Champions® Science Adventures®

Enrichment Made Easy

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Contents

Program Overview (Introduction) 2

Curriculum Components 3
- Lesson-Specific Kits 3
- Materials Not Included in Kits 3
- Instructional Training Video 3
- The Science Lessons 4
  - Science Content Areas Included in This Program 4
  - Lesson Format 4

Implementing Champions Science Adventures® Lessons 8
- Preparing Kits and Other Materials 8
- Integrating Best Practices in Champions Science Adventures® Lessons 8

For more information about Champions® Science Adventures,® ask us about our Program Guide. In addition to the information contained here, we cover our program's philosophy, approach, and foundational model. You'll also find references and a list of National Science Standards for grades K-4 and 5-8.

Program Overview (Introduction)

Research has shown that learning science in informal environments can be particularly important for developing and validating children's positive, science-specific interests, skills, emotions, and identities (Bell et al., 2009).[1] With this research in mind, the Champions Science Adventures® program was created to provide *all* teachers with fun, up-to-date, and easy-to-implement ways to incorporate science into their after-school programs or to enhance and enrich their existing science curricula.

When developing content, two sources in particular helped inform this program: the National Science Teachers Association (NSTA) Quality Science Education and 21st-Century Skills position statement;[2] and the National Science Standards[3] for grades K - 4 and 5 - 8. In its position statement, NSTA acknowledged the need for and importance of 21st-century skills within the context of science education programs by stating that "Exemplary science education can offer a rich context for developing many 21st-century skills, such as critical thinking, [and] problem solving…especially when instruction addresses the nature of science and promotes the use of science practices" (NSTA, 2011). Our inclusion of the National Science Standards in the Champions Science Adventures® program demonstrates our commitment to providing a broad and developmentally appropriate content base for children in grades K through 8, and enables teachers and administrators to more easily discuss the program and align the lessons to content taught in regular science classrooms.

Champions Science Adventures® teaches children in kindergarten through 8th grade foundational science concepts and practices from four different content areas using an engaging, hands-on approach that develops critical-thinking skills and fosters a love of science learning. The four different content areas are: Earth and Space Science; Life Science; Physical Science; and Technology.

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[1] Bell, P., Lewenstein, B., Shouse, A. W., & Feder, A. eds. (2009). *Learning science in informal environments: People, places, and pursuits.* Washington, D. C.: The National Academies Press.

[2] The Partnership for 21st Century Skills is a leading advocacy organization focused on infusing 21st-century skills into public education. For more information about 21st Century Skills, go to: www.21stcenturyskills.org.

[3] The National Science Standards reflect the contributions of thousands of teachers, scientists, science educators, and other experts across the country. The standards represent what it means to be scientifically literate and describe what all children should be able to do at different levels in various science content areas. For more information about the National Science Standards, go to: www.nap.edu/html/nses/.

The Biological Science Curriculum Study (BSCS) designs science curricula for today's children and teachers. For more information about the BSCS, go to: www.bscs.org.

Curriculum Components

Several curriculum components comprise the Champions Science Adventures® program in addition to this program overview:

- Lesson-Specific Kits (called *In Kit* materials in the lessons)
- Materials Not Included in Kits (called *Not in Kit* materials in the lessons)
- Instructional Training Video
- The Science Lessons

Each of these four components is described below.

LESSON-SPECIFIC KITS

Most Champions Science Adventures® lessons come with a kit that contains learning materials utilized in the lesson. These materials are needed for successful implementation of the lessons, and cover a wide range of items – from plastic flies and colored sand to fiber-optic wands and universal indicators. Each kit contains enough materials for five (5) children; therefore, teachers should order the number of kits needed based on the number of children in their programs. For example, if there are 18 children in a program, the teacher should order four (4) kits.

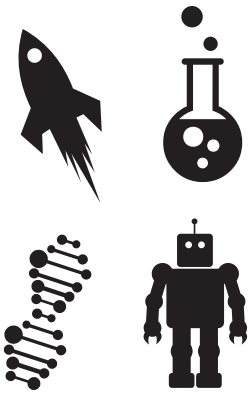
MATERIALS NOT INCLUDED IN KITS

All lessons in this program call for additional classroom materials teachers should find and gather and/or purchase prior to teaching the lessons. Other than materials that are designated as "optional," all materials that are not included in kits are needed for successful implementation of the lessons. These materials can be found in most classrooms or are available for purchase from local supermarkets or craft stores. Examples of these materials include child-size scissors, tape, pencils, photocopies of handouts, and crayons.

Note: When teachers are requested to make copies of handouts, regular copy paper should be used unless otherwise noted.

