

## **NTX Future City Junior, 2020**

### **DELIVERABLE #1**

#### **RESEARCH ESSAY: CLEAN WATER: TAP INTO TOMORROW**

Students write a 1,000-word essay that introduces their city and provides a solution to this year's challenge—Clean Water: Tap into Tomorrow. Choose a threat to your city's water supply and design a resilient system to maintain a reliable supply of clean drinking water.

#### **Suggestions and Resources for Completing the Essay Assignments**

See the Research Essay Outline (attached). Go over the outline with the students and have them list what they want to say in each section. Then suggest that they divide the sections so that everyone writes at least one part of the draft. When it's time to write the final version, they'll have plenty of material to work with. Also remind students that they can include up to four graphics in their essay.

Research Essay Resources (see attached forms or download from website:

<http://futurecity.org/resources>)

- Study the Clean Water: Tap into Tomorrow Real World Case Studies to get inspiring and instructive real-life examples of problems that were solved via innovative solutions.
- Also study the Research Questions and background information on Water Supply Systems in the Tap into Tomorrow Overview and Research Questions handout.
- Use the Research Cards as a way for the team to document and organize the information and relevant sources that they find.
- Review the Research Strategies for more ideas and information on citing sources in the bibliography.
- Analyze Essays from past NTX Junior winners to give the students a strong sense of what they are aiming for in their own essays. Go to Junior Team Center ([http://www.dfwfuturecity.org/team\\_junior.html](http://www.dfwfuturecity.org/team_junior.html)).
- Review the Research Essay Rubric (attached) to make sure you understand what the judges will be looking for in your paper.

#### **Research Essay Assignment**

Students research and write a 1,000-word essay that describes the unique attributes of their city and provides a solution to this year's challenge: Clean Water: Tap into Tomorrow.

First, students need to decide what their future city will be like. They can imagine what it would be like to walk down the main street of a city at least 100 years in the future. What would they hear, see, smell, and feel? How would the people who live in this future city describe it? What would make it futuristic and innovative? Students should think deeply about their city: what is its population, geographic location, cultural preferences, unique characteristics, and community needs?

#### **Tap into Tomorrow Overview**

We turn on the faucet and clean water flows out. Most of us don't think about how convenient it is to be able to drink, cook, wash, shower, flush, and water our yards whenever we want. We don't usually worry about whether water will flow from the tap, but plenty of engineers, city planners, developers, and other professionals think about it all the time. It takes expertise, planning, and constant work to keep a reliable water supply flowing. Unfortunately, people in many parts of the world cannot take clean water for granted. One in four people worldwide currently don't have access to clean water; that's 2 billion people. And it's estimated that by 2025, half of the world's population will be living in water-stressed areas— that is, areas where there is not enough water to meet everyone's needs.

Today's engineers, architects, and city leaders face the critical task of creating resilient cities. A resilient city withstands drought, flooding, big population changes, natural disasters, economic recessions, and other short and long-term threats. When it comes to a city's water supply system, resilience means providing adequate clean water for both residential and commercial uses under all possible circumstances. Resilience requires preventing and fixing leaks, identifying and removing contaminants, and making sure the supply of water always meets demand in the face of disruptions and longer-term changes. As a part of a resilient city, a reliable water supply ensures that clean and safe water is provided to all its residents for their well-being, to keep their communities stable and cared for, and the city economy strong and durable.

A resilient city ensures its residents are safe and healthy, their communities are stable and cared for, and the economy of the city is strong and durable. The students' challenge: Choose a threat to your city's water supply and design a resilient system to maintain a reliable supply of clean drinking water.

### **Research Essay Requirements**

- Students select a threat or stressor to the drinking water supply for their city based on its climate, geography, or issues specific to that city, such as rapidly growing or shrinking population, industrial base, or another factor.
- Although the focus of the essay is water supply system, the general theme of resiliency can be applied to other aspects of their city as well.
- The essay cannot exceed 1,000 words and should be free of grammatical and spelling errors.
- The essay can include a maximum of four graphics.
- The essay must cite at least three sources of information used during the idea development process. MLA style is preferred (see attached Research Strategies for more detail).
- Students should use a variety of sources of information, such as interviews with experts, reference books, periodicals, and websites. (Note: Wikipedia is not accepted as a source of research.)
- The essay must be submitted as a Word document via the Junior Team Center ([http://www.dfwfuturecity.org/team\\_junior.html](http://www.dfwfuturecity.org/team_junior.html)).

### **Competition Scoring**

Teams can earn up to 60 points for their Research Essay. Make sure they have thoroughly covered these categories in the rubric to maximize points:

- Introduce City & Define Problem 15 points
- Specs and Solutions 21 points
- Judge Assessment of Solution 12 points
- Writing Skills 12 points

Total 60 points

### **Scoring Deductions**

5 points – Late submissions (1-20 December) are accepted with a small point deduction.

