



Getting Started with APEX Science

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APEX Science Curriculum Overview

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Welcome to APEX Science

How do I use APEX Science?

In the following pages of this Trainer’s Guide, you will learn more about the curriculum, the standards addressed by each unit, and how to implement it. We have also included suggestions for creating a science center in your afterschool program, as well as some important safety guidelines.

The complete curriculum consists of eight units; each unit is packaged in its own Trainer’s Guide that includes four expeditions, or lessons, developed around the unit’s unique thematic focus. If you have never tried to “do science” with the children in your center, don’t be nervous – we’ve provided tools to help you! Please take a few minutes to become familiar with the components of each expedition. The **Background Information for Activity Leaders** reviews the key science concepts, and also provides you with an idea of what to expect the children to do. Then take a look at the detailed instructions included in the laminated **Activity Leaders Guide**. You’ll learn what materials to gather and how to set up the APEX Science Center, and also find a guided script that walks you through the expedition. Next, review the laminated **Expedition Learning Cards** that your children will use to explore the science concepts. Finally, review the **Data Collection Sheet** templates and any other supplementary materials for the expedition.

The order in which you implement the units and expeditions depends on your afterschool program’s needs and time constraints. You may, for example, choose to implement one unit per month, which is equivalent to one expedition per week, or you may find that the children want to explore an expedition or a unit over a longer period of time. We have ordered the four expeditions for each unit in a way that allows the activity leader and the children to build on what they learn about the unit’s theme.

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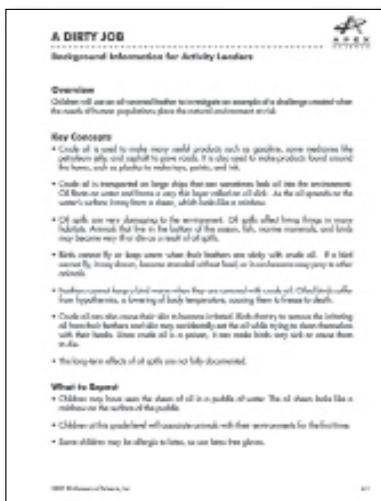


Description of Expedition

Component	Audience	Purpose
Background Information for Activity Leaders	Activity Leader	This section is designed to enhance the activity leader’s understanding of the science activity the children will explore. It includes a brief overview, key concepts, what to expect children to do, or what they may find challenging in the lesson, and a description of common misconceptions they may have about the concepts.
Activity Leader’s Guide	Activity Leader	The laminated Activity Leader’s Guide is a road map. It includes a materials list and instructions to prepare the demonstration component of the expedition (lesson), as well as how to set up the exploration. It also provides guided instructions to introduce and implement each section of the children’s Expedition Learning Card: Wonder, Explore, Record, Expand and Conclude.
Expedition Learning Card	Children	Each lesson includes three laminated copies of the Expedition Learning Card. The Learning Card is divided into five sections: Wonder, Explore, Record, Expand and Conclude, and guides groups of children through an investigation. Also included are: a guiding question, a three word vocabulary list, and a “why did we do that?” section that summarizes key concepts.
Data Collection Sheet	Children	This component provides a place for children to draw, write, or otherwise record their observations and responses to the prompts on the Expedition Learning Card.
Supplemental Materials	Activity Leaders Children	Supplemental materials, such as drawings or special instructions for creating specific materials, vary from lesson to lesson. In some cases we strongly recommend that the supplemental materials be laminated by the activity leader because they will be used repeatedly by the children or the activity leader; instructions for these cases are included in the lesson background section.

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Expedition at a Glance



A DIRTY JOB
Background Information for Activity Leaders

Overview
Children will use an array of materials to investigate an example of a challenge created when the needs of human populations drive the natural environment.