INSTRUCTIONAL TRAINING VIDEO

An instructional training video accompanies this program and is available for download from the website. The video showcases educators familiar with this program implementing different lessons from Champions Science Adventures.® Topics in this video include:



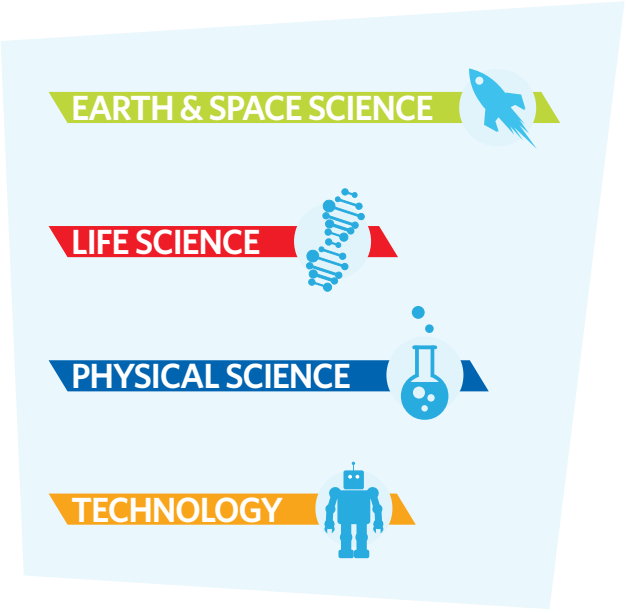
- Welcome and introduction to the Champions Science Adventures® program.
- The format of the lessons and the four science content areas covered in the program: Technology; Physical Science; Life Science; and Earth and Space Science.
- What inquiry-based learning is and how it is integrated into each science lesson.
- The research that supports this program and its instructional approach, including the BSCS 5E instructional model.
- Best practices for facilitating science learning among children, including preparing and managing a materials-intensive, hands-on science curriculum in a safe and developmentally appropriate way.

THE SCIENCE LESSONS

Science Content Areas Included in This Program

The Champions Science Adventures® program focuses on four science content areas that are color coded for quick reference. The four content areas and their corresponding colors are: Earth and Space Science (green); Life Science (red); Physical Science (blue); and Technology (orange). Here is a sampling of the topics included in each content area:

- **Earth and Space Science** lessons explore the properties and systems of Earth and our universe. Specific topics include: the solar system; space exploration; telescopes; weather and other natural events (earthquakes, volcanic eruptions); fossils.
- **Life Science** lessons explore the characteristics of organisms and the environment. Specific topics include: flowers; mammals; fish; reptiles; amphibians; spiders; insects; vertebrates and invertebrates; anatomy; microscopes; DNA.
- **Physical Science** lessons explore the properties of matter and motion, and the forces that occur when energy transforms from one form to another. Specific topics include: acids and bases; electricity; magnetism; gravity; flight; motion.
- **Technology** lessons explore the application of science and engineering to solve problems or challenges. Specific topics include: forensic science; flight; engineering; electricity.

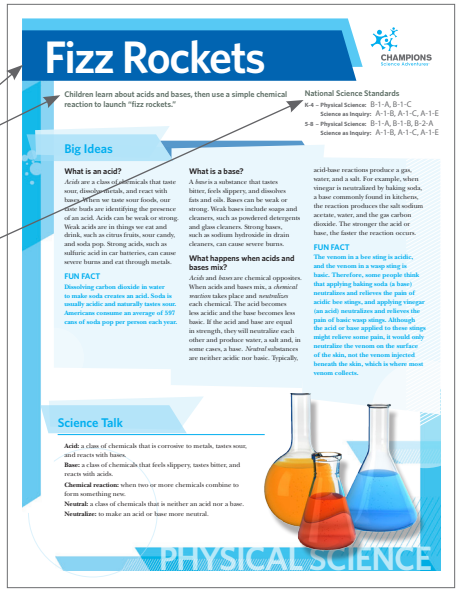


Lesson Format

To assist teachers in organizing and implementing the content, and to provide a familiar and comfortable learning environment for children, each lesson follows the same format. All Champions Science Adventures® lessons are designed to last between 45 and 75 minutes, depending on the age of the children and whether or not the Extensions to the lessons are taught. Before beginning a lesson, teachers should read through and familiarize themselves with the lesson, including how the various materials are utilized. Each lesson provides teachers with all of the science content needed to teach the lesson. However, teachers are always encouraged to personalize the lessons by drawing upon their own expertise or experience with the content. In addition, teachers may refer to current events or happenings as another way of enhancing the curriculum and connecting the science concepts to the children's own lives.

As noted above, each lesson follows the same format and contains the same sections. Each section is described below in order of its appearance in the lessons. When reviewing these sections, it is helpful to have a printed lesson to refer to as well.

