

**Mission:** How are defects created in a material?

**Age:** 8+

**Materials:** \$15

**Time:** 30 min

(Set-up: 5 min | Activity: 20 min | Clean-up: 5 min)

## NGSS Alignment of Candy Crystal Construction Activity

The information below may not include every area that this activity can be linked to NGSS concepts

### Disciplinary Core Ideas

#### PS1.B: Chemical Reactions

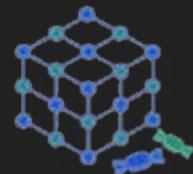
- Grade 5
  - ◇ When two or more different substances are mixed, a new substance with different properties may be formed.

#### ETS1.B: Developing Possible Solutions

- Grade 3-5
  - ◇ Research on a problem should be carried out before beginning to design a solution.
  - ◇ Communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.
  - ◇ Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.
- Middle School
  - ◇ A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
  - ◇ There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
  - ◇ Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
  - ◇ Models of all kinds are important for testing solutions.

#### ETS1.C: Optimizing the Design Solution

- Grade 3-5
  - ◇ Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.
- Middle School
  - ◇ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.
  - ◇ Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can prove useful information for the redesign process.



## Performance Expectations

3-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

## Crosscutting Concepts:

### Cause and Effect

- Grade 3-5
  - ◇ Cause and effect relationships are routinely identified, tested, and used to explain change.

### Influence of Science, Engineering and Technology on Society and the Natural World

- Grade 3-5
  - ◇ Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.

## Engineering and Science Practices

### Planning and Carrying Out Investigations

- Grade 3-5
  - ◇ Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

### Constructing Explanations and Designing Solutions

- Grade 3-5
  - ◇ Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

### Developing and Using Models

- Middle School
  - ◇ Develop a model to generate data to test ideas about designed systems including those represent inputs and outputs.

### Analyzing and Interpreting Data

- Middle School
  - ◇ Analyze and interpret data to determine similarities and differences in findings.