

SMCOE Green Career Awareness Course

Product Design and Innovation

Solutionary Phase	Fundamentals
Lesson # and title	Lesson Five: Using Tinkercad to Model an Organism
Duration	45 minutes

Lesson Overview

During this lesson, students continue their exploration of Tinkercad by modeling the design of an insect. The purpose of this activity is to have students focus on those structures that confer environmental benefits to that organism, and become inspired by those features to think how they could be applied to the design of a product.

Learning Objectives

- Become familiar with Tinkercad tools
- Model the design of an organism using Tinkercad

Content Standard(s)

CA NGSS, EP&Cs, CCSS-ELA, CCSS-Math, EP&Cs, History/Social Studies, Visual and Performing Arts, Computer Science, Health, CTE, PE
Insert the standards' codes and language verbatim

CA Standards for Career Ready Practice: 1. Apply appropriate technical skills and academic knowledge; 4. Apply technology to enhance productivity.

ETS1.A: Defining and Delimiting Engineering Problems The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1- 1)

ETS1.B: Developing Possible Solutions A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design 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 provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) 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. (MS-ETS1-4)

Computer Science (CS)

Algorithms and Programming-Program Development

People design meaningful solutions for others by defining a problem's criteria and constraints, carefully considering the diverse needs and wants of the community, and testing whether criteria and constraints were met.

Development teams that employ user-centered design create solutions that can have a large societal impact, such as an app that allows people with speech difficulties to translate hard-to-understand pronunciation into understandable language. Use cases and test cases are created and analyzed to better meet the needs of users and to evaluate whether criteria and constraints are met. An example of a design constraint is that mobile applications must be optimized for small screens and limited battery life.

Crosscutting Concepts: Human–Computer Interaction; Abstraction

Connection Within Framework:3–5.Impacts of Computing.Culture

College and Career Connection(s)

College Foci: Product Design, Manufacturing

Careers: Manufacturer, Product Designer, Biologist

Equipment, Instructional Resources, and Materials

- Device
- www.Tinkercad.com
- Realistic, plastic insects

Suggested Student Grouping

Individual

The Lesson

Preparation

Watch [Design Your Own Insect](#) to help familiarize with how to design an insect using Tinkercad (video can be used by students to help, but it is not necessary if students already feel comfortable with Tinkercad's tools).

Lesson Procedure

Link to Lesson Slide Deck:

https://docs.google.com/presentation/d/1l09B4Yy_OoKnNlycDczJz9Y5FQx5Q_nluK7D4a7dsmc/edit?usp=sharing

Activity/Task	Description	Time (min)
Prepare to use Tinkercad	<ul style="list-style-type: none">Students obtain a device and log on to Tinkercad	5
The Insect	<ul style="list-style-type: none">Students receive a realistic plastic insect.Students observe that insect's features.Students research the insect, focusing on those features that confer benefits within their environment.	10
Modeling an Insect	<ul style="list-style-type: none">Students use Tinkercad to copy the biological design of the insect.	30

Assessment and Preparation for Lesson Six

1. Complete the assignment and share a screenshot with the teacher.
2. Have students bring in one piece of nature (leaf, cone, bone, feather, etc.) for the next class.