- **Lesson Title and Overview:** Beneath the title of each lesson is a one- or two-sentence overview of the lesson and what the children will be doing or creating during the lesson.
- **National Science Standards:** Each lesson is aligned with one or more science standards from the National Science Standards for grades K – 4 and 5 – 8. All lessons are appropriate for children who fall within these grade levels. The key to successful implementation involves monitoring children's explorations and making adjustments, as needed, for older or younger groups of children.


Fizz Rockets

CHAMPIONS Science Adventures

Children learn about acids and bases, then use a simple chemical reaction to launch "fizz rockets."

National Science Standards

K-4 – Physical Science: B-1-A, B-1-C
Science as Inquiry: A-1-B, A-1-C, A-1-E
5-8 – Physical Science: B-1-A, B-1-B, B-2-A
Science as Inquiry: A-1-B, A-1-C, A-1-E

Big Ideas

What is an acid?

Acids are a class of chemicals that taste sour, dissolve metals, and react with bases. When we taste sour foods, our taste buds are identifying the presence of an acid. Acids can be weak or strong. Weak acids are in things we eat and drink, such as citrus fruits, sour candy, and soda pop. Strong acids, such as sulfuric acid in car batteries, can cause severe burns and eat through metals.

FUN FACT

Dissolving carbon dioxide in water to make soda creates an acid. Soda is usually acidic and naturally tastes sour. Americans consume an average of 597 cans of soda pop per person each year.

What is a base?

A *base* is a substance that tastes bitter, feels slippery, and dissolves fats and oils. Bases can be weak or strong. Weak bases include soaps and cleaners, such as powdered detergents and glass cleaners. Strong bases, such as sodium hydroxide in drain cleaners, can cause severe burns.

What happens when acids and bases mix?

Acids and *bases* are chemical opposites. When acids and bases mix, a *chemical reaction* takes place and *neutralizes* each chemical. The acid becomes less acidic and the base becomes less basic. If the acid and base are equal in strength, they will neutralize each other and produce water, a salt and, in some cases, a base. *Neutral* substances are neither acidic nor basic. Typically, acid-base reactions produce a gas, water, and a salt. For example, when vinegar is neutralized by baking soda, a base commonly found in kitchens, the reaction produces the salt sodium acetate, water, and the gas carbon dioxide. The stronger the acid or base, the faster the reaction occurs.

FUN FACT

The venom in a bee sting is acidic, and the venom in a wasp sting is basic. Therefore, some people think that applying baking soda (a base) neutralizes and relieves the pain of acidic bee stings, and applying vinegar (an acid) neutralizes and relieves the pain of basic wasp stings. Although the acid or base applied to these stings might relieve some pain, it would only neutralize the venom on the surface of the skin, not the venom injected beneath the skin, which is where most venom collects.

Science Talk

Acid: a class of chemicals that is corrosive to metals, tastes sour, and reacts with bases.
Base: a class of chemicals that feels slippery, tastes bitter, and reacts with acids.
Chemical reaction: when two or more chemicals combine to form something new.
Neutral: a class of chemicals that is neither an acid nor a base.
Neutralize: to make an acid or base more neutral.

PHYSICAL SCIENCE

On the first page of each lesson, teachers will see something similar to the following:

