Engineering Your Science Station

Welcome to the Knights of North Castle: Quest for the King's Armor VBS!
Get your journey as Science Leader off to a great start by following these simple pro tips:

Equip your Science Station for thrills—and potential spills!

Use this easy checklist to ensure you have everything you need:

- the Science Station sign from the **Activity Center Signs and Publicity Pak**
- **Knights of North Castle Tablecloths**, tarps, and/or sheets to cover floors and surfaces
- materials for each session's experiments
- plenty of paper towels and nontoxic cleaners
- **Decorating Poster Pak, Castle Callout Mobiles, and Wall Coverings**, plus more ready-made tools found on the ***Decorating and Publicity CD-ROM!***
- Knights of North Castle ***Complete Music CD*** or ***MP3 tracks*** to play during transitions and/or as Knights work on their experiments.

- Attend all Knights of North Castle training sessions to learn about the program and how your station fits into the overall message.

- Check out the **"VBS for Knights with Special Needs"** FREE resource at CokesburyVBS.com for tips on how to encourage each Knight to participate at his or her level of ability.

- The experiments in this book are intended to foster a sense of wonder about God and God's creation in Knights of all ages.

  Use the Introduction and Bible Tie-In for every experiment to best connect each session's Bible story, Castle Callout, and the Banner Verse.

Health & Safety Tips!

- Take time to read this book in advance all the way through to become comfortable with each activity, and perform at least two practice runs for each experiment.

- Unless otherwise noted, these activities are designed for Knights in grades 1–6, with alternatives provided for younger Knights on pages 28–32. Watch for steps that only adults should perform while the Knights observe.

- Do not use glass containers (use sturdy plastic ones instead), and do not use a microwave to heat ingredients.

- Always store materials in a secure, enclosed location to prevent unsupervised access.

Want to See the Experiments in Action?

Demonstration videos are provided for you for ALL elementary-level science experiments for Knights of North Castle VBS in the FREE Resources at CokesburyVBS.com! (does not include Preschool Science)

Science Station Features & Helps

Anyone can be a great Science Leader—all you need are the proper tools and preparation, which we've provided here for you! Each session at the Science Station features two experiment options:

Experiment 1

- Usually needs only 5 components or fewer
- Perfect for VBS programs with time constraints and/or space limitations
- Need to fill more time? Try this:
  - Let older Knights help you perform some preparation steps!
  - Have a volunteer record your experiment, then play the action back for your Knights!
  - Spend extra time going over the Bible Tie-in discussion questions!

Experiment 2

- Provides that WOW! factor
- Perfect for VBS programs with extra time and/or a desire to dive deep into Science
- Need to simplify? Try this:
  - Prepare more of your steps in advance to cut back on time!
  - Perform your experiment as a demonstration for your Knights while they enjoy a snack!
  - Play the demo videos provided for you in the FREE Resources at CokesburyVBS.com!

Scientific Method

Knights of North Castle science experiments lead Knights along the steps of the Scientific Method. These steps include:

1. **Observe:** What do you notice about the world around you?
2. **Ask a Question:** What will happen? How do the materials work together?
3. **Form a Hypothesis:** What do you predict will happen based on what you observe?
4. **Experiment:** Test your hypothesis.
5. **Analyze and Apply:** What happened? How does it apply to our Bible learnings?

Engineering Design Process

Knights of North Castle science experiments can also be communicated using the Engineering Design Process. These steps include:

1. **Ask:** What is the purpose of this experiment? What are we trying to learn?
2. **Imagine:** Brainstorm possible ways to conduct the experiment.
3. **Plan:** Which brainstormed idea will you use?
4. **Create:** Prepare the experiment based on your plan.
5. **Experiment:** Test your plan and evaluate it.
6. **Improve:** How could you have done this experiment differently? How does it apply to our Bible learnings?

Go Beyond for Even More Fun!

Connect with us online for more VBS Science tips, tools, and ideas!

Bible Story

Shadrach, Meshach, and Abednego Stand True
Daniel 3

Castle Callout

Armor Up with Truth!

Materials

- ☐ tall clear vase or jar
- ☐ clear bowl
- ☐ pillar candle that is no taller than the bowl
- ☐ vinegar
- ☐ baking soda
- ☐ matches
- ☐ cloth or paper towel

Safety Tip

Tie up long hair and loose clothing before lighting matches. Have a cloth on hand to wipe up spills to avoid slip/fall hazards.

As this experiment requires the use of a flame, we recommend this experiment as demonstration only with younger Knights and under close supervision with older Knights.

