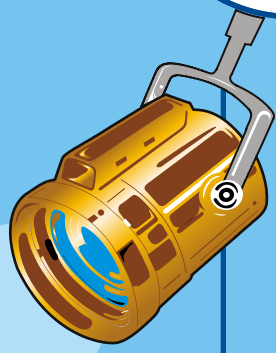
Mad SCIENCE



Movie MAGIC

THE SCIENCE BEHIND THE MOVIES

Teachers' Resource Manual

Hands-On Activities,
Classroom Demonstrations & More!

Volume 6

TEACHERS' RESOURCE MANUAL

History and Mission of Mad Science®

Established in Montreal, Canada, in 1985, the Mad Science Group performs live, interactive, and exciting science programs to children in 22 different countries through a network of more than 144 franchises. Mad Science presentations are designed specifically to be fun, entertaining, and educational. The Funky Farmworks performance you attended with your group demonstrates the commitment of Mad Science to both science education and sparking imaginative learning. To discover more about how you can expand the experience by inviting Mad Science into your school, community center, or home, visit our website at www.madscience.org.

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Welcome to the Movie Magic Teachers' Resource Manual

This manual is intended to extend the Mad Science *Movie Magic* experience by providing related demonstrations and activities that can be performed in the classroom. It has been designed to meet the needs of educators by fulfilling specific standards, which are outlined in the following section, as well as to facilitate the inquiry-based learning process. Included is a collection of science activities and demonstrations, and extension ideas in the areas of math, language arts, social sciences, and art. Vocabulary words and background information are also provided to ensure that the concepts presented in the activities can be fully explained.

This guide is also practical for scout leaders, camp directors, after-school program animators, and parents to conduct hands-on science activities consistent with the concepts presented in Movie Magic. The activities can be conducted with one child or 30 children and will further illustrate the science concepts related to movie-making and special effects.

The experiments presented in this guide follow a number of principles of physics, chemistry, and even psychology. The activities will demonstrate to students the concepts related to light, sound, perception, illusion, and special effects. To simplify the process of organizing experiments so that they can be conducted with children, all the elements necessary for each activity are grouped together, including the main concept, materials needed, tips, safety precautions, detailed steps, and explanations. Extension activities in other subject areas and suggestions for field trips have also been included to illustrate for students the multi-disciplinary nature of both science in general and movie-making in particular. Finally, a background information section briefly reviews the main movie-making concepts referred to in the activities, as well as related vocabulary, and lists several books to consult if more information is required. The section also includes various cross-curricular activities.

A generic experiment page for students' use is provided in the appendix; it may be freely photocopied and distributed. The sheet encourages students to note all the information that should be collected when any science experiment is conducted—this will help to reinforce the important elements of the scientific method. Before beginning any activities, you may want to review these concepts with the class. The definitions on the next page have been written in language that is appropriate for children in order to help clarify the ideas and processes involved in conducting a scientific experiment.

The Scientific Method

1. *Hypothesize*: A hypothesis is your best guess as to what will happen when you perform an experiment, given what you already know.
2. *Observe*: Whatever you saw happening while the experiment was performed should be recorded. These observations, which you can both write and draw, will help you to better understand what occurred during the experiment and can help if you ever want to conduct the experiment again. While recording your observations, try to include information gathered from as many of your senses as possible; these are the things you notice using your senses of smell, taste, touch, sight, and hearing. Remember to make sure that you never smell, taste, or touch anything that you do not recognize or that has not been approved by your teacher.
3. *Record*: Write down the materials you used, steps that you followed, and what happened during the experiment. You may also want to include diagrams and other detailed illustrations to depict the experiment.
4. *Draw Conclusions*: Conclusions are your ideas about why the experiment worked, or did not work, the way it did.