National Science Standards

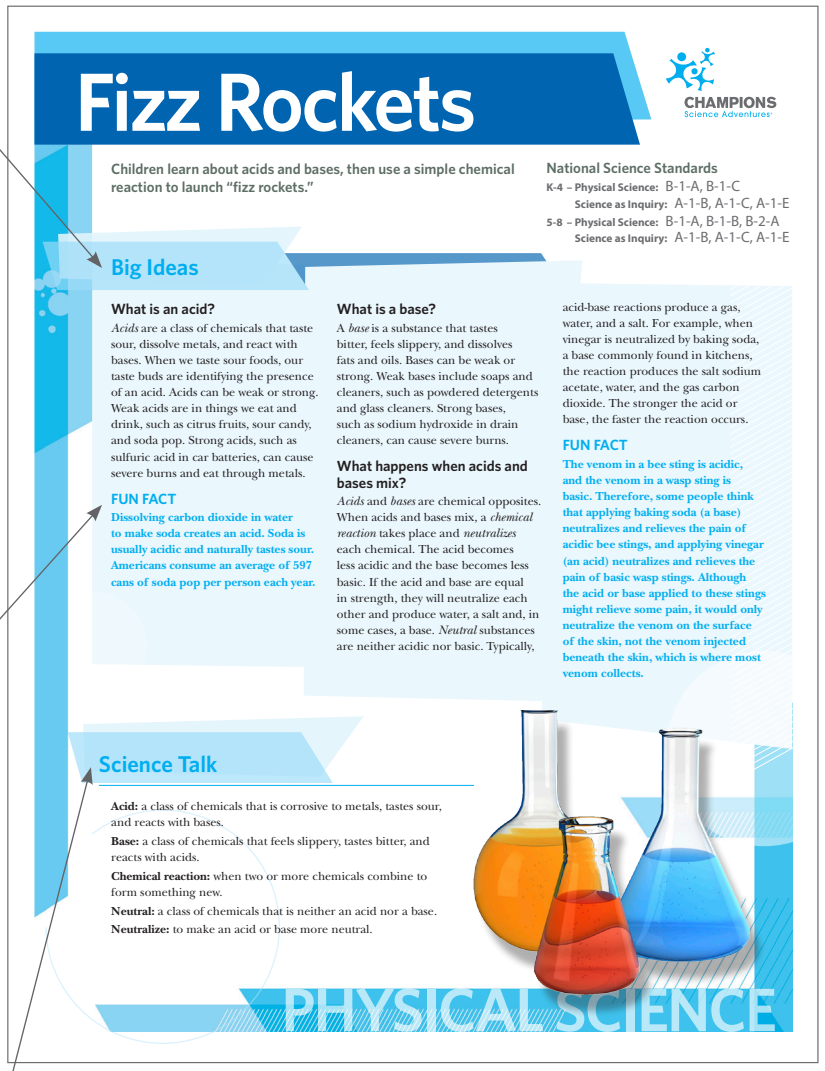
K-4 – Physical Science: B-1-A

5-8 – Physical Science: B-1-B

The National Science Standards reflect the contributions of thousands of teachers, scientists, science educators, and other experts across the country. The standards represent what it means to be scientifically literate and describe what all children should be able to do at different levels in various science content areas. This information is available in our Champions® Science Adventures® Program Guide.

Big Ideas: This section contains the key science concepts and any background information teachers need to successfully implement each lesson. Its informal, question-and-answer format is designed to help teachers become comfortable with the science content they will present to the children during the Explore and Experiment section of the lesson. Each Big Ideas paragraph contains words in italics. Most italicized words are listed and defined in the section Science Talk, and they represent the science vocabulary emphasized in each lesson. In each Big Ideas paragraph, Science Talk words are only italicized the first time they are used, and are intended to stand out for teachers while they read through each Big Idea in preparation for teaching a lesson.

Fun Fact: Following each Big Ideas paragraph is one Fun Fact related to the science content contained in that paragraph. Fun Facts are intended to create relevance and excitement about the topic. Teachers share Fun Facts with the children throughout each lesson, when appropriate. For example, a Fun Fact could be read aloud by the teacher to facilitate discussion while some children are finishing an activity or experiment and others are waiting to transition to a new phase of the lesson.



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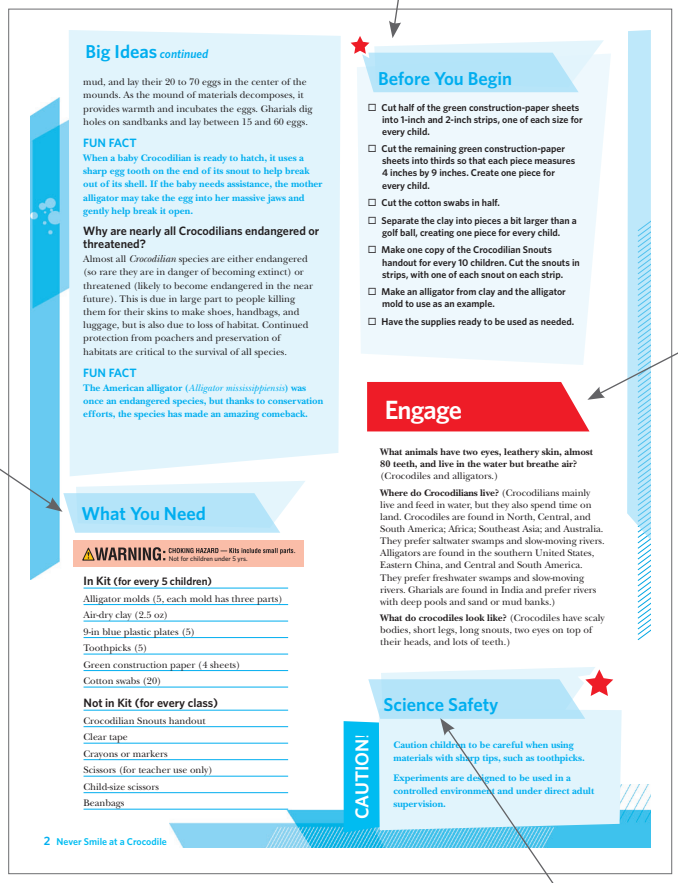
PHYSICAL SCIENCE

Science Talk: This section lists the science terms the children will be introduced to during each lesson as well as the definitions of those terms. The Science Talk section is intended to serve as a handy, at-a-glance reference for teachers.

