DESIGNING A GARDEN BENCH

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Unit Overview

During this project-based learning unit, students participate in the design process to identify and solve a real- world problem at their school – designing and building a garden bench for Drew Charter School's TinkerYard. Students begin the unit by determining the resources needed, interviewing a master gardener, and researching details about garden benches. Then, with the help of a teaching artist, students use perspective drawing to sketch ideas for the garden bench. The unit concludes with students synthesizing drawings from the various groups, constructing the garden bench, and blending the bench with its surroundings.

Using the Designing a Garden Bench unit plan as an example, this document also leads teachers through the three-stage process of designing their own project-based learning unit (selecting the desired results, determining acceptable evidence, and planning the learning experience). Use the **Unit Plan Template** posted with these resources to design your own project-based learning unit.

STAGE 1: IDENTIFY DESIRED RESULTS

(What will my students learn as a result of this unit?)

Stage 1: Teacher Planning Steps

1. With the help of students, identify a school, neighborhood, or community problem. Determine a means to solve the problem, such as engineering a product.
2. Identify the standards students will master through the project.
3. Develop essential questions, goals for student understanding, and learning objectives.
4. Establish when students will master each of the identified standards.

Stage 1: Designing a Garden Bench Example

The following is an example of Stage 1, in the context of designing a garden bench.

Standards Addressed[1]

1. **ENGR–Elem4:** Students will identify and safely utilize Engineering/Design Thinking tools.
    a. Identify tools used for specific purposes (measurement, attaching, cutting, etc.).

[1] *Standards adapted for the elementary level from the Georgia's middle and high school engineering and technology standards

b. Measure materials and parts necessary for solving a given problem.
c. Identify and practice safety procedures for using specific materials and equipment.
d. Practice proper care of tools.

2. **ENGR–Elem5:** Students will understand and utilize the Design Process (Brief, Research, Idea Development, Prototyping, Testing, and Evaluation/Modification).
    a. Recognize the importance of each step and its order in the Design Process.
    b. Apply each step of the design process to solve a given problem.

3. **ENGR–Elem7:** Students will understand that products are designed with form and function in mind.
    a. Consider the size, shape, texture, color, etc. in the purpose/visual interest of a product.
    b. Design a product that is attentive to size, shape, texture, color, etc.
    c. Recognize that given equal cost and function, a more attractive product is of more interest to a consumer.
    d. Consider the cost of the material related to its advantages or disadvantages—remembering that the project must break even or produce profit in the real world.

4. **ENGR–Elem8:** Students will understand that proper material selection is crucial to a successful prototype and final product.
    a. Consider the appropriate material/adhesive as well as the amount necessary for the task to be performed. (Ex: Pressure treated wood for exterior building projects)
    b. Select the proper material for the project.

5. **ENGR–Elem10:** Students will understand that research is necessary to understand a given problem completely.
    a. Recognize that there are different sources for information: books, internet, personal interviews, object studies, field trips, site studies, etc.
    b. Conduct research using the appropriate source.
    c. Determine if the source is reliable and appropriate.
    d. Apply knowledge learned to solving the given problem.

6. **ENGR–Elem11:** Students will communicate ideas and solutions clearly via drawings, models, and prototypes.
    a. Present ideas or solutions orally to groups, the class, and the community.
    b. Write about ideas or solutions clearly so that they may be considered by others.
    c. Create visuals that explain ideas and solutions to groups, the class, and the community.

Essential Questions

1. What is architecture?
2. What tools are used for gardening and how should they be stored?
3. How could the garden storage solution look like it belongs in the TinkerYard?

Students will understand that:

- There is a process utilized for engineering design.
- Architects design buildings and playgrounds.
- Gardeners use tools and need a place to work; designers can help create that space.
- Tools must be used safely during the build process.

Learning Objectives

Students will know:

- What tools a gardener uses and the storage necessary for those tools;
- What a garden workspace should include;
- The steps in the design process;
- The importance of sketching idea; and
- How to safely use tools to build ideas from the synthesized sketches.

Students will be able to:

- Complete a series of sketches that show their idea;
- Measure and build their ideas; and
- Utilize the design process.

STAGE 2: DETERMINE ACCEPTABLE EVIDENCE
(How will you assess students' understanding?)

Stage 2: Teacher Planning Steps

1. Determine what standards and learning objectives your authentic learning task will assess.
2. Create an authentic performance task that aligns to the unit's standards and learning objectives.
3. Determine what student products or performances will provide evidence that students have mastered the standards and learning objectives.
4. Develop criteria, or a rubric, for how you will evaluate these performances or products.
5. Create opportunities for student self-assessment, reflection, and peer critique.

