

# T-Shirts for a Cause Engineering Portfolio

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**This portfolio belongs to:**

## How “eco-friendly” are you?

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Consider your behavior on a day-to-day basis and evaluate whether your actions could be considered eco-friendly. Think about your home, transportation, eating habits and hobbies, for example. Write your thoughts below.

## Environmental Issues

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Use the following charts to record information about each environmental issue and describe how they impact your community, your region and the entire planet. Think about how these environmental issues can impact social justice, poverty, human rights and human conflicts around the world.

One example is filled in for you below. Complete the additional charts on the following pages.

### Environmental Issue: Water Scarcity

Local Impact	Regional Impact	Global Impact	What other impacts does this issue have beyond the environment?
<ul style="list-style-type: none"> <li>• Maryland typically does not suffer droughts but they do occasionally happen.</li> <li>• Periodic droughts are caused by lack of rainfall or water main breaks.</li> <li>• Areas affected have included Carroll and Frederick Counties and Baltimore City.</li> <li>• These droughts have led local governments to put restrictions on water use.</li> </ul>	<ul style="list-style-type: none"> <li>• A significant drought in the late 1990s prompted the state government to form the Maryland Water Conservation Advisory Committee.</li> <li>• This committee addresses and tries to prevent future water issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Over 1 billion people across the globe do not have adequate access to clean drinking water.</li> <li>• Lack of access is most common in underdeveloped regions of Sub-Saharan African, Southeast Asia and Latin America.</li> </ul>	<ul style="list-style-type: none"> <li>• People can contract diseases and become critically ill if they do not have access to clean drinking water.</li> </ul>

## Environmental Issues

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### Environmental Issue: Water Pollution

Local Impact	Regional Impact	Global Impact	What other impacts does this issue have beyond the environment?

### Environmental Issue: Air Pollution

Local Impact	Regional Impact	Global Impact	What other impacts does this issue have beyond the environment?

## Environmental Issues

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### Environmental Issue: Landfill Contamination

Local Impact	Regional Impact	Global Impact	What other impacts does this issue have beyond the environment?

### Environmental Issue: Global Climate Change

Local Impact	Regional Impact	Global Impact	What other impacts does this issue have beyond the environment?

## Choose a Cause

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Which of the four environmental issues do you feel most strongly about: water pollution, air pollution, landfill contamination or climate change? Work with your team to choose a cause to promote on your T-shirt.

Describe your issue or cause:

- Which issue did you choose?
- Will you focus on this issue at a local, regional or global level?
- How do humans negatively impact the environment in relation to the issue you chose?
- How will your T-shirt communicate the problem or negative human impact on the environment?
- What written message will you put on your T-shirt to communicate this impact?

## Do the Research

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Describe any positive and/or negative environmental impacts for each option related to producing your eco-friendly T-shirt. Record your ideas in the chart.

### Environmental Impact Comparison Chart

Options	Environmental Impact	Other Factors to Consider
Bamboo		
Hemp		
Organic cotton		
Vegetable dyes		
Low-Impact dyes		
Domestic manufacturing (made in the U.S.)		
Overseas manufacturing		
Made with no recycled materials		
Made with some or all recycled materials		





## Your Challenge

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Are you ready to create your T-shirt? Use the engineering design process outlined below as your team works on this project.

1. **Define the Problem:** What is your challenge? Write it below.

2/3. **Brainstorm, generate ideas and research:** Work with your STEM team to brainstorm answers to the following questions:

- What kind of material should our T-shirt be made of?
- What kind of dyes, if any, do we want to use?
- What text and graphics should our T-shirt feature?

4. **Identify Criteria and Constraints:** Based on the information provided, list the success criteria and constraints for the challenge.

## Your Challenge

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5. **Explore Possibilities:** Take notes below as you explore different possibilities.

- T-shirt style:
- T-shirt material:
- Color:
- Dye:
- Text and Graphics:
- Manufacturing/Labor:
- Packaging:

6./7. **Select an Approach and Develop a Design Proposal:** Which of the possibilities that you explored seems like the best solution? Select an approach and briefly describe it below.

Now develop a design proposal that explains your choice. Include each of the components below in your proposal. You should cite evidence from your research to justify your proposed design. Write your design proposal on the next three pages.

- Introduction: Briefly introduce the issue your T-shirt will address and summarize your intended message.
- Objective: Outline your goals in creating your T-shirt and describe any constraints and limitations.
- Design Strategy: Describe how your proposed solution will achieve the objectives that you have listed. Explain why you chose the materials and methods you did, and provide detail on why your proposed solution is the best one.
- Plan of Action: Describe the steps you will take to implement your solution and create your T-shirt.
- Verification Plan: Create a plan for ensuring that your proposed solution is working to achieve your goals.
- Predicted Cost and Schedule: Estimate the cost of implementing your T-shirt design and include an estimate of how long it would take to create.
- Statement of Contribution of Each Team Member: Describe how each team member contributed to the development of your T-shirt's message, the selection of materials and methods, and the creation of the design proposal.

