BIRDEE Unit 1 Lesson Plans

1.1.1. Connecting Nature to Engineering

Students will bring in and analyze an object from nature using structure, function, and mechanism. They will be introduced to BID and how it relates to the Engineering Design Process. They will Identify a problem by brainstorming things that get dirty.

Before the Lesson:

- In preparation for the unit, students will explore nature outside of the classroom and bring in an artifact that they think is **interesting** or **unusual** for lesson 1.1.1. Examples include pinecones, mushrooms, nests, seedpods, flowers, leaves. Be sure to instruct students to do this before starting the unit.
- Teachers may want to make a classroom poster of the **EDP Flowchart Detailed** for reference throughout the unit.
- Teachers will need to determine how they want to group their students (teacher choice, student choice, or random) to create project groups. They will remain in these groups for the next 2 weeks. Students will be responsible for entering data in the EDPL as a group. Any hard copies of Individual and group work should be saved, with group work kept in a designated folder in the classroom.

Engage: 5 min

View: 1.1.1. BID WOW!

Teacher Note: *Images of a bullet train and Kingfisher bird should be displayed on the Smartboard as students enter the classroom.*

1. *After the bell rings and attendance has been taken, ask the students:*
   - ***What do you see in the images below?***
   - ***How are the things in the images similar? How are they different?***
2. *Advance to the next slide, the **Kingfisher Train Morph GIF** of the Kingfisher's beak and the bullet train will play.*
3. ***Play video:** **Kingfisher Bullet Train example (BBC video)***
4. ***Class Discussion:** What is your reaction to the video? Were you surprised that a bird beak could inspire a train? Did you expect the bird beak to morph into a train?*

Nature can inspire some really cool things!

Explain: 10 min (*Presentation)*

Natural Object Analysis

- You were asked to go into nature and find a natural object that is intriguing or unusual. Today we will model an investigation and analysis of a yellow jacket wasp in terms of its Structure, Function, and Mechanism. *(**Teacher Note:** **NGSS crosscutting concept**)*

View: 1.1.1 Natural Object Analysis PPT

Student Handouts:

1.1.1. Natural Object Analysis: SFM Organizer

1.1.1. Identify a Problem Brainstorming Organizer

Student Materials:

N/A

Instructional PPT's & Materials:

1.1.1. BID WOW!

1.1.1. Natural Object Analysis PPT

1.1.1. BID & EDP PPT

Teacher Resources:

1.1.1. SFM Nature Examples-TEACHER Resource PPT

Web Resources:

Kingfisher Train Morph GIF
Kingfisher Bullet Train video
Kingfisher Color Image
Kingfisher Graphic Image
EDP Flowchart Detailed
BIDI Graphic
EDP Simple
EDP plus BIDI Simple

Explore: 10 min *(Individual then share)*

Natural Object Analysis

View: 1.1.1. Natural Object Analysis: SFM Organizer Image

- Now it is your turn! Working independently, you will use 1.1.1. Natural Object Analysis: SFM Organizer handout to analyze your found object in terms of its physical **Structure,** basic **Function,** and **Mechanism (**within its own biological system and within the larger ecosystem).
- **Share:** When you are finished analyzing your object, share your investigation with your group.

Explain: 10 min *(Presentation)*

What is Biologically Inspired Design? How is Biologically Inspired Design Connected to Engineering and the Engineering Design Process?

View: 1.1.1. BID & EDP PPT

Teacher Note: *This PPT connects the concepts of BID and the Engineering Design Process. Teacher notes are included in the speaker notes section of the powerpoint.*

- ***How to view a presentation with speaker notes***
  - *Open a presentation in Google Slides.*
  - *In the top right corner, next to Slideshow , click the Down arrow .*
  - *Click the Presenter view.*
  - *Click Speaker notes.*

Elaborate: 10 min *(Individual)*

Identify an Engineering Design Problem

- **View: EDP Flowchart Detailed** (or on poster if printed out).
- The first step of the engineering design process is identifying a problem.

- **View: 1.1.1. Identify a Problem Brainstorming Organizer Image**
- Today you will use 1.1.1. Identify a Problem Brainstorming Organizer to brainstorm the problem of dirty shoes:
  - What types of shoes get stained or gather dirt
  - How do shoes Get Dirty? What materials stain shoes?
  - Who has a problem (people or groups) with dirty shoes?

- You will have 2 min to list ideas for each prompt (one in each column on the worksheet). The goal is to be fluid with your ideas - come up with as many as you can. There are no “bad” ideas. Do

not evaluate or criticize, this will waste time and eliminate unique or different ideas.

View: [2 Minute Video Timer]

Teacher Note: *The 2 minute timer linked above can be used to keep time on the board as students come up with ideas for each prompt on the worksheet.*

Evaluate: 5 min *(Individual)*

Analyze your responses to choose a problem you want to focus on and write this problem at the bottom of the 1.1.1 Brainstorming Organizer. Include the “thing” that gets stained or dirty, what it gets dirty with, and the people/group who have problems with it getting dirty.

- Categorize people—who has the problem?
- Look at the social impact of the problem—how many people have the problem?
- What are the types of “dirt” you identified?
- What does “dirty" mean in each context?