Stage 2: Designing a Garden Bench Example

The following is an example of Stage 2, in the context of designing a garden bench.

Task Overview

Students will learn the design process through designing and building an element of Drew Charter School's TinkerYard – a garden bench/potting station. Students will learn about garden benches from a variety of sources – including interviews with a master gardener and internet research – to determine the parts needed for a fully functional bench. Students will also learn about up-cycling and will be required to utilize pallets in their design. Additionally, students will consider ways to make the bench sculpturally match existing TinkerYard structures. They will use perspective drawing to sketch their ideas for a garden bench. Then, students and adult coaches will synthesize these drawings and build the garden bench—adding sculptural elements to visually connect it to existing Tinker Yard structures.

Evidence of Understanding

- Sketches of the garden bench,
- The building process, and
- A completed workbench that the master gardener approves.

Evaluation Criteria

- Student safety, and
- A completed garden bench that works as planned.

Student Self-Assessment, Reflection, and Peer Critique:

- Students will participate in at least one of the critiques of peer sketches.
- Students will test the storage solutions and decide if modifications are necessary.

STAGE 3: PLAN LEARNING EXPERIENCES

What teaching and learning experiences will enable my students to demonstrate mastery of the standards and learning objectives?

Stage 2: Teacher Planning Steps

1. Determine the sequence of teaching and learning experiences that will ultimately equip students to engage with, develop, and demonstrate understanding.
2. Organize the sequence of teaching and learning activities using the below WHERETO elements.

WHERE TO	
W	**Where** are the students in this class going?
H	How will I **hook** and **hold** my students' imagination?
E	How will I **equip** all of my students for success?
R	How will I encourage my students to be **self-reflective**, and **self-evaluative**?
E	How will I build opportunities into instruction for my students to **self-evaluate** & **self-express**?
T	How will I **tailor** my instruction to accommodate student's strengths, needs, and learning gaps?
O	How will I **organize** the learning experience to maximize student understanding?

Stage 3: Designing a Garden Bench Example

The following is an example of Stage 3, in the context of designing a garden bench.

CODE	ACTIVITY	
W	1	Explain that students will be designing a workbench for the garden. Students will use skills that they obtain in class to build the structure that they design.
H, E	2	See above.
H, E	3	Students will be coached on sketching before beginning the process. Additionally, they will see images of many garden bench ideas before sketching.
E, O	4	The teacher will meet with small groups and individuals to discuss possible designs and give suggestions.
E, T	5	Students will receive helpful hints from each other. The teacher will provide demonstrations on the safe usage of tools.
E	6	Students will show each other their work in order to make comments, provide feedback, to improve the overall quality.
R	7	Students will critique their artwork throughout the process.

A NOTE FROM MS. BRYANT

Dear Teacher,

After watching the video and looking over the materials, your excitement may lead you to the conclusion that you need to replicate our unit on your campus. **I caution you that replicating our exact project may not be in your best interest.** While I certainly invite you to share our interest in promoting *tinkering* or *gardening* on your campus – I would rather implore you to explore your campus and seek your own real world problems for your students to solve!

You can achieve this unit's academic goals through almost any problem-solving unit that includes the elements of designing and building. Therefore, I encourage you to look for problems, or have your students look for problems, on your campus or in your community, in which a built solution is desired. Then, follow the design process (understand the brief, research, idea development, 3-d prototyping/rendering, testing, and evaluation/modification) outlined here.

It may seem overwhelming to consider solving a "real" problem in your school or community. You may have many questions that make you wonder if it is even a good idea to try something like this. But – believe me – it is completely worthwhile, and it feels doable if you take it one step at time!

When students are tasked with fully understanding and creating solutions to real world problems, they are extremely motivated and willing to learn concepts that far exceed expectations. My elementary students will work harder to prove they are worthy of trying "grown-up tools" – tools that might include anything from a power sander to a protractor. They are learning amazing things. Students in my Engineering Design class are learning measurement and geometry. They are also developing researching skills and interviewing expertise. They are learning about the characteristics of materials and hypothesizing about the durability of certain materials by testing them in the TinkerYard structures we build. Teamwork, collaboration, communication, and cooperation are more than buzz words—my students live them as they design and build. My students are rendering their ideas using perspective-drawing skills, which is challenging even for students in higher grades.

Elementary kids can do amazing things—it may take their minds and bodies longer to accomplish a task, but given the opportunity and the right encouragement, they rarely disappoint. Help your kids understand the power they possess to make a positive change in their school or community.

Sincerely,
Courtney Bryant