Buzzy Bees Facilitator Guide

The Buzzy Bee and Pollinator Pathway project has 3 unique lesson plans. Each can be done as an individual stand-alone project or in sequence for a deeper interdisciplinary learning experience.

Project One: All about Bees and Pollinators. (4-6 hours + independent research)
Design and Build a Pollinator Pathway in your Community.

Background:
In this project, students will learn about a bee's life cycle, habitats, and pollination. They learn about bees' critical role in our ecosystem and how their survival is at risk. Students may use local resources to research their own neighborhood and determine the ways in which their own community may or may not be supporting bees' survival. Armed with this knowledge, students will work together to build a model of their own community, highlighting some attributes that both support and put at risk, bees' survival. Students can use this model as an opportunity to propose changes in their community to better ensure that bees have the resources needed to thrive.

Learning Goals:

- students will learn about the bee's life cycle
- students will learn about pollination and the importance of pollinators in
- students will learn about possible reasons why bees are endangered
- students use available resources to research their own community, exploring ways in which it both supports bees and puts their survival at risk
- students will work in teams and learn to collaborate, communicate, and work together to solve real world challenges
- students will use the design thinking process and propose solutions to improve local bee survival.
- students will build a model of their community including aspects that both support and endanger bee survival. They will then redesign and present a model of their community with proposed solutions.

Materials:

- 3DuxDesign cardboard and connectors
- 3DuxDesign 3'x6' site plan (optional)
- one set worksheets per team (or per student)
- assorted craft materials
- pencils, markers, paint etc.
- scrap paper

Project guide:

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Teams of 3-5 students can work together. Depending on age and class, facilitator may guide students through the PDF introduction to bees, habitats, pollinators, and life cycles. Introductions include 2 pages of written content on the student worksheets along with links to video resources. There is also a link to an optional life cycle project that can be done using 3DuxDesign materials.

Life cycle: https://www.youtube.com/watch?v=LM7eEitKcIM
Pollination: https://www.youtube.com/watch?v=ta154f5Rp5Y
Design your own Pollinator pathway: https://bit.ly/diypollinator
Build a model of the bees' life cycle using 3DuxDesign templates: https://www.3duxdesign.com/blogs/the-3dux-stem-show/episode-7-life-cycles

For more bee resources: These are our favorite on TPT
Bee-Keeper for the day virtual field trip:
https://www.teacherspayteachers.com/Product/Beekeeper-for-the-Day-at-the-APIARY-Virtual-Field-Trip-Distance-Learning-6284013
Save the Bees Bundle:
https://www.teacherspayteachers.com/Product/Save-the-Bees-Digi-BUNDLE-PDFGoogle-Slides-Distance-Learning-6431874

After completing the group discussion, teams will follow the worksheet to do activities 1-3. Students may use a variety of resources for their research including digital resources, community outreach (local gardeners, farms, apiarists, town department of conservation, etc.) or articles. If possible, schedule a local professional knowledgeable about bee to visit the class for and interview.

If using the 3DuxDesign site plan mat, after teams complete their small group work, all teams will need to collaborate and build one community one the site map mat. Each team can elect a spoke person to share their work and agree on a final design. Teams can each be assigned a different part of the community to build. Once individual structures are built, all teams reconvene to lay out and finalize the community. If time allows, students can bring the community to "life" with characters and other decorations.

Student groups will then move on to activity 4, designing possible solutions to improve bee habitat. After teams complete small-group work, the entire class can finalize the community improvements to help support bees and prepare for a presentation

Presentations including writing components, photography, video, or other media can be submitted to 3duxdesign for consideration on the Global Futures Student Showcase!

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Project Two: Buzzy Bee Game Design.

A no-tech computational thinking project.

Background:
In this project, your students will design a game that requires players to use computational thinking. Students use their knowledge of bees' natural habitat, life cycle and potential hazards to design a game where the objective is for Buzzy Bee to safely navigate the community to reach its hive. In designing the game, students will follow the instructions to create a game board. In playing the game, students will need the bee to bypass 5 "survival cards" and avoid 3 "hazard cards" in the shortest pathway possible. The lesson can be designed on the community build from part one of this project or designed using printed sheets of the blank grid paper (supplied). The project can be scaffolded for k-5. Pick the version that works for your group.

