting the students familiarize themselves with the *SimCity4 Deluxe* software. Time is sped up in a simulation; decisions must be made rapidly during the game. It is important for students to learn what each button in the toolbar does. Encourage team members to explore the toolbar and share their discoveries with the full team.

About the SimCity 4 Deluxe Screens and Buttons

The buttons in the toolbar and the windows key in the *SimCity 4 Deluxe* simulation will give your team an opportunity to experience the same kinds of decisions engineers and city planners face in their daily work.

Starting a New City

- Students can choose between three different size regions to build their city in Small, Medium, or Large
- Students completed cities must exist 150 years or more in the future.

This selection will affect the technology that is available as they build the City.

Using the Terrain Toolbar

Your team has considerable latitude to create a terrain that will support the City. The terrain toolbar in God Mode allows students to create the terrain on which their city will be built.

- Students can make rivers and coastlines; raise and lower the terrain; create trees, forests, and streams; raise or lower the sea level; and stretch the terrain.

Have your students practice using the tools in the terrain toolbar. Notice what each one does, and use all the features so the students can become comfortable creating the natural environment in which their City will be built. When they have finished building the terrain, they can press the "accept this terrain" button to enter the new City and then use the vertical and horizontal tool bars.

Using the Mayor Mode Toolbar

The Mayor Mode Toolbar helps the team make the kinds of decisions engineers and city planners make. Where will they put houses, commercial zones, and industries? What kinds of highways, streets, and roads will they build? Where will they build them? How will they power the City?

For *SimCity 4 Deluxe,* go to "Mayor Mode", Use the icons on the left vertical navigation bar to place and alter City objects.

Icon Overview:

- The **landscape icon** has a submenu to create trees, water and level surfaces.
- The **zone icon** has a submenu to create residential, commercial, and industrial zones.
- The **transportation icon** has a submenu to create roads, highways, subways, rail, and more.
- The **utilities icon** has a submenu to create water, power, and recycling facilities.
- The **civic icon** has a submenu to create police, fire, schools, hospitals, recreation areas, landmarks, special buildings, and more.
- The **emergency icon** allows the dispatch of fire, and police, the location of a disaster, and the start of a disaster.
- The **advisor panel icon and city opinion polls icon** allows a view of petitioner issues and advisor specifics.
- The **budget icon and graphs icon** have submenus to view the budget, ordinances, neighbor deals, graphic and citywide data.
- The **options icon** has a submenu for

preferences, saving the City, selecting a new City, or exiting.

- The **data views icon** (on the bottom horizontal bar) creates views of your City based on specific criteria.

Getting Information About Your City

For *SimCity 4 Deluxe*, choose the data views icon or graphs icon to view specific information about your city. Choose the advisor panel to learn about pertinent issues affecting your city and to read the bottom scrolling screen for headlines and articles. Or choose the my Sims mode icon to view Sims opinions on issues affecting their lives and city.

What Did You Notice as You Ran the *SimCity 4 Deluxe* Simulation?

Many students will have an intuitive "feel" for the *SimCity 4 Deluxe* program and what it can do. Use this exercise to stimulate awareness about the complex relationships and dynamics of citizen needs, growth, taxation, revenues, and sustainability.

Allow your students to approach *SimCity 4 Deluxe* experientially. Give them time to play the game and become acquainted with the complex dynamics and interrelationships of demographics, economics, city planning, and engineering. After they have played several games, use this work sheet to inspire students to draw some observations from their experience.

1. What was the terrain like before you built your City? What changes did you make to it? How did you use the existing terrain to build your City?
2. Who lived in your City?
3. What kinds of industrial areas did you build? Where did you build them?
4. What kinds of commercial areas did your City have? Where did you build them?
5. Where did you build the residential neighborhoods?
6. How did the people get to and from work? In and out of town?
7. What kinds of recreational facilities did you provide?
8. Where did you put your schools?
9. Where did you build your hospitals?
10. How did you power your City?
11. How was your City able to pay for what it built?
12. What made people want to live in your City?
13. What things did you build that made money for your City?
14. What things did you build that spent your City's money?
15. What did you do about pollution in your City?
16. Did you accept neighbor deals? Why?
17. What did you do with your City's garbage?
18. Did you use connectivity with your neighbor? Why or why not?
19. Did you change tax rates? Why or why not?
20. Did you re-zone during the building of your City? Why or why not?

Using SimCity 4 Deluxe to Stimulate Awareness About the Relationships and Dynamics of Citizen Needs, Growth, Taxation, Revenues, and Sustainability

The *SimCity 4 Deluxe* simulation allows students to watch, experience, and draw conclusions about the complex relationships and dynamics of citizens' needs, growth, taxation, revenues, and sustainability. You can use the SimCity4 Deluxe simulation as a basis for discussing the assumptions students have about the choices they make while running the simulation. Encourage students to use the data from *SimCity 4 Deluxe* about crime, pollution, unemployment, and taxes to help them discover how the decisions they made in the simulation affected whether people wanted to live and work in their cities. Here are some hints for helping students to think and draw some conclusions about their experience. Help your students discuss how the decisions they made about what to build, when to build it, and where to build affected whether people wanted to move into and remain in their SimCity. Before they build their Future City, have the students run several *SimCity 4 Deluxe* simulations. Here are some activities and questions designed to prepare them to move from concrete experience to abstract conceptualization and active experimentation:

- As the City begins to grow, have students use the graph window to provide projections about City size, traffic, power usage, unemployment, number of residents, commerce, industry, pollution, crime, health, and education.
- Ask them to form hypotheses about what they can do to educate more of the citizens, reduce pollution, improve crime statistics, etc.
- Have them test their hypotheses as they continue to run the simulation.
- Have them use the data views tool to see the mix of industries in the City and compare that mix with national demand. Have them make hypotheses about a tax rate that will encourage sustainable growth.
- Have them test their hypotheses as they continue to run the simulation.
- Have them notice what things cost to build.
- Help them discover what produces revenue.

