

Prepare for a natural disaster

Primary: (ages 7-11)

Science

Students learn how communities around the world prepare for and respond to natural disasters. Students are asked, “How can you build a structure to withstand the tornado winds?” They use the materials provided to build a structure that will hold a family of 3 people during a tornado and then test their model and compare results. Prior to the construction, students will research and design their model on paper, and show how they will use their limited budget.

Time allocation Around 2 lesson periods

Subject content Learn about natural disasters and preparing for tornados
Design a solution that reduces the impacts of a weather-related impact whilst considering the properties of materials and techniques
Plan and carry out fair tests in which variables are controlled

Creativity and critical thinking This unit has a **creativity** focus:

- Generate and explore ideas for structures to withstand a tornado
- Plan, envision, create, and evaluate a model shelter
- Consider multiple perspectives and reflect on steps taken

Other skills Collaboration

Key words tornados; storms; wind; weather; climate zones; testing; construction materials; properties; recording

Products and processes to assess

Students produce and test a model to withstand a tornado and compare the results of tests to check and improve their model’s performance. At the highest levels of achievement, not only are measurements and comparisons accurate but their product is imaginative and shows a high level of personal features in its formulation, techniques and composition. Their work process demonstrates willingness to explore a variety of ideas and a good awareness of what might make a fair test. Some ideas have been pushed to their limits before making final choices and there is good awareness of the areas of personal novelty and ability to evaluate the strengths and limitations of designs.

Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

| Step | Duration | Teacher and student roles | Subject content | Creativity and critical thinking |
|------|-----------------|--|--|---|
| 1 | Lesson period 1 | <p>Teacher starts by introducing the idea of natural disasters. What are natural disasters? What types of natural disasters can the students think of? As appropriate to local curriculum and context they may introduce the idea of climate zones and weather differences. Teacher introduces students to the idea that we can not stop natural disasters, but we can prepare for them. This can be extended to a brainstorming session in which students generate ideas for ways to prepare for natural disasters.</p> <p>They give the students a mission: Can you build a shelter to withstand storm winds, with the materials provided? The teacher shows the 'So Would You Survive' video clip from the Weather Channel (see resources) to help engage and build fascination</p> | <p>Learning about different types of natural disasters</p> <p>Climate zones and weather differences</p> <p>Considering how societies prepare for natural disasters</p> | <p>Understanding the context and boundary of the problem</p> <p>Generating ideas for preparing for natural disasters</p> |
| 2 | Lesson period 1 | <p>Teacher facilitates a further brainstorming activity about what structures students have seen that might hold up against strong winds. What do they have that other structures do not? What sorts of materials or composition techniques? Have they seen (or can they imagine) any unusual, radical, or strange structures? What made them unusual or radical?</p> | <p>Considering the properties of composition materials and techniques</p> | <p>Generating, exploring, stretching, and playing with ideas for structures to withstand a tornado</p> |
| 3 | Lesson period 1 | <p>Students will now see what materials are available and receive their budget (this should be a minimal budget of the teacher's choice). With their partner they will spend around 20 minutes drawing and designing how they will use these materials in an interesting or unusual way to create their structure. They will need to produce a written record of how they have used their budget as well. Students then have an additional short time period to create their model shelter according to their written design.</p> | <p>Collaboratively designing and producing a shelter to protect from natural disaster, based on scientific concepts</p> | <p>Proposing and producing a solution that is personally novel</p> |
| 4 | Lesson period 2 | <p>After time is up or in the next period, students will share their creations with neighbouring groups and students discuss and plan how to test the constructions using the fan to simulate storm winds. How can they make sure that the test is fair and not affected by outside factors? (e.g. distance from fan, making sure window is not open, testing in same location etc.)</p> | <p>Planning how to carry out a fair test of resistance</p> | <p>Checking accuracy and analysing gaps in knowledge</p> <p>Explaining strengths and limitations of a specific solution</p> |

Students then carry out the test and time and record if/how long the structure stays standing. Groups give each other feedback on the strengths and limitations of the designs and on how novel they are. They work out which structure stayed standing the longest by comparing results.

If time allows, students can be given an opportunity to improve and re-test their designs or create a second design drawing on the basis of what they have learned from the first round of design and testing.

Finally, students can be asked to reflect (orally or in writing) on the following questions

- Were you successful in this challenge? Why or Why not?
- What was the most difficult part of the challenge? Why?
- What was the best/most unusual idea you and your partner had? What was so good/unusual about it?
- What did you learn about construction and engineering?
- What further changes would you make if you could design another shelter?
- What materials were not effective? Why do you think that was?

Testing constructions, observing, timing, recording and comparing results.

Improving their design for a shelter on the basis of the results of their test

Considering why they got the results they did and what they learned about materials, construction, and engineering

Considering several perspectives and implementing feedback to improve their creations

Reflecting on steps taken and the novelty of a solution and its possible consequences.

Resources and examples for inspiration

Web and print

- So you think you think you'd survive video from the Weather channel
<https://www.youtube.com/watch?v=4tq66ksizg0>

Other

- Construction materials such as: straws, cardboard, yarn, plastic containers, water bottles, paper, foil, toilet paper roles, rubber bands, paper cups etc.
- Glue, string, staples, tape etc. for attaching materials
- Allow students to take notes, design, and keep a record in their notebook in a method that works best for them

Creativity and critical thinking rubric for science

• Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

| | CREATIVITY Coming up with new ideas and solutions | Steps | CRITICAL THINKING Questioning and evaluating ideas and solutions | Steps |
|-------------------|---|--------------|---|--------------|
| INQUIRING | Make connections to other scientific concepts or conceptual ideas in other disciplines | 1 | Identify and question assumptions and generally accepted ideas of a scientific explanation or approach to a problem | 4 |
| IMAGINING | Generate and play with unusual and radical ideas when approaching or solving a scientific problem | 1,2 | Consider several perspectives on a scientific problem | 4 |
| DOING | Pose and propose how to solve a scientific problem in a personally novel way | 3 | Explain both strengths and limitations of a scientific solution based on logical and possibly other criteria (practical, ethical, etc.) | 3,4 |
| REFLECTING | Reflect on steps taken to pose and solve a scientific problem | 4 | Reflect on the chosen scientific approach or solution relative to possible alternatives | |