Biomimicry
(10-12 days - 45 mins/day)

RESET AN AEOP EFFORT aeop

Authors
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SUBJECT/GRADE LEVEL
Subject Area(s) STEM

Grade Level(s) grades 6-8

Materials

Item	cost per item	quantity	total
RVR battery	$60.00	1	$60.00
Glowforge materials	$4.00	50	$200.00
Drones	$60.00	5	$300.00
Balsa gliders	$1.00	75	$75.00
Parachute men	$3.25	15	$48.75
		TOTAL	$683.75

STANDARDS

Next Generation Science Standards

- MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions

Mathematics Standards | Common Core State Standards

- **7.G.A.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- **G.MG.A.2** Apply geometric methods to solve real world problems.

English Language Arts Standards | Common Core State

- **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- **RST.6-8.8** Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LESSON OBJECTIVE(S)

Students investigate their favorite animal's influence in the modern world by collecting and curating information into a Google Sheet and creating an infographic.

CAREER CONNECTION(S)

Mentor Background: Dr. Benjamin D. Nye is the Director of Learning Sciences at the University of Southern California, Institute for Creative Technologies. Ben's major research interest is to identify best-practices in advanced learning technology, particularly for frontiers such as distributed learning technologies (e.g., cloud-based, device-agnostic) and socially-situated learning (e.g., face-to-face mobile use). His research interests include modular intelligent tutoring system (ITS) designs, modeling social learning and memes, cognitive agents, and educational tools for the developing world and low-resource/low-income contexts. He received his Ph.D. in Systems Engineering from the University of Pennsylvania in 2011. Ben currently leads projects focused on areas such as mobile adaptive learning ecosystems (Personal Assistant for Life-Long Learning), open-source and user-authorable tutoring chat dialogs (OpenTutor), a studio for career mentors to self-record their own virtual mentors (CareerFair.ai), and augmented reality experiences with the La Brea Tar Pits to understand complex concepts (Re-Living Paleontology) In his prior work as a Research Professor at the University of Memphis, Ben led work on the Shareable Knowledge Objects (SKO) framework integrating ITS services such as AutoTutor for the ONR ITS Grand Challenge, helped data mine effort a corpus of 250k human-to-human online tutoring dialogs (part of the ADL PAL initiative), collaborated on ONR's PAL3 tutoring architecture for supporting life-long learning, and is an advisor and book editor for the ARL Generalized Intelligent Framework for Tutoring (GIFT) advisory panel. Ben's research tries to remove barriers to development and adoption of ITS so that they can reach larger numbers of learners, which has traditionally been a major.

STEM Careers: Aviation, Engineering, Biologist, Researcher, Graphic Designer

ENGAGEMENT

Brief Description: Watching a dancing robotics video introducing Boston Dynamics and reflecting via class discussion and Jamboard image activity.

Procedures: Day 1

- Doodling in Math: Spirals, Fibonacci, and Being a Plant [1 of 3] = 6 minutes
- What do you notice? What do you wonder? Jamboard and Discussion = 10 minutes
- Find examples and add to our Jamboard. Respect each other's work. = 15 minutes
- Each student must add at least 3 images, no repeats, label with a sticky note or text box

EXPLORATION

Brief Description: Students will learn about infographics. They will explore the Google Site for the project and decide if they'd like to work alone or with a partner. They will choose videos and articles to explore. They will create sketchnotes or Edpuzzles or Google Forms to prove they watched videos and read articles.

Procedures: Days 1-3

Day 1: Share infographic example, discuss project, visit Google Site, decide on partner or work alone
Day 2-3: Watch playlist of biomimicry videos : choose 4 videos (either sketchnote or create an EdPuzzle for each video chosen)
Day 1-3: EdPuzzle creation knowledge checks or sketchnote notes after each video segment.
Day 1-3: Read articles with examples of biomimicry - sketchnote to prove
Day 3: Turn in sketchnotes or completed EdPuzzles

EXPLANATION

Brief Description: Students will check understanding using Open Tutor. They will then choose their favorite animal, investigate the animal's influence in the modern world, collect and curate information into a Google Sheet, then create an infographic to explain their findings.

Procedures: Days 4-12
Day 4 & 5: Use Open Tutor to check for biomimicry concept understanding
Day 5: Choose the animal they want to research. Add to Google Sheet bank.
Day 5 -7: Research examples of biomimicry from their animal
Day 7-10: Use Google Slides, Adobe Spark, or Piktochart to create an infographic that shows findings
Day 10-12: Present and publish infographic on Google Form

ELABORATION

Brief Description: STEM is a class for everyone. Students will range in ability thus allowing for reach (if you finish early) activities.
Procedures: Extra growth activities:
3d print models of biomimicry with Tinkercad or Thingiverse
Drone coding with Tynker
flight activities and experiments with parachute men/balsa gliders
Glowforge model creation

EVALUATION

Brief Description: Rubric, sketchnotes, EdPuzzles/Google Form creation, OpenTutor, Infographic presentation
Procedures:
Students will be evaluated on the entire process in formative ways listed above and summatively through their infographic presentation.

REFERENCES

- Fibonacci Sequence with Vihart
- Jamboard and Discussion
- Google Slides
- Adobe Spark
- Piktochart
- Google Form
- Open Tutor
- Add to Google Sheet bank.
- infographic example,
- visit Google Site,
- playlist of biomimicry videos
- EdPuzzle
- sketchnote
- Read articles
- Drone coding with Tynker
- Tinkercad
- Thingiverse
- Glowforge model creation