National Science Education Standards Met by This Teachers' Resource Manual

The National Science Education Standards were developed by the National Research Council in the United States, in collaboration with many other bodies, as well as a number of teachers, school administrators, parents, curriculum developers, college faculties, scientists, engineers, and government officials. They outline what students need to know and understand and what they should be able to do to be scientifically literate, and rest on the premise that science is an active process.

SCIENCE AS INQUIRY

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

PHYSICAL SCIENCE

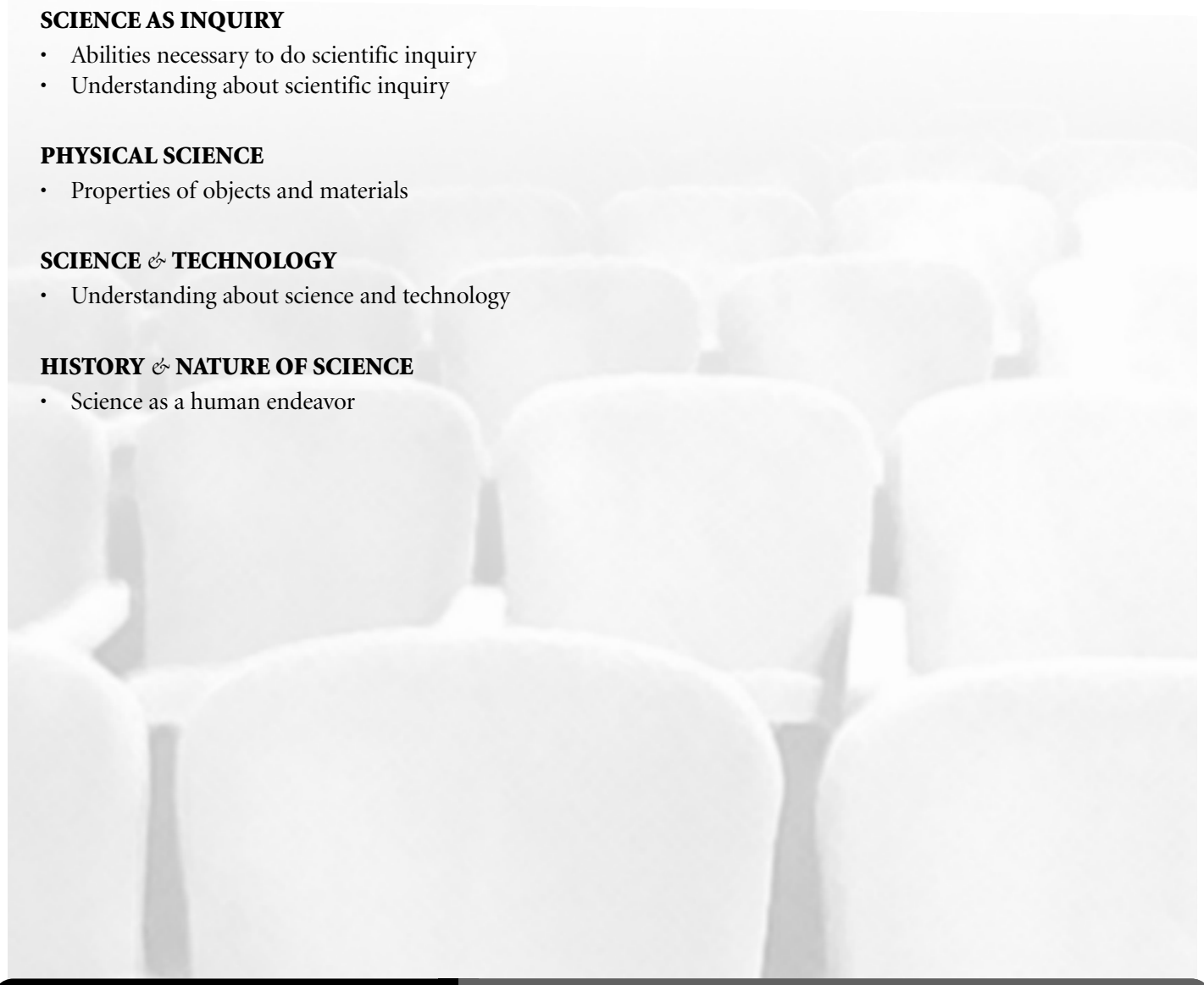
- Properties of objects and materials

SCIENCE & TECHNOLOGY

- Understanding about science and technology

HISTORY & NATURE OF SCIENCE

- Science as a human endeavor



National Science Education Standards Met by All Mad Science® TRMs

	Movie Magic	Funky Farmworks	Don't Try This At Home II: Newton's Revenge	Mad Mission to Mars: 2025
SCIENCE AS INQUIRY				
Abilities necessary to do scientific inquiry	X	X	X	X
Understanding about scientific inquiry	X	X	X	X
PHYSICAL SCIENCE				
Properties of objects and materials	X	X		
Position and motion of objects	X		X	X
LIFE SCIENCE				
Characteristics of organisms		X		X
Life cycles of organisms		X		
Organisms and environments		X		
EARTH AND SPACE SCIENCE				
Properties of earth materials		X		X
Objects in the sky				X
Changes in earth and sky				X
SCIENCE AND TECHNOLOGY				
Ability to distinguish between natural objects and objects made by humans	X			X
Ability of technological design	X		X	X
Understanding about science and technology	X	X	X	X
SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES				
Personal health		X		
Characteristics and changes in populations				
Types of resources		X		X
Changes in environments		X		X
Science and technology in local challenges				
HISTORY AND NATURE OF SCIENCE				
Science as a human endeavor	X	X	X	X

Canadian Common Framework of Science Learning Outcomes Met by the Production & Manual

GENERAL LEARNING OUTCOMES

- Investigate objects and events in their immediate environment and use appropriate language to develop understanding and communicate results
- Demonstrate and describe ways of using materials and tools to help answer science questions and to solve practical problems
- Demonstrate that science and technology use specific processes to investigate the natural and constructed world or to seek solutions to practical problems