Optional: Students using the LED lighting components will build a simple **circuit** by connecting an LED bulb and a battery. **this project requires a lithium battery which is poisonous if swallowed- grade 3+)**
When the LED and battery wires are connected, electrical current can flow in a complete loop, called a **closed circuit**, and the light will go on. Students will figure out how to engineer an open circuit that closes only when a conductive bee closes the circuit. Refer to this video (skip to minute 17.40 – 23 for an LED lighting refresher)

Learning goals:

- students may build on their research and knowledge of bees from project one to design a board game with an objective to ensure bees' survival in students' own community. (part one not required)
- students hone computational thinking skills and learn the basics of coding as the design and play the game.
- k-2 students will build counting, direction, and math skills
- students learn to use the design process and build engineering skills as they prototype and test multiple possible game solutions
- students build social and emotional skills, working in teams to develop and optimize a game.
- students will understand algorithmic thinking in the context of creating a sequence of steps through game design
- if using LED lighting components
    - students will learn about energy, electricity, renewable energy
    - students will build simple, incomplete, and complete circuits and use them in a real-world application as a part of game design

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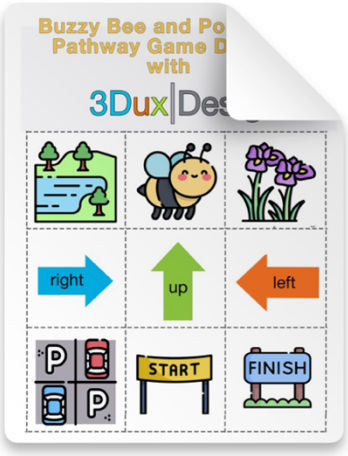
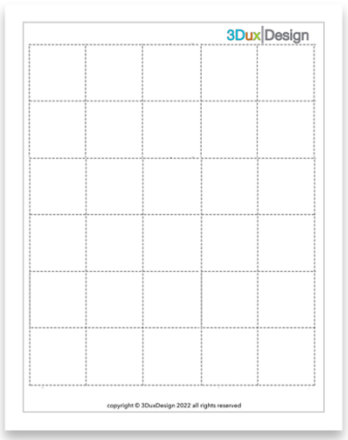
Materials

1. If using the 3DuxDesign community build from part one, each student should receive one copy of printed game pieces (see pdf). These should be printed at 100% scale. Extra direction pieces may be desired.
2. If this project is done as a stand-alone project, students will be using a paper board. Print game pieces (see PDF) at 50% scale (or print 2 per sheet) Print 2 pages of the full-page "Game Board" grid per student.
3. Pencils, crayons, or markers
4. scissors
5. 3DuxDesign 3-way connectors and small cardboard pieces to make game pieces stand

game pieces to print



game board



game pieces standing

Refer to the student worksheets pages 7-12 for specific instructions based on group and resources available.

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Part Three: A Day at the Races. Build and Race a Motorized Bumble Bee Bot (**this project requires a lithium battery which is poisonous if swallowed- grade 3+)**

Your students will build a Bumble Bee Bot using cardboard shapes, 3DuxDesign connectors, pipe cleaners or other innovative craft materials. They will use the a weighted motor and will build a simple **circuit** by connecting the motor to a battery. When the motor and battery wires are connected, electrical current can flow in a complete loop, called a **closed circuit**, and the motor will vibrate, and the bot will move. The goal will be to make the bee move straight and fast. Students will also design a track of a specified length and optimized for the specific tendencies of their own bot to compete against other teams.

The key to making them move in a straight line is **directional friction** or making sure the parts of the robot that contact the ground have more friction in one direction than the other. This will take trial, error, and patience. Students should understand that there is no single "right answer" to this project. The process is **iterative**, meaning they will repeat the steps of designing, building, and testing multiple times until they get a working robot. Your students will follow the **engineering design process** to build their robots and address these problems.

There are many design factors your students will discover when building their Bumble Bee Bots. They can identify cause and effect relationships between these elements and the robot's movement. For example:

- Robots that are too tall or skinny might fall over easily.
- Robots that are too heavy might move very slowly.
- Robots that are too flexible might move more slowly than stiffer robots.

goals:

- students will learn about energy, electricity, and renewable energy
- students will build simple circuits and use them in a real-world application as a part of game design
- students learn to use the design process and build engineering skills as they prototype and test multiple possible robot designs
- students learn about forces, friction, and mass in the context of real-world applications as they design, build and optimize a robot for speed
- students build social and emotional skills, working in teams to develop and optimize a robot
- students reflect on their design

materials:

- cardboard shapes (like 3DuxDesign 1-2.5" shapes)

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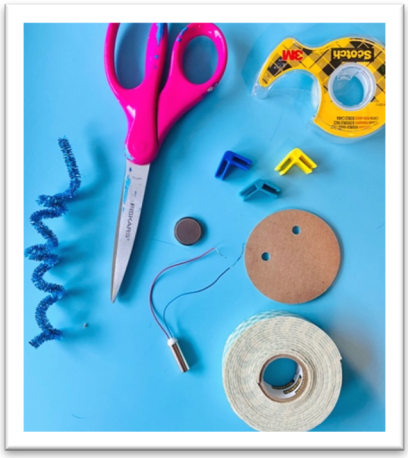
- 3DuxDesign connectors
- assorted items for "feet" including pipe cleaners, tooth picks, Q-tips, straws etc.
- mini vibrating motor (either supplied by 3DuxDesign or ordered at Brown Dog Gadgets
- 1.5-3V lithium button battery **(these are poisonous if swallowed: with adult supervision)**
- clear tape
- 2-sided foam adhesive tape if available will help attach the battery.



For instructions, refer to student worksheets