STEM and Fairy Tales:

Blending Fantasy and Science

Starting with STEM

Choose your STEM principle first, then match the fairy tale to it.

Theme: Coding
Fairy Tale Tie-in: Your robot is any fairy tale character who has to take a journey: Cinderella to the ball, Little Red Riding Hood to Granny's, Jack to the market. Code your robot through a maze to reach its destination. For a harder activity, set fairy tale items from the story to be collected along the way.

Theme: Chemistry
Fairy Tale Tie-in: Snow White's stepmother needs one last ingredient to make her poison. But she hasn't labeled her powders correctly. Do a white powder investigation with baking soda, sugar, and cornstarch, adding water, vinegar, and iodine to correctly identify each substance.

Theme: Properties of Matter
Fairy Tale Tie-in: Explore the Snow Queen's ice powers with a super-cooled water demonstration to make instant ice. Let the ice melt in the sun in a thin layer of water that will evaporate by the end of your program. Make ice cream and talk about how temperature changes and pressure change liquids into solids.

Theme: Baking and Food Science
Fairy Tale Tie-in: How did the Witch in the Woods build her Gingerbread Cottage? What kind of baked goods would be sturdy enough to remain standing, and how does the way they're baked matter? What kind of confections make the best glue? What diet might she have fed little Hansel to fatten him up?

Theme: Animal Transformations
Fairy Tale Tie-in: Transformations are a part of many stories, like The Frog Prince and The Little Mermaid. Talk about real life creatures that undergo transformations, like tadpoles to frogs, caterpillars to butterflies, larvae to insects. Partner with your local Park District and find these creatures out in the wild to discuss their life cycles.

CHILDREN'S PLACE
WOOD COUNTY DISTRICT PUBLIC LIBRARY

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Starting with Stories

Choose your fairy tale first, then identify which STEM concepts can be applied.

Fairy Tale: The Three Little Pigs
Concepts: Structural Engineering, Architecture, Wind and Weather
Experiments:

A Literal Interpretation

Split your group into three. Give one group a bundle of straw, one a bundle of sticks, and one a bunch of bricks. Instruct them to build a structure that can stand on its own. Then introduce the "Big Bad Wolf" (a hairdryer) and see how easily the structures can be blown down.

Build a House the Wolf Can't Blow Down

Give each group an array of building materials. You can go in several directions with this -- toothpicks and marshmallows or gumdrops, recyclables, paper and newspaper, etc -- but give each group the same materials. Then test each structure with your Big Bad Hairdryer to see what stays standing.

Real-Life Applications

Talk about houses and buildings constructed in areas prone to hurricanes or earthquakes. Just like the third little pig, engineers and architects have to look at the dangers of the area and build to compensate for them. Talk about earthquake-proof buildings in San Francisco and hurricane-proof structures on the east coast.

Talk about real-life winds that can destroy houses, even ones made of brick and s tone. Discuss tornadoes and straight-line winds that can devastate the Midwest, and have the kids design structures intended to withstand those dangers.

Fairy Tale: Jack and the Beanstalk
Concepts: How Plants Grow, Gravity
Experiments:

Ongoing Bean Growing

Help the kids determine what conditions may have helped Jack's beans grow so strong and tall. Plant beans in Dixie cups to test the effects that sunlight, water, and soil composition have on growing things. Observe weekly.

Save the Giant

Could the giant's demise have been prevented if he'd had a parachute? Use hard-boiled eggs to test the effects of different sizes of parachutes.

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Fairy Tale: Cinderella
Concepts: Estimation, Sequencing, Matching, Sorting, Telling Time
Experiments:

No Two Feet Alike

With shoes on, have kids line themselves up from smallest feet to biggest, using shoe size as the guide. If you want to add a challenge, make them do this without talking, just holding up fingers. Once they're in place, tell them to remember who they are standing by, then split the group into pairs. Have students take their shoes off and measure the exact length of their foot in inches or centimeters. Have them line up again and see if the order changes. Talk about how two kids with the same shoe size can still have different sized feet.

Find Your Sole-Mate

Ahead of the program, get some donated shoes and roll the bottom of each in paint. Make shoeprints on sheets of paper. At the program, put all the shoes in a pile and give each student a shoeprint. Match the shoeprint to the shoe. Talk about why the sole of shoes are different and what the purpose of the designs is.