Before You Begin: This section is a checklist of the things teachers will need to prepare prior to teaching the lesson as well as the items they should make available to children during the lesson. To ensure the successful implementation of each lesson, teachers should complete each task listed before gathering the children for the lesson. Teachers will need approximately 30 minutes to prepare the materials for each lesson, keeping in mind that some lessons will require slightly more or less preparation time.



Big Ideas *continued*

mud, and lay their 20 to 70 eggs in the center of the mounds. As the mound of materials decomposes, it provides warmth and incubates the eggs. Gharials dig holes on sandbanks and lay between 15 and 60 eggs.

FUN FACT

When a baby Crocodilian is ready to hatch, it uses a sharp egg tooth on the end of its snout to help break out of its shell. If the baby needs assistance, the mother alligator may take the egg into her massive jaws and gently help break it open.

Why are nearly all Crocodilians endangered or threatened?

Almost all *Crocodilian* species are either endangered (so rare they are in danger of becoming extinct) or threatened (likely to become endangered in the near future). This is due in large part to people killing them for their skins to make shoes, handbags, and luggage, but is also due to loss of habitat. Continued protection from poachers and preservation of habitats are critical to the survival of all species.

FUN FACT

The American alligator (*Alligator mississippiensis*) was once an endangered species, but thanks to conservation efforts, the species has made an amazing comeback.

Before You Begin

- ☐ Cut half of the green construction-paper sheets into 1-inch and 2-inch strips, one of each size for every child.
- ☐ Cut the remaining green construction-paper sheets into thirds so that each piece measures 4 inches by 9 inches. Create one piece for every child.
- ☐ Cut the cotton swabs in half.
- ☐ Separate the clay into pieces a bit larger than a golf ball, creating one piece for every child.
- ☐ Make one copy of the Crocodilian Snouts handout for every 10 children. Cut the snouts in strips, with one of each snout on each strip.
- ☐ Make an alligator from clay and the alligator mold to use as an example.
- ☐ Have the supplies ready to be used as needed.

Engage

What animals have two eyes, leathery skin, almost 80 teeth, and live in the water but breathe air? (Crocodiles and alligators.)

Where do Crocodilians live? (Crocodilians mainly live and feed in water, but they also spend time on land. Crocodiles are found in North, Central, and South America; Africa; Southeast Asia; and Australia. They prefer saltwater swamps and slow-moving rivers. Alligators are found in the southern United States, Eastern China, and Central and South America. They prefer freshwater swamps and slow-moving rivers. Gharials are found in India and prefer rivers with deep pools and sand or mud banks.)

What do crocodiles look like? (Crocodiles have scaly bodies, short legs, long snouts, two eyes on top of their heads, and lots of teeth.)

What You Need

⚠WARNING: CHOKING HAZARD — Kits include small parts. Not for children under 5 yrs.

In Kit (for every 5 children)

- Alligator molds (5, each mold has three parts)
- Air-dry clay (2.5 oz)
- 9-in blue plastic plates (5)
- Toothpicks (5)
- Green construction paper (4 sheets)
- Cotton swabs (20)

Not in Kit (for every class)

- Crocodilian Snouts handout
- Clear tape
- Crayons or markers
- Scissors (for teacher use only)
- Child-size scissors
- Beanbags

Science Safety

CAUTION!

Caution children to be careful when using materials with sharp tips, such as toothpicks.

Experiments are designed to be used in a controlled environment and under direct adult supervision.

2 Never Smile at a Crocodile

Engage: *This section correlates with the Engagement phase of the 5E instructional model.* It contains developmentally appropriate questions teachers can ask the children prior to a lesson, to help establish prior knowledge or experience with a concept and to help generate excitement about a concept. Most questions are open-ended and designed to promote discussion as well as ensure the content is relevant to the children.

What You Need: All of the materials needed to successfully implement each lesson are listed in this section. This section contains two parts: *In Kit* materials and *Not in Kit* materials. *In Kit* materials refer to the materials in the kits that accompany the lessons. Each kit contains enough materials for five children. In most cases, *Not in Kit* materials are ones found in classrooms or can be purchased locally, for example, tape, child-size scissors, and pencils. Teachers should find and gather these materials prior to teaching the lessons.

