SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Designing using Codeblocking in Tinkercad	Gr. 7 - Understanding Structures & Mechanisms

Codeblocks

Coding Tool	Tinkercad
Cross-curricular	Math

Big Ideas

Science

- Structures have a purpose
- Inquiry

Math

- Mathematical Process
- Number Sense - integers
- Measurement - converting units
- Geometry & Spatial Sense - location and movement

Specific Expectations

Science

- 1.1 - evaluating importance in factors to be considered
- 2.6 - use appropriate science and technology vocabulary

Math

- Number Sense
  - identify and compare integers found in real-life contexts
  - represent and order integers
- Measurement
  - solve problems that require conversion of units of area
- Geometry & Spatial Sense
  - plotting points
  - identify, perform, and describe dilatations
  - create an analyze designs

Description

This lesson is a continuation from their exploration, and adds design and ideas of a structure that is useful to them. Students will use code to create a structure which has a purpose specific to individuals, society or the economy (e.g., must withstand a load, or force). It can be something which already exists, however must be altered in a way to maximize performance. The end result is a share .gif to explain their structure. Further extensions are suggested.

Materials

- For each group of 4-5 students
  - 12 pieces of spaghetti, 1 large marshmallow, 1 meter of masking tape
- technology device and internet access to create Tinkercad account (e.g., teacher created account and classroom built)
- Website - www.tinkercad.com
- anchor charts with prior learning
- full 100 minute block (more time may be necessary for more intricate designs)

Computational Thinking Skills

Iterative Thinking
- students will be experiences a new form of block coding

Abstraction
- understanding of using x, y, z plane to focus on which makes their design easier

Decomposition
- focusing on one aspects at a time

Debugging
- working on a plan to complete the task

Introduction

- In a circle, **share one** idea they can recall about their experience on Tinkercad (e.g., only one sentence or less)
- Design Thinking lead-in & Challenge (dschool.stanford.edu)
  - prompt them with:
    - IDEATE - did you share ideas, did you come together to grow your understanding?
    - PROTOTYPE - did you have fail, try again and think of other solutions?
  - 10-minute challenge to understand importance of failing and trying again (design thinking process)
    - build the tallest structure which can support a load with only the materials given - can manipulate all materials, except the marshmallow -
    - debrief - similar questions above; importance of failure with innovations
- Discuss **purpose** of the lesson
  - Codeblock a structure that has a specific purpose which is important to them (e.g., keyboard, desk, etc.)
  - recognize design thinking process in finding alternate solutions
- Build **success criteria** together
  - terminology used, factors and considerations kept in mind, environmental impact, etc.
  - math focus (if applicable)
  - use of computational skills, learning skills

Action

- During Creation, have brief discussions;
  - If anyone has tried something that has not worked, and how they fixed it
  - If anyone is noticing patterns, making a plan, making something easier, etc.
  - What have you taken from the Design Challenge to help in your structure creation?

Consolidation/Extension

- Why is the design thinking process important?
    - what is one area you can work on
    - could build SMART Goals for further design challenges
- Student self and peer reflections on their structures
    - Refer to success criteria to provide descriptive feedback
        - what works well, what could be improved and how
- Extensions
    - showcase their ideas as a gallery walk (e.g., half of the students share, while the other half rotate through a few); could revisit for suggested improvements
    - 3D print the structure; check with your school-board for this option
    - physical build using loose parts and recycled items (e.g., students find objects that help them build using a specific scale)

Assessment

- Focus on the co-created success criteria and big ideas
- Triangulation of evidence; choice of what works best for your students:

Conversations	Observations	Products
• digital recordings as a reflection piece • photographs of students working through the process	• use of digital screen-shots to document learning • teacher anecdotal notes from their exploration • learning skills, computational thinking	• shared .gif, presentation • loose parts structure • writing about the process

Additional Resources

- Websites
    - Tinkercad - https://www.tinkercad.com/learn/#/learn/codeblocks
    - Scratch - https://scratch.mit.edu/