Key Concepts

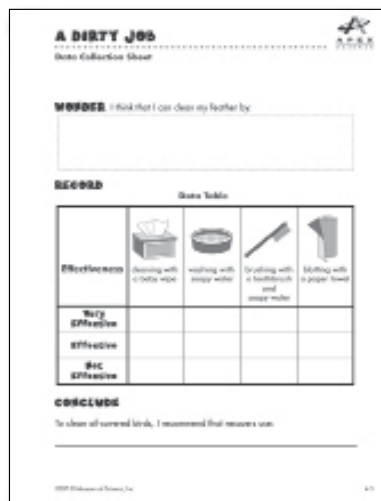
- Create a list to make more useful products such as goggles, swim caps, and life preservers. Life preservers only and useful to give each. It is also used to make a list based around the items, such as plastic, rubber, paper, and so on.
- Create a list to investigate a large ship that has sometimes had to use the environment. It has an engine and a way the large collection of life. In the air, the water's surface being from a ship, which looks like a window.
- Oil spills are very dangerous to the environment. Oil spills affect living things in many habitats. Animals that live in the bottom of the ocean, fish, marine mammals, and birds may become very ill if they eat oil or spill.
- Birds cannot fly or keep warm when their feathers are oily with crude oil. If a bird cannot fly, being alone, because it cannot fly, it is in a bad situation. It is in a bad situation, because it cannot fly, it is in a bad situation.
- Humans cannot help a lot of things when they are covered with oil. Oil spills affect the environment, a lowering of body temperature, causing them to freeze to death.
- Create a list to make their life in human habitat. Birds that try to survive the landing of their birds, feathers and so on, can be very hard to see. The oil spills trying to clean themselves with their hands, clean water, and so on, it can make birds, very sick or even dead.
- The long-term effects of oil spills are not fully documented.

What to Expect

- Children may have seen the shape of oil in a puddle of water. The oil often looks like a rainbow on the surface of the puddle.
- Children at this grade level will associate animals with their environments for the first time.
- Some children may be allergic to latex, so use latex-free gloves.

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Background Information for Activity Leaders



A DIRTY JOB
Data Collection Sheet

WORDER I think that I can clean my feather by _____

RECORD

State Table

	Washing with a cloth wipe	Washing with soap water	Crabbing with a toothbrush and soap water	Washing with a paper towel
Effectiveness				
Why Effective				
How Effective				
How Effective				

CONCLUDE
To clean of covered birds, I recommend that means use _____

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Children's Data Collection Sheet



A DIRTY JOB
Expedition Learning Card

How will you help the bird feather?

1 WORDER How can we clean the feather from its mess? How can we help the bird feather?

2 EXPLORE Find a way to clean the feather so it can fly again. Use the materials you have. Be creative! Imagine that you are working on the boat.

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Children's Expedition Learning Card (Front)



A DIRTY JOB
Expedition Learning Card

3 RECORD Note the effectiveness of each method. **GET READY: your feather on the Data Table.**

4 CONCLUDE Which method was best able to clean your feather?

5 EXPAND Make a plan of how you can help protect wildlife in your neighborhood. **GET READY: a picture on a sheet of paper that shows the wildlife & your neighborhood and how you can help protect them from the mess. Use any online resources. Give your ideas to help in your community.**

Discovery We discovered that feathers take a long time to clean. They are very important to the bird. They are very important to the bird. They are very important to the bird.

Congratulations! You have helped a bird. You have helped a bird. You have helped a bird.

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Children's Expedition Learning Card (Back)



A DIRTY JOB
Activity Leader's Guide

Engage

- 1 Gather the children together. Explain the purpose of our oil spill. Tell them you are going to do a project to help the bird.
- 2 Ask: "How can we clean the feather from its mess? How can we help the bird feather?"
- 3 Ask: "How can we clean the feather from its mess? How can we help the bird feather?"
- 4 Ask: "How can we clean the feather from its mess? How can we help the bird feather?"

Explore

- 1 If you are working with more than 4-5 children, divide the children into groups. Distribute the Data Collection Sheet and the Learning Card. Ask the children to put on the gloves and the gloves to protect their eyes and skin from the harmful effects of the simulated crude oil.
- 2 "Today we are going to pretend to recover a bird that has been covered in oil. We will use a number of different methods to clean it. Follow the instructions on the Learning Card to investigate the best way to recover the oil from the mess."
- 3 Place all covered feathers on each child's plate.
- 4 Allow children enough time to complete the WORDER, RECORD, CONCLUDE, and EXPAND sections of the Learning Card.

