Eva the Engineer Syllabus

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Course Overview

The primary goal of the *Eva the Engineer* program is to educate, excite, and encourage young women to pursue science, technology, engineering, and mathematics (STEM) fields. Hands-on activities are used to teach lessons on the principles of civil engineering, sustainability, and women in STEM in this interactive elective course developed particularly for young women in middle school. Life cycle assessments, water use and water treatment, concrete, and the use of recycled materials in construction applications are just a few of the sustainability-focused engineering principles to which the students will be exposed. By presenting examples of successful female engineers, as well as allowing young women to explore the engineering field interactively, students envision themselves succeeding in STEM fields.

Lesson 1: Introduction to STEM

Learning Objectives

- Introduce STEM and present breadth of opportunities in STEM careers.
- Present responsibilities and opportunities for engineers.
- Discuss underrepresentation of women and minorities in STEM fields.

In-class Activity: Building a "tree" from "STEM" showing STEM branches and disciplines.

Distribute t-shirts and *50 Women in Science* books.

Homework: Read about 5 women from *50 Women in Science* and fill out worksheet.

Lesson 2: Life Cycle Assessments and Water Usage

Learning Objectives

- Discuss water resources and worldwide usage.
- Introduce life cycle assessments and three pillars of sustainability.
- Think critically about social, environmental, and economic impacts of water.

In-class Activity: Group life cycle assessment of tap water vs. bottled water.

Homework: Personal water usage chart.

Lesson 3: Field Trip to Nine Springs Water Treatment Plant

Learning Objectives

- Understand implications of water consumption after tracking personal water usage.
- Learn about water treatment.

In-class Activity: Field Trip to Nine Springs Water Treatment Plant.

Homework: Read about 5 women from *50 Women in Science* and fill out worksheet.

Lesson 4: Infrastructure in Civil Engineering

Learning Objectives

- Practice problem solving and teamwork.
- Introduce distribution of forces.

In-class Activity: Chair building competition using masking tape and recycled newspaper.

Homework: Read about 5 women from *50 Women in Science* and fill out worksheet.

Lesson 5: Concrete and Cookies

Learning Objectives

- Introduce the components (ingredients) of concrete.
- Understand of concrete mix design and the roles of the components of concrete in the structure through drawing correlations to a cookie.
- Discuss widespread uses and life cycle impacts of concrete.

In-class Activity: Use chocolate chip cookies to describe concrete.

Life cycle calculation comparing concrete with and without recycled materials.

Homework: Read about 5 women from *50 Women in Science* and fill out worksheet.

Lesson 6: Hands-on Concrete Lab

Learning Objectives

- Review uses of concrete and life cycle impacts of concrete.
- Hands-on experience mixing concrete.
- Discuss how recycling, in both personal and in engineering applications, reduces solid waste and other life cycle impacts.

In-class Activity: Mix concrete for stepping stones using recycled glass as decoration.

Homework: Read about 5 women from *50 Women in Science* and fill out worksheet.

Lesson 7: Celebrating Women in STEM

Learning Objectives

- Incorporate learning from weekly reading assignments in *50 Women in Science*.
- Discuss role of women in STEM history and how they have not always received the same historical recognition.
- Recognize tremendous accomplishments and scientific achievements of women in STEM.
- Present women of all backgrounds and identities and their contributions to STEM, particularly engineering.

In-class Activity: BINGO using cards with facts about women in STEM.

Homework: Come with 3 questions for guests next week.

Lesson 8: Panel of STEM Professional Women and College Students

Learning Objectives

- Interact with engineers who are in the industry and ask questions.
- Develop communication skills.
- Demonstrate that women in STEM are relatable.

In-class Activity: Question and answer session with professional women in STEM.