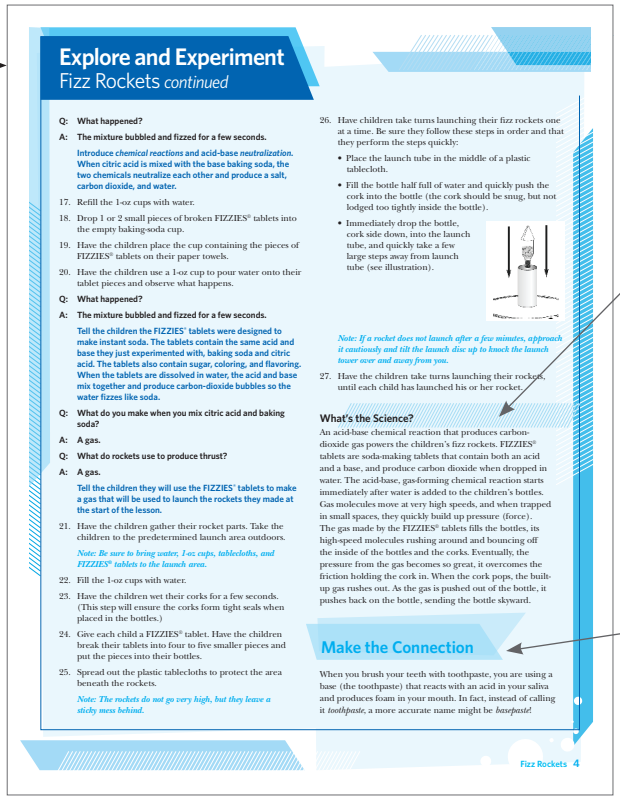
Make sure if a child takes the experiment home and has younger siblings, the parents know there are small parts included that are a choking hazard to children under 5.

⚠WARNING: CHOKING HAZARD — Kits include small parts. Not for children under 5 yrs.

Science Safety: This section contains all cautions that may apply to the implementation of a lesson. These cautions are often related to the materials used in lessons, but may also apply to the environment in which the lesson will take place. For example, some lessons are best implemented outdoors. When lessons take place outdoors, teachers should take care that the lesson area is free from any obstructions or other hazards that could compromise the children's safety. *All experiments are designed to be used in a controlled environment and under direct adult supervision.* In addition, teachers who are prepared and organized experience fewer safety-related incidents.

Explore and Experiment: *This section correlates with the Exploration phase of the 5E instructional model, and contains the main experiment(s) of the lesson.* Each experiment is designed to engage and entertain children through the use of fun and innovative materials and methods that capture children's imagination and provide intrinsic motivation for learning. The steps in each experiment are numbered to assist teachers in guiding the children through the experience.

Because one of the tenets of inquiry-based learning is exploring content through the use of questions, interspersed throughout each experiment are questions for teachers to ask the children. These questions and the answers children might provide appear in bold text, and are intended as starting points in the process. Teachers should always give children ample time to consider and answer each question as well as to ask and discover the answers to new questions. One way to ensure engagement would be to have children form pairs then discuss potential answers with their partners before sharing them with the whole group. Sometimes, however, the answer to a question is intended to be discovered during an experiment. In this case, teachers may be directed to tell the children something such as "I don't know what will happen, so let's find out!"



Explore and Experiment
Fizz Rockets *continued*

Q: What happened?
A: The mixture bubbled and fizzed for a few seconds.

Introduce *chemical reactions* and acid-base *neutralization*. When citric acid is mixed with the base baking soda, the two chemicals neutralize each other and produce a salt, carbon dioxide, and water.

17. Refill the 1-oz cups with water.
18. Drop 1 or 2 small pieces of broken FIZZIES® tablets into the empty baking-soda cup.
19. Have the children place the cup containing the pieces of FIZZIES® tablets on their paper towels.
20. Have the children use a 1-oz cup to pour water onto their tablet pieces and observe what happens.

Q: What happened?
A: The mixture bubbled and fizzed for a few seconds.

Tell the children the FIZZIES® tablets were designed to make instant soda. The tablets contain the same acid and base they just experimented with, baking soda and citric acid. The tablets also contain sugar, coloring, and flavoring. When the tablets are dissolved in water, the acid and base mix together and produce carbon-dioxide bubbles so the water fizzes like soda.

Q: What do you make when you mix citric acid and baking soda?
A: A gas.
Q: What do rockets use to produce thrust?
A: A gas.

Tell the children they will use the FIZZIES® tablets to make a gas that will be used to launch the rockets they made at the start of the lesson.

21. Have the children gather their rocket parts. Take the children to the predetermined launch area outdoors.

Note: Be sure to bring water, 1-oz cups, tablecloths, and FIZZIES® tablets to the launch area.

22. Fill the 1-oz cups with water.
23. Have the children wet their corks for a few seconds. (This step will ensure the corks form tight seals when placed in the bottles.)
24. Give each child a FIZZIES® tablet. Have the children break their tablets into four to five smaller pieces and put the pieces into their bottles.
25. Spread out the plastic tablecloths to protect the area beneath the rockets.

Note: The rockets do not go very high, but they leave a sticky mess behind.

26. Have children take turns launching their fizz rockets one at a time. Be sure they follow these steps in order and that they perform the steps quickly:
    - Place the launch tube in the middle of a plastic tablecloth.
    - Fill the bottle half full of water and quickly push the cork into the bottle (the cork should be snug, but not lodged too tightly inside the bottle).
    - Immediately drop the bottle, cork side down, into the launch tube, and quickly take a few large steps away from launch tube (see illustration).