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Activity Leader's Guide (Front)



A DIRTY JOB
Activity Leader's Guide

Conclude

- 1 Gather the children together and ask the following questions:
 - "Which method worked best?" Encourage children to explain the reasons why one method worked better than the others.
 - "What did you learn today? Justify the reason you chose to help the bird. How can we help the bird? How can we help the bird?"
- 2 Ask: "How can we clean the feather from its mess? How can we help the bird feather?"
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Activity Leader's Guide (Back)

APEX Science Curriculum Overview

Implementing APEX Science Expeditions

APEX Science was developed to give afterschool program providers a flexible curriculum that adapts to the unique needs of your center. For example, the materials were designed to be used by children in grades K-5, working in small groups, to accommodate the needs of centers that work with multiage groups, as well as those that divide children by grade level into smaller groups. Young children, or those with lower reading and writing skills may need your guidance to complete the expedition. You may want to try grouping children with lower reading and writing skills with children with higher skills. The easy-to-follow directions and child-friendly graphics will engage all children and make the experience fun.

Background Information for Activity Leaders

Before conducting an expedition, become familiar with the Background Information for Activity Leaders. It provides an overview of the basic science concepts that the children will explore and help you facilitate discussion and anticipate the children's questions. It also includes suggestions about what the children may do or find challenging, and explanations about common misconceptions the children may have. This component also contains instructions on how to prepare any expedition materials that need to be built or preassembled. In addition, some expeditions may contain drawings, pictures, or game cards that help facilitate the expedition.

Activity Leaders Guide

Use the laminated Activity Leader's Guide to prepare for the expedition. On the left side of the front of the card you'll find a list of materials and instructions to help prepare the demonstration you will do with the whole group. This area also contains the instructions necessary to set up the APEX Science Center, which will be used by the children in small groups to complete the expedition. On the right side of the front of the card you'll find guided instructions. Take time to read through it. You'll notice that the colored text is the recommended language that may be used until you feel more comfortable with the concepts and the materials.

This section is divided into three parts. ENGAGE is completed first as a whole group. During EXPLORE, children work in small groups at their APEX Science Center using the laminated Expedition Learning Cards. Once they complete the Expedition they will gather

APEX Science Curriculum Overview

Implementing APEX Science Expeditions (continued)

as a whole group again. Use the CONCLUDE section of the Activity Leader's Guide, engage the children in a conversation about their findings and what else they might want to explore.

The top right hand side of the Activity Leader's Guide indicates the ideal group size for each expedition. Each small group should have their own set of materials and equipment whenever possible. You may want to set up a schedule to cycle groups through the Science Center during the afternoon or over a period of a week; be sure to replenish any consumable supplies as needed.

Expedition Learning Card

The Expedition Learning Card guides children through the expedition and gives them open-ended prompts that engage them in conducting an experiment, testing their own products, or modeling a natural phenomenon. The WONDER, EXPLORE, RECORD, EXPAND and CONCLUDE sections are completed during the time children are at the APEX Science Center. Depending on the expedition, the children may be asked to complete the entire card, or they may be asked to complete the EXPAND section at home or at their own pace. For example, in the expedition Ecosystem on a String, after children complete the process of building their own small-scale model of a living ecosystem, they are challenged to EXPAND their understanding by keeping a voluntary log of their Ecosystem observations on their own pocket sized observation log. This type of activity is consistent with the science center philosophy, which encourages children to explore at their own pace, and according to their own interests. The activity leader's role is to model curiosity and show interest in the children's endeavors to discover along their own interests.

Data Collection Sheets

Ask any scientist how they keep track of what happens in their research, and they'll tell you that they always record their findings, using drawings, written descriptions, data tables, journals, etc. Each APEX Science expedition includes a data collection sheet to encourage children to document their thoughts and findings at their own developmental level. There is space to write or to draw depending on the child's writing and language skills. Encourage the children to review and share their data with other children, and to think about what their findings mean, and what new questions they might ask based on what happened.

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Creating a Science Center

Why a Science Center?

A science center is a place where active hands-on science may take place at any time, whether children choose to participate in a structured activity, or are inspired to investigate their own questions. A science center incorporates activities and materials that are initiated by an activity leader, but should also be conducive to child-directed inquiry investigations and experiments. Children learn more by returning to explore an idea, rather than being expected to completely understand it at first exposure. Once they have completed an APEX Science expedition, encourage them to explore their own questions generated by an expedition, either on their own or in a small group. These opportunities for independent and collaborative exploration offer children a foundation for a lifelong appreciation and pursuit of science.