10 points – For essays that exceed the 1,000-word limit.

## **SUGGESTED ESSAY OUTLINE**

In the Research Essay, you will share your vision of your future city and your solution to Powering the Future challenge: design a resilient power grid for your future city that can withstand and quickly recover from a natural disaster.

You can use the following outline as a guide to help you organize and draft your essay.

### **Introduction**

Briefly introduce your future city by including basic information people should know, such as your city's name, population, age, and location. Include any unique features of your city – what makes your city futuristic and innovative.

### **Define the Problem**

Describe the threat and its effect on your city's water system. Include:

- The threat or disaster you chose
- The immediate challenges that this threat creates and any potential lasting effects on your city and residents
- How the drinking water supply system is likely to be disrupted by this threat. What are the system's vulnerabilities?
- The impact to the health and safety of the people in your city, including vulnerable populations (i.e., elderly, young, and/or economically-disadvantaged)

### **Describe Your Solution**

Here's where you get to describe the innovative design of your future city's water system and how you've prepared it to withstand and recover from your selected threat. Be sure to:

- Describe your city's water supply system. Be sure to highlight which aspects are futuristic and innovative, and include water collection, storage, treatment, transport, monitoring, and demands.
- Describe the (one) innovative way you have prepared your water supply system to withstand your selected threat. Include how the solution ensures the health and safety of city residents.
- Describe some of the risks connected with using this solution and how the solution reduces these risks.
- Discuss the tradeoffs/compromises connected with your water supply system and how your design reduces or eliminates these tradeoffs.
- Explain the types of engineering involved in designing your resilient city and what kinds of engineers were most helpful.

### **Conclusion**

The impact of your resilient city. Share why people want to live in your city and what makes it a great place to live. Tie together the potential effects of a specific drinking water issue and the need for a resilient water supply system. Summarize how the design of your system will keep the people in your city safe and healthy.

## Essay Rubric (FC Jr.)

	<b>0</b> <b>No Points</b> Requirements missing	<b>1</b> <b>POOR</b> Poor-Fair quality. Fulfills less than 50% of requirements.	<b>2</b> <b>GOOD</b> Average-Above average quality. Fulfills at least 90% of requirements.	<b>3</b> <b>EXCELLENT</b> Excellent quality. Fulfills 100% of requirements with additional distinctive features.
<b>I. INTRODUCE CITY AND DEFINE THE PROBLEM (15 points)</b>				
<b>1. City overview</b> <ul style="list-style-type: none"> <li>Introduce city: location, geography, climate, development, etc.</li> </ul>	No description of city	Underdeveloped description of city.	Clear and developed description of the city.	Clear and thoroughly developed description of city.
<b>2. Features and innovations</b> <ul style="list-style-type: none"> <li>Attributes or features that make this city unique</li> </ul>	No description of unique features.	Underdeveloped description of unique features.	Clear and developed description of unique features.	Clear and thoroughly developed description of unique features.
<b>3. Describe the future city's water supply system</b> <ul style="list-style-type: none"> <li>Collection, storage, treatment, transport, monitoring and demands</li> </ul>	No discussion	Underdeveloped description of water supply system.	Clear and developed description of water supply system.	Clear and thoroughly developed description of water supply system.
<b>4. Describe the selected threat to the water supply system</b> <ul style="list-style-type: none"> <li>Realistic threat (based on location, geography)</li> </ul>	No description of threat or threat is not a realistic given location, geography.	Underdeveloped description of threat.	Clear and developed description of water supply threat.	Clear and thoroughly developed description of water supply threat..
<b>5. Describe the impact of the threat on city and its citizens</b> <ul style="list-style-type: none"> <li>Immediate impact of threat and potential long-lasting effects</li> <li>Impact on health and safety of vulnerable population groups</li> </ul>	No description of impact on city or citizens.	Underdeveloped description of effects on city and vulnerable populations	Clear and developed description of the effects on city and vulnerable populations.	Clear and thoroughly developed description of the effects on city and vulnerable populations.
<b>III. SPECS AND SOLUTION (21 points)</b>				
<b>6. Describe one innovative solution for a resilient water supply system.</b> <ul style="list-style-type: none"> <li>Allow water supply to withstand threat</li> </ul>	No solutions.	Underdeveloped description of solution.	Clearly outlines the solution to withstand and recover from threat.	Clear and thorough description of solution to withstand and recover from threat.
<b>7. Describe technology involved</b> <ul style="list-style-type: none"> <li>Innovative and futuristic</li> </ul>	No description of technology	Underdeveloped description of technology. Not particularly innovative.	Clear and developed description of the technology. Innovative.	Clear and thoroughly developed description of technology. Innovative and futuristic.
<b>8. Resiliency assessment and plans</b> <ul style="list-style-type: none"> <li>Conditions that can cause system to fail</li> <li>Ability to identify damage and repair system</li> </ul>	No description	Limited assessment of conditions and ability to identify damage and repair system.	Clear assessment of conditions and ability to identify damage and repair system.	Clear and thorough assessment of conditions and ability to identify damage and repair system.
<b>9. Risks, tradeoffs, and compromises</b> <ul style="list-style-type: none"> <li>Benefits, drawbacks, risks</li> <li>Tradeoffs &amp; compromises</li> </ul>	No discussion of benefits, risks or tradeoffs	Description of one risk and/or tradeoff.	Description of more than one benefit, risk, or tradeoffs.	Description of more than two benefits, risks, or tradeoffs.
<b>10. Describe benefits to citizens</b> <ul style="list-style-type: none"> <li>How will the resilient grid keep residents safe and happy?</li> </ul>	No description	Underdeveloped description	Clear and developed description of benefits	Clear and thoroughly developed description of benefits