Note: If a rocket does not launch after a few minutes, approach it cautiously and tilt the launch disc up to knock the launch tower over and away from you.

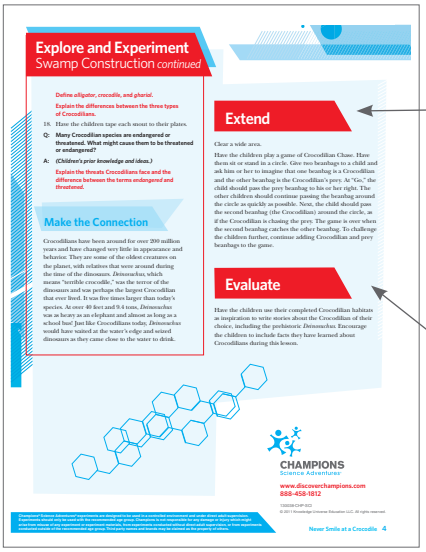
27. Have the children take turns launching their rockets, until each child has launched his or her rocket.

What's the Science?
An acid-base chemical reaction that produces carbon-dioxide gas powers the children's fizz rockets. FIZZIES® tablets are soda-making tablets that contain both an acid and a base, and produce carbon dioxide when dropped in water. The acid-base, gas-forming chemical reaction starts immediately after water is added to the children's bottles. Gas molecules move at very high speeds, and when trapped in small spaces, they quickly build up pressure (force). The gas made by the FIZZIES® tablets fills the bottles, its high-speed molecules rushing around and bouncing off the inside of the bottles and the corks. Eventually, the pressure from the gas becomes so great, it overcomes the friction holding the cork in. When the cork pops, the built-up gas rushes out. As the gas is pushed out of the bottle, it pushes back on the bottle, sending the bottle skyward.

Make the Connection
When you brush your teeth with toothpaste, you are using a base (the toothpaste) that reacts with an acid in your saliva and produces foam in your mouth. In fact, instead of calling it *toothpaste*, a more accurate name might be *basepaste*!

Fizz Rockets 4

- **What's the Science?:** This section appears within the Explore and Experiment section, and indicates to the teacher that he or she should pause to discuss the science concept related to the step in the experiment the children just completed. *This section correlates with the Explanation phase of the 5E instructional model by providing the scientific explanation for the science concept(s) the children are learning about at specific points or during certain steps in an experiment.*
- **Make the Connection:** This section helps children contextualize what they have learned within the framework of their existing levels of understanding and experiences, in order to deepen their understanding as well as promote retention.



Explore and Experiment
Swamp Construction *continued*

Define *alligator*, *crocodile*, and *gharial*.
Explain the differences between the three types of Crocodilians.

18. Have the children tape each snout to their plates.

Q: Many Crocodilian species are endangered or threatened. What might cause them to be threatened or endangered?
A: *(Children's prior knowledge and ideas.)*

Explain the threats Crocodilians face and the difference between the terms *endangered* and *threatened*.

Make the Connection
Crocodilians have been around for over 200 million years and have changed very little in appearance and behavior. They are some of the oldest creatures on the planet, with relatives that were around during the time of the dinosaurs. *Deinosuchus*, which means "terrible crocodile," was the terror of the dinosaurs and was perhaps the largest Crocodilian that ever lived. It was five times larger than today's species. At over 40 feet and 9.4 tons, *Deinosuchus* was as heavy as an elephant and almost as long as a school bus! Just like Crocodilians today, *Deinosuchus* would have waited at the water's edge and seized dinosaurs as they came close to the water to drink.

Extend
Clear a wide area.

Have the children play a game of Crocodilian Chase. Have them sit or stand in a circle. Give two beanbags to a child and ask him or her to imagine that one beanbag is a Crocodilian and the other beanbag is the Crocodilian's prey. At "Go," the child should pass the prey beanbag to his or her right. The other children should continue passing the beanbag around the circle as quickly as possible. Next, the child should pass the second beanbag (the Crocodilian) around the circle, as if the Crocodilian is chasing the prey. The game is over when the second beanbag catches the other beanbag. To challenge the children further, continue adding Crocodilian and prey beanbags to the game.

Evaluate
Have the children use their completed Crocodilian habitats as inspiration to write stories about the Crocodilian of their choice, including the prehistoric *Deinosuchus*. Encourage the children to include facts they have learned about Crocodilians during this lesson.