A science center encourages and depends on interactions and behaviors that are considered good practice for afterschool staff. As an APEX Science activity leader, you will need to:

- support children's initiative
- assist without taking control
- encourage children to take leadership roles
- interact with children to help them learn
- ask questions that encourage children to think for themselves
- share skills and resources to help children gain information and solve problems
- vary the approaches used to help children learn
- allow children to express their ideas, take time to listen

Workspace

A science center does not need to be costly or elaborate. It might consist of a table or tables that are set apart to incorporate storage and provide readily available access for science tools and resources, works in progress and collections of objects that children can use to explore. The center should be engaging and organized to allow easy access to basic science tools. Access to a sink is very helpful.

Storage

In most afterschool programs storage space is a challenge. With the increased focus on science assessment, you may find that school leaders are more willing to allocate space to store materials needed to implement science in your afterschool program. If space continues to be limited, rotate materials related to the current unit so that they are easily accessible on a daily basis.

APEX Science Curriculum Overview

Creating a Science Center (continued)

Equipment

Children need opportunities to learn to use simple science equipment and tools to gather data and to extend their senses. Try to provide a variety of tools in your science center for children to use:

- different kinds of rulers to measure the length, height, and depth of objects and materials
- thermometers to measure temperature
- stopwatches to measure time
- balances and scales to measure weight and force
- tweezers to pick up small items
- measuring spoons and cups
- magnifiers to observe objects and organisms
- microscopes to observe the finer details of plants, animals, rocks, and other materials
- computers, handheld devices, and calculators to conduct investigations and gather data

APEX Science Curriculum Overview



Safety

General Safety

- Children must be appropriately supervised according to ages, abilities and needs.
- Children should be supervised when they arrange materials and equipment to suit their activities to screen for potential hazards.
- Closely supervise activities that are potentially harmful.
- Children should be able to easily get materials out and put them away by themselves to reduce risks of injury.
- Proper precautions should be taken when working with sharp objects. Children should never be allowed to work with sharp knives or blades.
- Never use mercury thermometers. They are no longer sold due to the danger of mercury poisoning should the thermometer break.
- Some children have medical conditions, allergies, or other challenges. Become informed about the conditions that may cause danger to the children in your center.
- Remind children not to place foreign objects into their mouths, ears or nostrils.
- Very loud sounds can cause permanent hearing damage; remind children to be cautious, and monitor volume levels during sound explorations.

Eye Safety

- Activity leaders and children should wear safety goggles when working with chemicals or materials that may irritate the eyes, or when objects or projectiles may misfire and accidentally strike an eye. If possible, provide a set of child-sized goggles in your science center to ensure that they fit properly.
- Activity leaders and children should never look directly into the sun. Looking directly at the sun without protection can cause permanent eye damage, even on a cloudy day.
- Children should wash their hands before they touch their eyes.

APEX Science Curriculum Overview

Safety (continued)

Liquid or Powdered Chemical Safety

- The activity leader must be aware of possible adverse chemical interactions. Avoid placing products that may interact with each other at the science center. Carefully read product labels. For example, product labels warn that mixing common products such as bleach and other cleaners can produce harmful fumes.
- Wear goggles and wash hands frequently to protect the eyes, mouth and nose. Even common chemicals such as salt can sting and irritate the eyes.

Outdoor and Living Organism Safety

- Science often occurs outdoors, and when your expedition leads you outside, avoid dangerous areas. Areas that will be used by children should be inspected for dangers such as unauthorized personal, automobile traffic, broken glass, poisonous plants or dangerous animals or insects.
- Become familiar with local plants, insects or animals that are poisonous, bite or sting. Ask the afterschool program site director to post the local poison control emergency number. Your local agricultural agency can also provide posters and information about potential dangers from local plants.
- Use careful judgment when allowing children to collect live organisms. For example, turtles have been known to be carriers of salmonella and some wild animals may have rabies. Also, some plants, birds or animals may not be touched because they are protected under environmental laws.
- Activity leaders and children should practice frequent hand washing, especially after working with soils, chemicals, or live organisms.
- Do not use old batteries that appear corroded. Wires used in combination with batteries may become excessively hot.
- Do not dispose of chemicals without first checking for specific disposal directions provided on the label.