Design and Social Responsibility –
Disaster Relief Shelter

Description
In this activity, students will design a shelter for people affected by natural disaster or conflict.

Throughout the world, an estimated 60 million people have been displaced from their homes and need safe, healthy, and secure shelter. The construction of shelter is largely determined by local conditions, the available resources of local governments, and international aid.

Lesson Objectives
The student will be able to:

• Understand the consequences of natural disaster and conflict on a human scale
• Investigate regions of the world that have had or are in recovery from disaster or human conflict
• Assess the effectiveness of shelters designed for use following the occurrence of a natural disaster or human conflict
• Evaluate the effectiveness of the emergency response of government agencies and/or non-governmental organizations (NGOs) to natural disasters or human conflict
• Apply research methods and techniques to solve design problems
• Assess how design can impact society, culture, and the environment
• Sketch and create rough scale drawings
• Solve problems by creating 3D models using intermediate or advanced modelling techniques

Assumptions
The student will:

• Know how to login to a computer and use a word processor
• Know how to conduct Internet research
• Be able to empathize with the challenges of displaced persons living in temporary emergency shelters
Terminology

Natural disaster: a natural event such as a flood, earthquake, tornado, volcanic eruption, or hurricane that causes loss of life and/or extensive physical damage to natural or human-made environments.

Non-Governmental Organization (NGO): any non-profit, voluntary citizens’ group organized on a local, national, or international level.

Scale: a ratio of the length of a drawn object relative to its length in “real space.” A proportional representation of an object either reduced or enlarged.

Social responsibility: the moral position that organizations and individuals ought to adopt for the benefit of society at large.

War: a conflict carried out by force of arms, between nations or between parties within a nation. Warfare can occur on land, in the sea, or in the air.

Estimated Time

4 hours

Recommended Number of Students

20, based on the BC Technology Educators’ Best Practice Guide

Facilities

Computer lab installed with CAD software (Google SketchUp, AutoCAD, CADopia, Vectorworks, etc.)

Tools

• Computer with projector and speakers, installed with CAD software and Internet access
• Printer

Materials

• Student activity handout with instructions (see “Student Activity Sheet—Design a Temporary Emergency Shelter”)
• Minimum 8.5” × 11” paper for sketching
• Modelling materials: cardboard, commercial modelling boards, white glue, glue sticks, balsa wood, popsicle sticks, material of sufficient size to accommodate the model
• Student-sourced materials such as plastic, small replica solar panels for lighting, and other materials to enhance the model for realism
Resources

“Design and Social Responsibility by William Mangold” (The People, Place, and Space Reader)
There are a number of terms related to design and social responsibility that also address similar interests: design activism, public interest design, human-centred design, social impact design, and social design. This website includes a comprehensive reading list on the subject.
http://peopleplacespace.org/frr/design-and-social-responsibility/

How to Build a Perfect Refugee Camp (New York Times)
http://www.nytimes.com/2014/02/16/magazine/how-to-build-a-perfect-refugee-camp.html?_r=1

IKEA Flat-Pack Refugee / Emergency Shelter

United Nations Office for Project Services (UNOPS)
This website may help increase understanding of the level of complexity involved in coordinating large-scale humanitarian development projects, particularly regarding project management, procurement, and infrastructure considerations.
https://www.unops.org/english/Services/Pages/default.aspx

Stackable Emergency Shelters

UNHCR Innovative Shelter Solutions through Research and Development
http://www.unhcr.org/protection/basic/5638cc0b9/innovative-shelter-solutions-research-development.html

Teacher-led Activity

1. Begin by brainstorming with students the minimum requirements for adequate living conditions and how these requirements might differ depending on climate, geography, topography, and other environmental considerations.

2. Discuss the causes of displacement, whether natural or produced by humans. You may wish to explore any of the following topics:
   • Investigate areas of the world where people are in distress.
   • Conduct a Google image search for “refugee shelters” to compare designs.
   • Discuss cultural considerations that might impact how shelters are constructed and organized.
   • Discuss the ideal number of people per shelter; determine the shelter size accordingly.
   • Discuss the range of building materials that can be sourced from both local and foreign aid services and how these materials may differ depending on environmental conditions (i.e., mountainous regions, deserts).
• Demonstrate sketching and the use of scale in the sketch.
• Discuss modelling and ideally have a premade model you can show to the class.
• Explain possible connections between designing disaster relief facilities and the disciplines of landscape architecture and urban design.