## Your Challenge

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### Design Proposal

Introduction:

Objective:

Design Strategy:

## Your Challenge

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### Design Proposal (continued)

Plan of Action:

Verification Plan:

## Your Challenge

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### Design Proposal (continued)

Predicted Cost and Schedule:

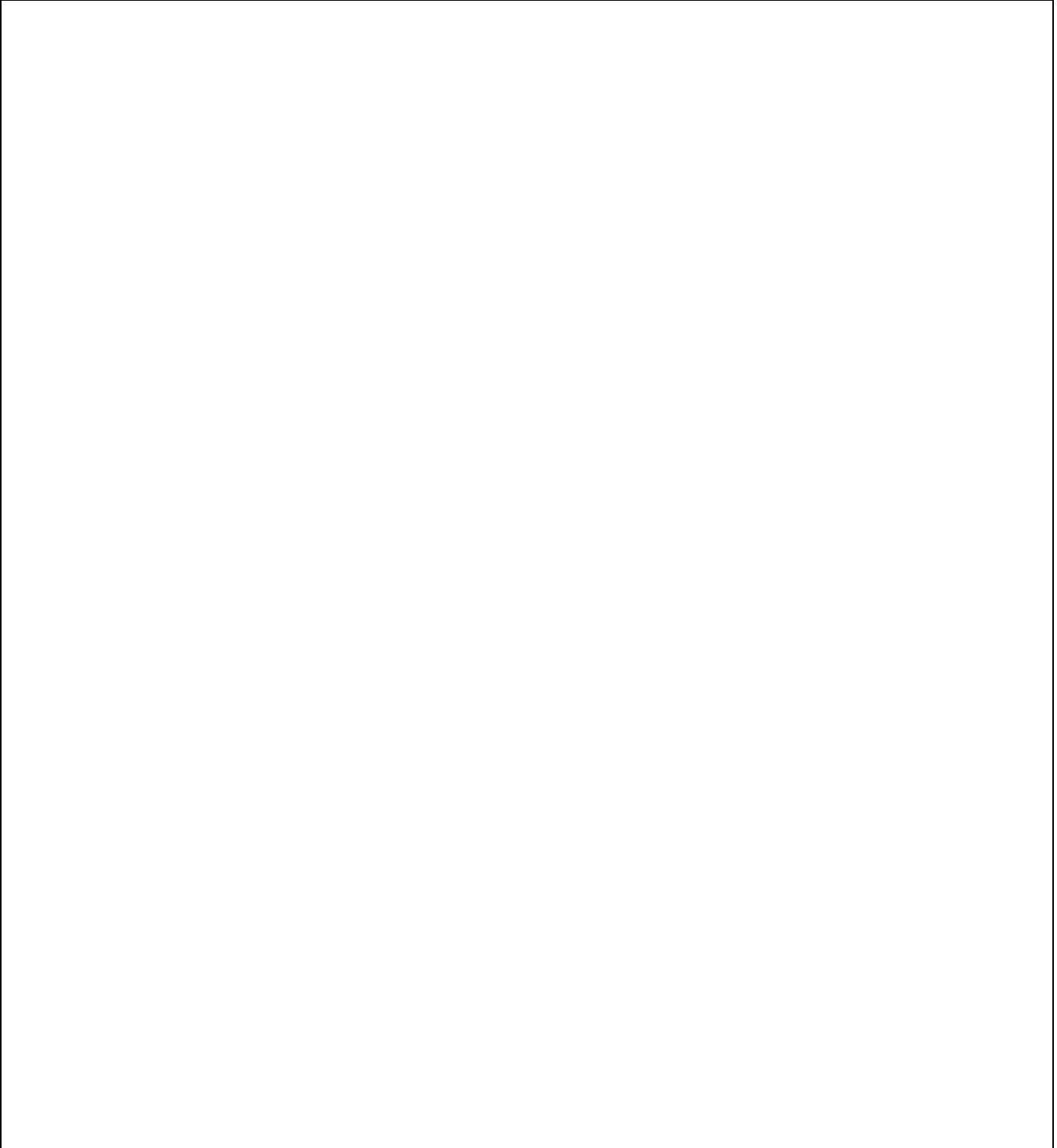
Statement of Contribution of Each Team Member:

## Your Challenge

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8. **Make a Prototype:** Sketch or print and attach a copy of your prototype.

What is your final cost?



## Your Challenge

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**9. Test and Evaluate:** Gather feedback to test the effectiveness of your design. Use tally marks to record the number of people who respond to each section of the survey.

<b>Question 1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
On a scale of 1-4, how attractive is the design? 1 – Design is confusing or unfinished 2 – Design is reasonable 3 – Design is attractive and creative 4 – Design is well-balanced, creative, attractive and well thought out				

<b>Question 2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Ask people to describe the message or cause they think your T-shirt is advocating. Next, explain your cause, and then ask them to rate the clarity of your cause on a scale of 1-4. 1 – Cause is not clear or prominent 2 – Cause is not easy to identify 3 – Cause is clear 4 – Cause is clear and engaging				

<b>Question 3</b>	<b>under \$10</b>	<b>\$10-\$20</b>	<b>\$20-\$50</b>
How much would you be willing to pay for this T-shirt?			

**Additional comments (optional):**





## Your Challenge

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### 10. Refine Your Design:

How will you refine your design in response to your evaluation and new criteria? Write your ideas below.

### 11. Communicate Results:

Scientists and engineers communicate their work at conferences and through articles in magazines and trade journals. Now it's your turn! With your STEM team, write a school newspaper article and develop a two- to three-minute presentation about your T-shirt design.

Your article and presentation must:

- Clearly state your cause.
- Explain why you chose your cause.
- Explain how your T-shirt design supports your chosen cause, both in its message and in the materials and processing choices you made.
- Describe how your choices ensured that your T-shirt was produced in an affordable and eco-friendly way.
- Cite evidence for your choices.
- Include an image of your T-shirt.
- Involve all team members.

Also, be sure to distinguish between facts derived from research, and judgment calls that your group made based on reasoning. Consider using flowcharts, diagrams, models, graphs or tables where appropriate.

You may compose your article on the following page.