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Never Smile at a Crocodile 4

- **Extend:** *This section correlates with the Elaboration phase of the 5E instructional model, and consists of an activity or additional experiment that builds on the science concept introduced during the Explore and Experiment section.* Teachers can choose to conduct this activity immediately after the activity or activities from the Explore and Experiment phase or conduct it as a separate activity at another time. As with the section Make the Connection, the Extend section provides an additional level of understanding of the science concepts by drawing connections to existing knowledge, and is another way to help children retain what they have learned.
- **Evaluate:** *This section correlates with the Evaluation phase of the 5E instructional model.* It includes ways teachers might assess the children's learning through methods that are age-appropriate and meaningful.

Implementing Champions Science Adventures® Lessons

PREPARING KITS AND OTHER MATERIALS

Before conducting a lesson, teachers should always read through the entire lesson to ensure they understand the science content and that they have all of the kit items and other materials needed to successfully implement the lesson.

- ### Distribution of Materials

  Many lessons contain materials with numerous parts and pieces that teachers should prepare in advance according to the checklist provided in the section Before You Begin. In addition, teachers will sometimes need to consider how best to distribute the materials to the children, to ensure there is an efficient process that makes the best use of the time allotted for the lesson. For example, one way to set up materials for easy distribution would be to set out the materials "buffet-style" on one or more tables, and have each child gather the needed materials in a paper lunch bag while proceeding down the table.

- ### Preparing Materials for Younger Children

  Teachers may need to spend more time preparing materials for younger children in advance. For example, teachers may need to cut strings to certain lengths, tear strips of tape, or tie knots in items, to ensure younger children have time to successfully complete an experiment or activity. Or teachers could consider asking older children to assist younger children with preparing materials prior to or during a lesson. Experiments are not appropriate for children under the age of 5.

- ### Preparing and Using Chemicals

  Whenever a lesson calls for the use of chemicals, teachers must prepare (measure and place in containers, etc.) the chemicals prior to the children's arrival. In addition, teachers must always follow the chemical safety rules stated in the lesson.

INTEGRATING BEST PRACTICES IN CHAMPIONS SCIENCE ADVENTURES® LESSONS

- ### Inquiry-Based Learning

  The lessons in this program are founded on the concept of inquiry. With this in mind, teachers are encouraged to begin each lesson by asking the children divergent questions that facilitate discussion and help ensure content is relevant to the children, always allowing enough time for children to answer the questions. One way to ensure engagement and participation from the onset is to have children form small groups and answer questions among themselves before sharing their answers with the entire group. However, sometimes the best questions and observations are ones that generate from the children. Therefore, at any point during a lesson, teachers should be flexible and alert for opportunities to strengthen children's understanding through their own experiences and discoveries.

- ### Hands-on Activities

  The hands-on activities and experiments are the cornerstone of the lessons. Research has shown that layering content within the context of kinesthetic (physical) actions helps strengthen comprehension and retention – in essence, creating a "hands-on/mind's-on" learning environment. Therefore, the Explore and Experiment section of each lesson also contains content related to the topics being explored that teachers should share with the children at specific times throughout an experiment.

Techniques to Help Ensure Children Are Focused and Safe

To ensure experiments run smoothly and that children are focused and safe, there are several techniques that may be helpful to teachers.

- During experiments, teachers should always make sure their directions are clear and appropriate for the ages of the children in their group.
- For more complicated, multi-step experiments, sometimes a cueing system, or focusing technique, that alerts children to look at the teacher, set down anything they may be holding, and wait for further directions may be needed. A cueing system can be as simple as "One, two, three—eyes on me."
- Pausing during steps and allowing children to catch up or allowing children help one another is also effective. This could also be a good time for teachers to share a Fun Fact or two with the children to keep them focused on content while waiting for others to complete a step.
- All Champions Science Adventures® lessons should be fun and children should be actively engaged. However, sometimes it may be necessary to set expectations, or classroom rules, for certain activities to ensure children are not distracting others and, more importantly, to ensure all children are safe. For example, during a lesson in which children are flying their own gliders, the expectation (rule) might be that children may only fly their gliders in a designated area, away from other children and other obstructions. An additional expectation might be that children may only retrieve their gliders after all of the children have flown their gliders.

There should always be time at the end of a lesson for children to reflect on their learning and for the teacher to evaluate the effectiveness of the lesson. The section Make the Connection at the end of each lesson is intended to help children connect the content of the lesson to other scenarios in their own lives—thereby providing context for their science learning as well as promoting retention. If schedules allow, this is also a great time for families and other school personnel to join in on the children's learning and fun.

Finally, the key to successful, inquiry-based instruction, is to generate an atmosphere of exploration free from risk that allows children to generate questions and theories, to test those theories, and to delight in their discoveries. The process is most successful when there is balance between allowing children time to explore and investigate, and imparting foundational science content that is understood and is meaningful to the children. Champions Science Adventures® lessons are designed not only to impart foundational science content and science-process skills, but to provide children with other lifelong skills and dispositions, such as problem solving, critical thinking, and a love for learning.