Teacher-led Extension Activities
• Have local emergency preparedness representatives visit the class to discuss considerations around providing temporary shelter.
• Conduct a field trip to an emergency services warehouse.
• Have students produce a CAD drawing of their shelter sketch, using appropriate software. Consider using a simulation program (e.g., Autodesk Flow Design, a virtual wind tunnel simulation software application) to test the shelter design under extreme weather conditions.

Student Activity
Students will follow the “Student Activity Sheet—Design a Temporary Emergency Shelter.” With a partner or in small groups the students will determine an emergency scenario and the reaction by the population to the displacement. They will then research shelter solutions, ideate and draw several proposed shelter solutions, and build one scale model of their best solution.

Extension Activities for Students
• Draw the shelter design in a Computer Assisted Drafting (CAD) program.
• Build the actual shelter full size so it could conceivably be disassembled and shipped. This could be either donated for actual emergency preparedness (assessed for utility by emergency services) or sold as a storage shed.

Assessment
The following scale may be used for the purposes of evaluation, in conjunction with the rubric found below. The rubric may be used to conduct teacher-led assessment, peer assessment, and/or individual assessment.

- **Beginning** Attempted, but criteria not completed to satisfaction
- **Developing** Attempted successfully at the minimum level
- **Accomplished** Completed successfully at a higher than satisfactory level
- **Exemplary** Completed successfully at an exceptional level
## Temporary Emergency Shelter Assessment Rubric

<table>
<thead>
<tr>
<th>Stage</th>
<th>Beginning</th>
<th>Developing</th>
<th>Accomplished</th>
<th>Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empathize</strong></td>
<td>Student demonstrates limited empathy for end users</td>
<td>Student demonstrates empathy for end users at a satisfactory level</td>
<td>Student demonstrates an accomplished level of empathy for end users</td>
<td>Student demonstrates an exemplary ability to empathize with end users</td>
</tr>
<tr>
<td><strong>Define</strong></td>
<td>Student demonstrates limited ability to create a problem definition based on user needs and insights</td>
<td>Student demonstrates satisfactory ability to create a problem definition based on user needs and insights</td>
<td>Student demonstrates accomplished ability to create a problem definition based on user needs and insights</td>
<td>Student demonstrates exemplary ability to create a problem definition based on user needs and insights</td>
</tr>
<tr>
<td><strong>Ideate</strong></td>
<td>Student demonstrates limited ability to sketch out solutions based on problem definition</td>
<td>Student demonstrates satisfactory ability to sketch out solutions based on problem definition</td>
<td>Student demonstrates accomplished ability to sketch out solutions based on problem definition</td>
<td>Student demonstrates exemplary ability to sketch out solutions based on problem definition</td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td>Student demonstrates limited ability to generate prototype</td>
<td>Student generates prototype at a minimally satisfactory level</td>
<td>Student demonstrates accomplished ability to generate prototype</td>
<td>Student demonstrates exemplary ability to generate prototype</td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>Student demonstrates limited ability to capture feedback</td>
<td>Student demonstrates ability to capture feedback at a minimally satisfactory level</td>
<td>Student demonstrates accomplished ability to capture feedback</td>
<td>Student demonstrates exemplary ability to capture feedback</td>
</tr>
</tbody>
</table>
## Oral Presentation Scoring Guide