Discussion Questions:

1. What features of the City in the simulation seemed to attract more people to the City? How can you test your hypotheses?

2. What features seemed to discourage people from coming to the City? How can you test your hypotheses?

3. What features seemed to attract industry to your City? How can you test your hypotheses?

4. What things seemed to increase pollution in your City? How can you test your hypotheses?

5. What things seemed to promote rapid growth? How can you test your hypotheses?

6. What things seemed to produce slower growth in the simulation? How can you test your hypotheses?

FUTURE CITY TUTORIAL CD-ROM

For more information on "Designing the City" view the Future City tutorial CD-ROM and go to the Future City Web site at www.futurecity.org. The Tutorial CD-ROM is posted on the Future City Web site and is available from your regional coordinator.

Instructions on Downloading and Using Starter Regions

1. Prior to using the starter region, please select the size of the city you wish to develop. The rules suggest doing a Medium Sized city.

2. Next, copy the appropriate zip file to your My Documents folder (or in Windows Vista, Documents folder) on the computer you plan to use *SimCity 4 Deluxe* on. Please do this from the computer you plan to play SimCity 4 with.

    a. If you select to do a Small Sized City, then copy the "Small City.zip" file.

    b. If you select to do a Medium Sized City, then copy the "Medium City.zip" file.

    c. If you select to do Large Sized City, then copy the "large City.zip" file.

3. Uncompress the zip file you copied over. In Windows XP or Windows Vista, you should be able to double-click the file.

    a. If you have Windows Compression turned on, it will open it up like a folder. On the left hand pane, select "Extract Files" and it should extract it to My Documents folder.

    b. If you have a zip utility (such as WinZip or PKZip) installed, please follow that programs extraction instructions.

4. Locate the folder you just extracted, it will be named according to the size of the city you are developing.

    a. Small Sized City – Folder should be called "Small City".

    b. Medium Sized City – Folder should be called "Medium City".

    c. Large Sized City – Folder should be called "Large City".

5. Copy the folder to the My Documents\SimCity 4\Regions directory for the user you plan to play SimCity 4 with. You should end up with the following directory:

    a. Small Sized City – My Documents\SimCity 4\Regions\Small City

    b. Medium Sized City – My Documents\SimCity 4\Regions\Medium City

    c. Large Sized City – My Documents\SimCity4\Regions\Large City

6. Now start SimCity 4. When you reach the region view, select Load Region.

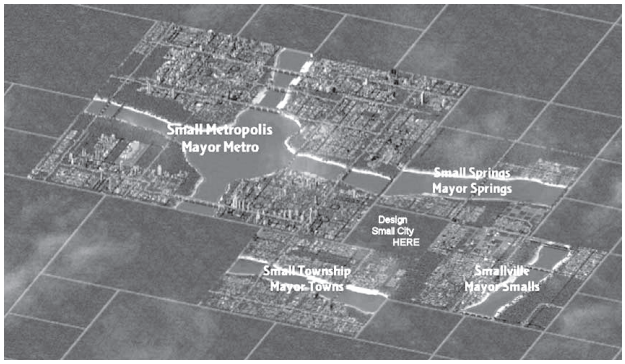
    Select the appropriate region for the city size you are developing:

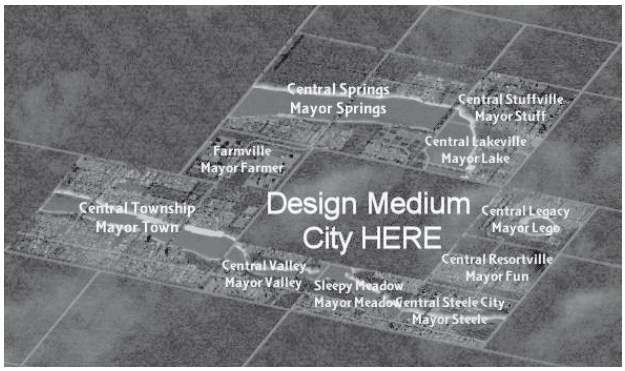
    a. Small – Choose "Small City" Region

    b. Medium – Choose "Medium City" Region

    c. Large – Choose "Large City" Region

7. Your region should look similar to the following:





8. Please determine what you want to name your competition city. We need the name of the city to match your submitted paperwork to make scoring easier.

9. Start your new city on the square in the center of the existing cities. They are labeled "Design (City Size) City Here" on the pictures above.

10. You can delete and create a new city if you are unhappy with your existing city. You can via the Windows or Mac folder structure, navigate to the appropriate region folder and copy it to another directory on your computer if you want to backup the city.

Documentation Details

Your Regional Coordinator may ask you to submit the Computer Design on CD-ROM or as an e-mail file attachment. In either case, keep a backup copy for your team.

If Sending a CD-ROM

Save your Future City design to your hard drive and copy it to a CD-ROM. Saving your design directly to a CD-ROM may result in a corrupted file that cannot be read by your computer.

Your Regional Coordinator may ask you to submit 2 copies of the CD-ROM. The Future City to be judged should be the only item on the CD-ROM. Be sure to label the CD_ROM with your school name and Future City name. The Regional Coordinator is not responsible for the CD_ROM damaged or lost in the mail.

If Sending by e-mail

Before e-mailing the Computer Design file, be sure that it is not corrupted. Attach the file to a cover e-mail that contains your school name and Future City name.