Sorting Lentils

In Grimms' Cinderella, the stepmother tells Cinderella that she can go to the ball if she finishes a series of tasks. One of these tasks is sorting lentils out of the fireplace ashes. Give children a mix of dried beans and rice to separate and see who can finish the task first. For an easier version of this, mix magnetic objects into a bin of rice and use magnet wands to separate.

How Many Minutes to Midnight

Cinderella has to leave the ball before the stroke of midnight. Give kids analog clocks and practice telling time. Set times and have the kids tell you if the time they see is too late for Cinderella.

Give the kids math word problems to solve: If the ball starts at 8:00, and it takes the Godmother x minutes to transform the animals, y minutes to get Cinderella dressed, and z minutes to get to the palace, how much time will she have with the prince before she has to leave?

Since many of Cinderella's ideas are timed exercises, you can make this into a relay race, seeing who can get Cinderella to the ball first!

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Fairy Tale: Rapunzel
Concepts: Tensile Strength, Simple Machines
Experiments:

Strength of Hair (and Hair-Like Things)

Find a wig you can destroy and give each student a strand of hair. Ask them to break it and then rate how much strength it took. Then give each student a few strands of hair and see how the strands can be twisted or braided to be made stronger. Show the students a piece of yarn and ask what they observe.

Getting Rapunzel Down From Her Tower

Introduce students to the six simple machines (lever, inclined plane wedge, wheel and axle, pulley, and screw) and talk briefly about how each simple machine is used to make work easier. Split your group into teams and give each time to brainstorm and sketch some ways that simple machines could be used to rescue Rapunzel from her tower. If you have the appropriate supplies, students can even build prototypes.

Hair Like Rapunzel

Split students into pairs and give each a ruler or tape measurer. Have them measure the length of each other's hair. Set them this math puzzle, based on how long their hair is: If Rapunzel's tower is x feet tall, and hair grows at a rate of .5 inch per month, how long would you have to grow your hair to use it to get in and out of Rapunzel's tower?

Fairy Tale: The Billy Goats' Gruff
Concepts: Civil Engineering (Bridges), Water Science, Sink or Float
Experiments:

Build a Better Bridge

Break students into teams and give each team the same configuration of recyclables. Instruct them to build the longest bridge they can that can support the weight of 100 pennies. Give them 15 minutes to build, and then test the bridges. The team with the longest unsupported span wins.

Build a Better Boat

How else could the Goats have gotten past the troll? By building a boat and sailing across the river. Give students a piece of foil or clay to fold or mold into a boat shape. Using a water table, see if the boats float, and then see how many pennies the boat can hold before it sinks.

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Other Fairy Tale STEM Connections:

The possibilities are endless! Below are just a few more ideas to play with.

- Little Red Riding Hood: color and camouflage, the food chain, predators and prey
- Hansel and Gretel: nutrition, body science, the digestive system
- Sleeping Beauty: why we sleep, plants and their defenses
- Snow White and the Seven Dwarfs: poisonous plants, rocks and gems
- Goldilocks: heat and temperature, energy transfers
- The Snow Queen: ice science, seasons, mirrors and reflections
- The Little Mermaid: ocean life and health
- Icarus and Daedelus: flight, aerodynamics

Losing Momentum? Add the "A" and make it STEAM!

With fairy tales, incorporating the A into STEAM opens a lot more possibilities:

- Talk about sound, music, and patterns with stories like "The Pied Piper" or "The Brementown Musicians"
- Teach a traditional country dance or waltz like Cinderella and the Prince or the Twelve Dancing Princesses might have known
- Learn about spinning and the parts of a spinning wheel with Sleeping Beauty
- Decorate gingerbread houses for Hansel and Gretel to find
- Throw a Trashion show and gather in teams of Fairy Godmothers to design ball gowns and suits of armor worthy of royalty
- Talk about "mixed" creatures in mythology -- centaurs, mermaids, griffins, chimeras, etc -- and have the kids design and draw their own
- Discuss cartography and have kids design their own map of a fairy tale kingdom

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