<table>
<thead>
<tr>
<th>Level</th>
<th>Content</th>
<th>Organization</th>
<th>Delivery</th>
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</thead>
<tbody>
<tr>
<td><strong>Exemplary</strong></td>
<td>• Selection is well chosen and effective.</td>
<td>• Substantial preparation is evident.</td>
<td>• Voice is used consciously and successfully to enhance the message.</td>
</tr>
<tr>
<td></td>
<td>Exemplary Presentation is outstanding and engages the audience.</td>
<td></td>
<td>• Engages or entertains audience.</td>
</tr>
<tr>
<td><strong>Accomplished</strong></td>
<td>• Selection is adequate.</td>
<td>• Some preparation is evident.</td>
<td>• Voice is appropriate and correct but may not enhance the message.</td>
</tr>
<tr>
<td></td>
<td>Accomplished Presentation achieves its purpose and maintains audience interest.</td>
<td></td>
<td>• Maintains audience interest.</td>
</tr>
<tr>
<td><strong>Developing</strong></td>
<td>• Selection is weak or poorly suited to the task.</td>
<td>• Little preparation is evident.</td>
<td>• Voice problems interfere with message delivery in places.</td>
</tr>
<tr>
<td></td>
<td>Developing Presentation is minimally accomplished and does not engage the audience.</td>
<td></td>
<td>• Audience may struggle to understand or follow the presentation.</td>
</tr>
<tr>
<td><strong>Beginning</strong></td>
<td>• Selection has not been made in advance.</td>
<td>• Preparation is not evident.</td>
<td>• Voice problems interfere with message delivery.</td>
</tr>
<tr>
<td></td>
<td>Beginning Presentation is inadequate and does not maintain audience interest.</td>
<td></td>
<td>• Audience is unable to understand or follow the presentation.</td>
</tr>
<tr>
<td><strong>Not At All</strong></td>
<td>• Presentation is too brief to evaluate or not attempted at all.</td>
<td></td>
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</table>
Student Activity Sheet—
Design a Temporary Emergency Shelter

There has been an event that has displaced thousands of people so that they are homeless. Shelter must be found as soon as possible, along with necessities such as water, food, and medical services. You will design a temporary shelter as well as a plan for multiple shelters and infrastructure within a confined area.

Figure 1—Darfur refugee camp in Chad
https://commons.wikimedia.org/wiki/File:Refugee_camp_Chad.jpg
Figure 2 illustrates the stages of “design thinking” as presented by the “d.school,” formally known as the Hasslo Plattner Institute of Design at Stanford University. Your activity will be framed using this model. The steps for each stage in the process are described along the way.

EMPATHIZE

Learn about the audience for whom you are designing, by observation and interview. *Who are my users? What matters to these people?*

Pick a place on the planet where a disaster has already occurred, or invent a disaster and a location and work from there. The facility will need to accommodate at least 2,000 people, so the shelter area must be large enough to build many shelters and potentially expand for even more people.

DEFINE

Create a point of view that is based on user needs and insights. *What are their needs?*

a. Document a list of the challenges related to the location you’ve chosen (e.g., geography, climate, etc.).

b. Investigate and document resources and materials locally available as the first source to address the immediate needs of the people, until more formal resources can come from the state, other unaffected communities nearby, or Non-Governmental Organizations (NGOs).

c. Is there access to the basic necessities of life (e.g., food, water, and waste disposal)?

d. Is there cell phone reception? Satellite radio access?

e. Consider the minimum required medical services based on the population of the displaced community.
3. Ideate
Brainstorm and come up with as many creative solutions as possible.

Design a shelter that can accommodate at least six people and a few belongings.

a. Sketch out shapes and sizes of shelters, considering rain and/or snow and wind resistance.

b. Consider standard dimensions for cot sizes, toilets, a table and counter surface area (with a sink), etc.

4. Prototype
Build a representation of one or more of your ideas to show to others. How can I show my idea? Remember: a prototype is just a rough draft!

a. Build a scale model of one shelter that will fit on a letter-sized piece of cardboard.

b. Build a model to a smaller scale on a larger piece of cardboard that includes an array of shelters organized into a “neighbourhood.” The model should include:
   - The shelters
   - Water stations
   - Latrines
   - A common place for social gathering
   - Electrical power source(s)
   - Government and NGO contact centre
   - A medical station
   - A food distribution station
   - Roadways to connect to other areas, city centres, villages

5. Test
Share your prototyped idea with your class to explain your “disaster” and the reasons for your solutions to the various challenges.

Present your model along with your design sketches to your class. Based on feedback from the class, what elements of your design are effective? What elements can be improved?