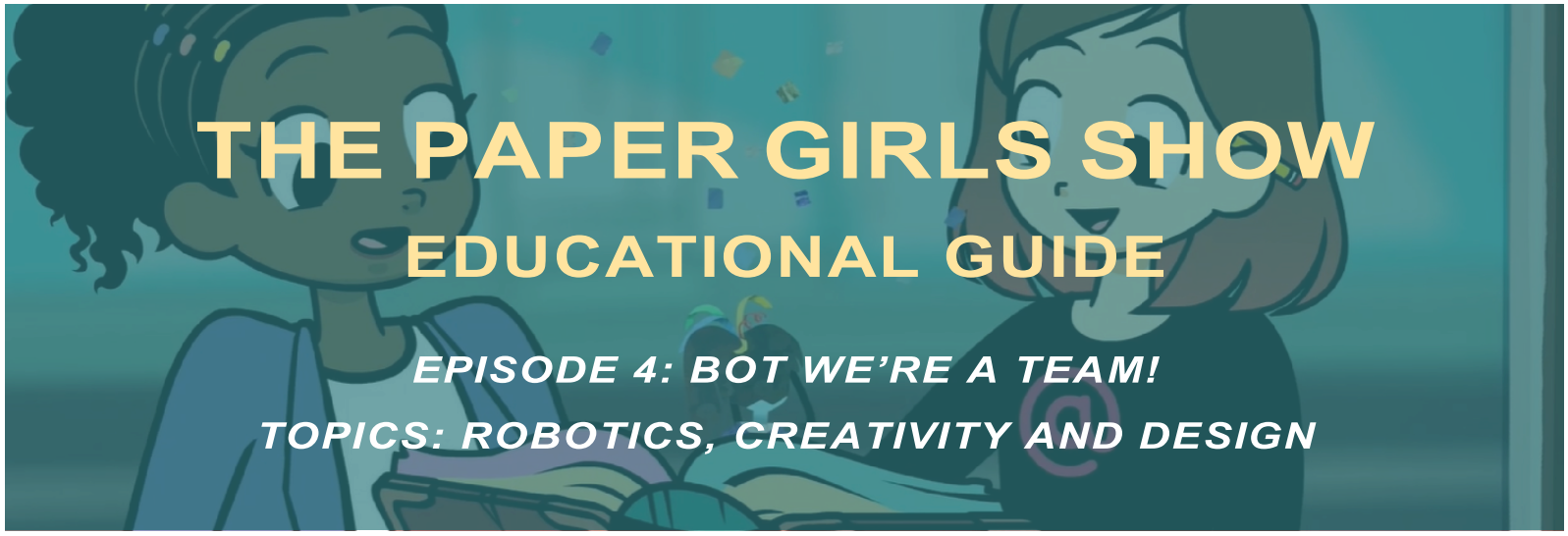

# THE PAPER GIRLS SHOW

## EDUCATIONAL GUIDE

### *EPISODE 4: BOT WE'RE A TEAM!*

### *TOPICS: ROBOTICS, CREATIVITY AND DESIGN*

## EPISODE SYNOPSIS

Reese and Caily compete in a robotics competition and can't agree on a project. They meet Kami's uncle, Professor Seymour, in Confetti who helps them come up with a plan.

## FEATURED STEAM TOPICS

**BIG IDEA** – Robots and machines are created by engineers and designers to help humans do challenging tasks. They can make hard tasks easier for us.

## EXPLANATION FOR CHILDREN:

**ROBOTICS** - A robot is a machine that does tasks without the help of a person. Most robots are controlled with computers and have many parts. Robots come in all shapes and sizes because they are designed for different purposes, but every robot can only do what a person has built them to do.

**PROGRAMMING** - Also known as coding, is a language that allows human to communicate with computers in order to tell them what to do. Programming involves telling the computer information a specific sequence to help it perform its task.

**GEARS -** One type of simple machine and move in a circular motion to help move objects and part. Each gear has teeth that push other gears to transmit pressure and provide motion. Simple machines help make tasks easier for people to do.

## RELATED CONTENT STANDARDS (CORE CURRICULAR AIMS) IN THIS EPISODE

The standards and curricular aims listed below are linked to this episode's extension activities. Each activity is designed to promote children's creative thinking with paper-based technology and engineering design.

## Related Central Ideas

(International Society for Technology in Education Standards for Students, ISTE, 2016).