Experiment 1
Invisible Fire Extinguisher

I. Preparation

Gather materials.

Test the experiment beforehand to determine the right amount of baking soda and vinegar for your large vase or jar. You want the bubbles to rise to about ⅔ of the height of the jar. Start with 1 tablespoon of baking soda and ⅓ cup of vinegar and adjust amounts as needed.

II. Introduction

Say Something Like: **In today's story, God sent help to Shadrach, Meshach, and Abednego in the fiery furnace and protected them from the heat of the fire. We are not going into a fire; we are going to put out a fire in a way that is different from what you may have seen before.**

Ask: **What are some ways that people put out fires?**

Ask: *(show materials)* **Do you see anything here that would help put out a fire?**

III. Experiment

Step 1. Place the pillar candle in the bowl and light it.

Step 2. Mix approximately 1 tablespoon of baking soda and ⅓ cup of vinegar in the large vase or jar. Watch until the bubbling reaches its peak and begins to subside.

Step 3. Tilt the jar over the lit candle as if you were going to pour the mixture onto the candle, but do NOT actually let the liquid come out of the jar. You are allowing the gas that has collected above the liquid to fall onto the candle. What happens?

Step 1

Step 2

Step 3

IV. Side Quest:

Knights can perform a similar experiment themselves. Divide your group into teams, if needed. Give each team a birthday candle, a lump of clay, a punch cup, baking soda, and vinegar. They will use clay to place a birthday candle inside a punch cup and sprinkle two large pinches of baking soda around the candle. An adult should light the birthday candle, and then Knights can pour about 3 tablespoons of vinegar into the bottom of the cup. The same reaction will take place, with the carbon dioxide filling the cup until the candle goes out.

V. How does it work?

When vinegar and baking soda mix, they have a chemical reaction. As part of the reaction, a gas called carbon dioxide is formed. Carbon dioxide is more dense than oxygen, so when you pour the carbon dioxide over the candle, it sinks into the bowl and pushes out the oxygen. Fire needs oxygen to burn, so the candle goes out. This is the same principle at work in carbon dioxide fire extinguishers.

VI. Bible Tie-in

Fire can be scary! In today's story, God protected the three friends from the fire. God is also at work with people today, giving us the knowledge to protect ourselves with inventions like fire extinguishers, fireproof fabrics, sprinkler systems, and smoke alarms. It's important to be safe and protected, but it is good to know that just like for Shadrach, Meshach, and Abednego, our God is with us and watching over us.

Bible Story

Shadrach, Meshach, and Abednego Stand True

Daniel 3

Castle Callout

Armor Up with Truth!

Materials

- glass or ceramic plate
- clear glass jar or vase with a smooth rim
- penny
- candle that is shorter than the jar or vase
- lump of modeling clay
- pitcher of water
- matches
- cloth or paper towel

Safety Tip

Tie up long hair and loose clothing before lighting matches. Have a cloth on hand to wipe up spills to avoid slip/fall hazards.

As this experiment requires the use of a glass or ceramic plate, a glass jar or vase, and flame, we recommend this experiment as demonstration only with younger Knights and under close supervision with older Knights.

Experiment 2
Water Suction

I. Preparation

Gather materials.

II. Introduction

Say Something Like: **In today's story, God sent help to Shadrach, Meshach, and Abednego in the fiery furnace and protected them. We are going to see if fire can help us with a challenge.**

Ask: *(Show Knights materials)* **Have you seen materials like these before? How do we normally use them?**

Ask: *(Place the penny on the plate with the candle in place and pour enough water into the plate to just cover the penny.)* **I'd like to get this penny out without getting my fingers wet. What are some things I might try to do that?**

III. Experiment

Step 1: Place the candle in the center of the plate. Use the modeling clay to stabilize it, if necessary.

Step 2: Pour enough water onto the plate to just cover the penny.

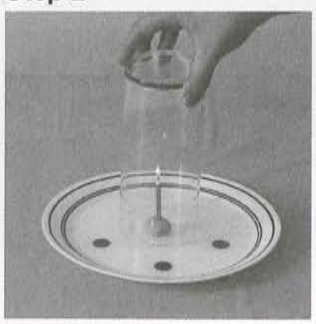
Step 3: Light the candle. Turn the vase or jar upside down over the burning candle. What happens?

Step 4: Ask a Knight to pick up the dry penny.

Step 5: Invite older Knights to perform the experiment themselves (divide your group into teams with adult supervision, if needed). Repeat steps as time allows or until each Knight who wants a turn gets one.

Steps 1

Step 2



Step 3