## Essay Rubric (FC Jr.)

	<b>0</b> <b>No Points</b> Requirements missing	<b>1</b> <b>POOR</b> Poor-Fair quality. Fulfills less than 50% of requirements.	<b>2</b> <b>GOOD</b> Average-Above average quality. Fulfills at least 90% of requirements.	<b>3</b> <b>EXCELLENT</b> Excellent quality. Fulfills 100% of requirements with additional distinctive features.
<b>IV. SPECS AND SOLUTION (Cont'd)</b>				
<b>11. Engineering disciplines involved</b>	Engineering disciplines are not identified or not relevant to solution	Discusses one relevant Engineering discipline.	Clear description of more than one relevant engineering discipline	Clear and detailed description of more than one relevant engineering discipline.
<b>12. Role of 1-2 engineers</b>	Role of engineers are not identified	Underdeveloped discussion of role of one engineer	Clear description of role of 1-2 engineers involved in system and solution	Clear and detailed description of role of 1-2 engineers involved in system and solution
<b>IV. JUDGE ASSESSMENT OF SOLUTION (12 points)</b>				
<b>13. Effectiveness and quality of solution</b> <ul style="list-style-type: none"> <li>● Effective solution for maintaining reliable supply of clean drinking water despite threat</li> <li>● Appropriate design and application of technology</li> <li>● Ensures citizen safety and health</li> </ul>	Not effective	Solution is somewhat effective. Technology and design need improvement. Questionable ability to ensure citizen safety and health.	Solution is effective, but technology and design could be improved; good ability to ensure citizen safety and health.	Solution is a highly effective, with excellent technology application; excellent ability to ensure citizen safety and health.
<b>14. Innovative and futuristic solution</b> <ul style="list-style-type: none"> <li>● Reasonable extrapolation and application of technology</li> <li>● Degree to which solution involves engineering</li> </ul>	Not innovative or original	Somewhat original or innovative. Not futuristic. Little engineering involved.	Solution is moderately innovative, original or futuristic. Some engineering involved.	Solution is highly innovative, original and futuristic. Excessive engineers involved.
<b>15. Plausibility of solution</b> <ul style="list-style-type: none"> <li>● Based on sound scientific principles</li> </ul>	Implausible or not scientifically sound	Solution is not very plausible (science fiction)	Solution is plausible	Solution is highly plausible and scientifically sound
<b>16. Tradeoffs &amp; compromises</b> <ul style="list-style-type: none"> <li>● Accounting for risks, benefits</li> <li>● Assessing consequences and making logical decisions</li> </ul>	Does not explore tradeoffs	Some consideration of tradeoffs, but ignores major issues.	Adequate assessment of tradeoffs, but analysis and decisions could be improved.	Excellent assessment of risks, benefits, tradeoffs in the decision-making process.
<b>V. WRITING SKILLS (12 points)</b>				
<b>17. Organization</b>	Poorly organized	Fair organization	Good organization	
<b>18. Writing skills</b>	Poor writing	Fair writing	Good writing	
<b>19. Grammar &amp; spelling</b>	Many errors	Some errors	Few, if any, errors	
<b>20. Maximum number of Graphics</b> <ul style="list-style-type: none"> <li>● If used, max of 4 (does not include tables)</li> </ul>	Exceeds maximum of 4 graphics, illustrations		Does not exceed maximum of 4 graphics and/or illustrations	
<b>21. List of references</b> <ul style="list-style-type: none"> <li>● At least three acceptable references</li> <li>● Wikipedia not recognized as an acceptable reference</li> </ul>	No references	Less than three acceptable references	At least three acceptable references	
<b>22. Word count</b> <ul style="list-style-type: none"> <li>● Does not include title, references</li> <li>● Includes all captions and words in graphics, illustrations and tables.</li> </ul>	No word count at end of document or inaccurate count		Accurate word count at end of document	