SKILLS

- Observe and explore materials and events in their immediate environment and record the results
- Work with others and share and communicate ideas about their explorations
- Interpret findings from investigations using appropriate methods
- Observe and investigate their environment and record the results
- Work collaboratively to carry out science-related activities and communicate ideas, procedures, and results

KNOWLEDGE

- Describe and compare characteristics and properties of living things, objects, and materials

SPECIFIC LEARNING OUTCOMES

- Ask questions that lead to exploration and investigation
- Identify problems to be solved
- Make predictions, based on an observed pattern
- Select and use materials to carry out explorations
- Identify materials and suggest a plan for how they will be used

PERFORMING & RECORDING

- Observe and explore materials and events in their immediate environment and record the results
- Follow a simple procedure where instructions are given one step at a time
- Manipulate materials purposefully
- Use appropriate tools for manipulating and observing materials and in building simple models
- Observe, using one, or a combination of, the senses
- Make and record relevant observations and measurements, using written language, pictures, and charts

ANALYZING & INTERPRETING

- Use personal observations when asked to describe characteristics of materials and objects studied
- Propose an answer to an initial question or problem and draw simple conclusions based on observations or research

COMMUNICATION & TEAMWORK

- Work with others and share and communicate ideas about their explorations

The Science Behind the Movies

MOVIE MAKEUP

Since the early days of Hollywood, movie fans have been enthralled by the transformations made by actors when they put on makeup to become incredible characters. In those early days, a makeup artist had to be as much a scientist as an artist, experimenting with materials not nearly as sophisticated as we have today.

The first true makeup magician was actor Lon Chaney Sr., who is often referred to as "The Man of a Thousand Faces." Chaney used such materials as fish skin, mortician's wax, and grease paint to accent his facial features for various parts. At one point, he even cut off the tips of cigar holders and inserted them into his nose to appear more authentic for a character role.