## Empowered Learner

Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

***Knowledge Constructor:*** Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

***Innovative Designer:*** Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

***Computational Thinker:*** Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

## Engineering: Design

Ask questions, make observations, and gather information about a situation people was to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

*Source: NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press.*

# ACTIVITY EXTENSIONS FOR EPISODE TOPICS

In this episode, children are introduced to the idea that used paper can be folded into new and different shapes and objects. Below is a brief listing of activities that invite children to explore and work with paper and robotics. In each activity the emphasis is on the process of thinking, design, and making rather than a perfect end product as children take the lead in their own investigations. Parents and teachers can support children in their work by asking prompting questions such as: How did you make that move?; What will you need to help you?; What can your robot do?; How can the robot help people?; What is another way you can make that machine move?

## 1. Paper and Cardboard Robot

In this simple extension activity, you can invite your students to design their own robot to help them with a particular problem. The children can identify a problem they need help with and then create a sketch of a robot that will help them. You can also invite your students to create a multi-media collage with their designed robot or encourage them to create a 3-dimensional sculpture using paper, cardboard, and simple craft supplies such as buttons, string, pipe cleaners, and clay.

### PROMPTING QUESTIONS

- What problem can your robot help you with?
- How does your robot help you?
- Can you tell me about this part of your robot?; What does it do?

Children's Book Extensions:

Boy + Bot

Written by Ame Dyckman

Illustrated by Dan Yaccarino

Publisher: Knopf Books for Young Readers

*Commentary:*

Boy + Bot is an engaging story with colorful illustrations about the relationship between a boy and his robot. The boy tries to figure out how to help his robot when it stops working.

## 2. Cardboard Gears

This extension activity will take some support from an adult to complete as children will need to measure and cut materials correctly to get them to fit together and turn. Materials needed include: Compass, ruler, pencils, scissors, glue, push pins, corrugated cardboard (inner ridged layer between two smooth outer layers). To begin you will need a small base piece of cardboard (at least 8" by8"). You will then need to cut out several small circles – 1 inch, 2, inch, and 3 inch sizes work best. You will then need to cut a strip a cardboard about ¼ inch wide and remove one of the smooth sides so that the ridges are sown on one side. Cut to length and glue the smooth side to the outer edge of each of your circles so that the ridges face out. Let the gears dry. Once dry use a push pin to place your first gear on the cardboard, add more gears taking care to align the edges in order to facilitate movement.

Once all gears are placed, experiment in turning them right to left and left to right. Replace gears as needed and to experiment further.

### PROMPTING QUESTIONS

- How will the gears move?
- Are the cardboard teeth fitting together?; Do the gears need to be closer or further away from each other?
- What will happen if you add another gear?; Where will you put it?

Children's Book Extensions:

Rube Goldberg's Simple Normal Humdrum School Day

Written by Jennifer George

Illustrated by Ed Steckley

Published by Harry N. Abrams

A colorful and inventive story about a boy inventor named Rube and his efforts to create and combine simple machines to help him during the day. Great introduction for young children to simple machines and Rube Goldberg combinations.

## 3. Hand Robot

This extension activity invites your students to create a moveable robot hand using just cut up drinking straws, twine and cardboard. You will also need scissors, tape, and markers. To begin, invite each child to trace and cut out the shape of their hand on the cardboard (cutting it about one inch bigger than their tracing is helpful for smaller hands). Next the child will mark where their joints are centered on the cardboard hand and lightly the cardboard on the join line. Cut small pieces of straw for each finger (resembling bones) but leave a space at the joint line. Tape the straw pieces to the cardboard and run a piece of twine through the straws on each finger (tape the twine down at the top of each finger).

Tape a piece of straw to the wrist area and thread all five pieces through the wrist straw. Pulling on each string will result in the finger moving.

### PROMPTING QUESTIONS

- Where are the bones in each finger?
- Can you move just one finger?; What about two?
- How could a hand robot help you do something challenging?

Extension Website:

NASA: The Robotics Alliance Project

https://robotics.nasa.gov/students/students.php

## ABOUT Angela Eckhoff, PhD

Angela Eckhoff, is an Associate Professor of Teaching and Learning and the Director of the Virginia Early Childhood Policy Center at Old Dominion University. Dr. Eckhoff studies the role of creativity in child development and learning, arts-based research and pedagogical practices, and early STEAM learning in both classroom and museum settings.

She is a co-editor of the Full STEAM Ahead column for Teaching Young Children from NAEYC as well as the author of ‘Provoking Curiosity” and the four-book “Creative Investigations” series from Gryphon House Inc. Dr. Eckhoff holds a dual PhD from the University of Colorado–Boulder in educational psychology and cognitive science.