PERSISTENCE *of* VISION

Motion pictures are based on the principle known as "persistence of vision." There is no such thing as a "moving picture." What you see is actually a series of rapidly projected still photographs. Your brain and eyes work together to see this moving image. Every second a movie runs, you are actually watching 24 still-frame individual pictures. Just think of how many pictures are drawn for an animated movie!

The eye acts like a window on the world, transmitting coded information to your brain along your nerves. The eye's retina is like a camera where light and color-sensitive cells capture and focus images in incredibly short periods of time. The picture on the retina persists until the next picture is focused. Through the phenomenon of persistence of vision our brain is able to interpret a series of linked still images as moving, which allows us to see our favorite films.

SOUND EFFECTS

Special films need special sound effects and sound engineers who will effectively imitate a sound when they can't record the real thing. In the film industry, these sound engineers are called Foley artists. A Foley artist "re-creates" sound effects for film, television, and radio productions on a Foley stage in a post-production studio. They use almost anything that you can imagine, such as car fenders, plates, glasses, and chairs to create the sound effects that the director wants in the film. Almost every motion picture and television show you have ever seen contains a Foley track. There are many reasons why Foley effects are an intricate part of a soundtrack. On a film set nothing is real—a sword is made of plastic, a marble floor is really just painted plywood. Foley technology replaces or enhances live sound; the result is a sword that rings like metal and floors that echo like marble. During filming, a location sound recordist tries to capture only the dialogue. Microphones are strategically positioned on a set to record the actors without the background noises from camera and crew. Foley technology helps to add in that deleted layer of background sound that ends up producing a richer and more realistic soundtrack.

The need for Foley technology is simple—the world is a loud place! Despite the recordist's best efforts, things like planes, trains, and automobiles are all around us and you can't stop the world just because you're making a movie! Noises on location often mask the dialogue, which must be replaced in a recording studio later—an actor may have to replace an entire scene or just one word. This process is called Looping, or Automated Dialogue Replacement (ADR). The dialogue editor then fits together the "Production Audio" (the live sound) and the ADR into a complete track so that the soundtrack for the entire film is assembled in a complete package.

MODELS

Filming stunningly realistic space chases requires a special technique called Motion Control. The individual spacecraft models move very little; instead, the camera moves towards them on rails, filming each model individually under computer control, against a blue background. The camera films each separately so

that the crafts can move closer or farther apart. The background of stars requires yet another piece of filming. Finally, an optical printer assembles all the shots into a single sequence.

LIGHTING

The term "being in the limelight," which refers to being in the center of the action, is an old theater term that is actually based on a real stage-lighting technique from the 1950s. This flattering light, which made the actors on stage appear to the audience to be softly glowing, was based on a chemical reaction involving lime, which is also called calcium oxide. Science has always played an important role in making both actors on a stage or in the movies look their best. Different combinations of colors and intensities of light can create definite moods for a scene. A lighting director needs to know the science behind the mixing of colors and the positioning of shadows in order to achieve a certain "look" for a scene.

THE GREEN SCREEN: A COMPLEX CONCEPT

The illusion of an actor walking on the moon, through fire, or flying through the air like Superman is created by a special effects technique known as a green screen (also known as a blue screen) or a traveling matte.

The green screen, or traveling matte, technique allows you to combine two or more pieces of film into one piece that looks very real. For example, let's pretend that you are a movie-maker and you would like to create the illusion of an actor kayaking through very choppy water (assume that you cannot find a stunt double and your actor cannot swim).

Your first step is to film the choppy river on location. This shot is called the background plate. Your second step is to film your actor as he sits in a kayak in the studio. Place a green background screen (hence the name "green screen") behind the actor in the studio. At this point, you'll end up with two pieces of film. One piece of film is a shot of the choppy water, and the other piece of film is a shot of the actor in a kayak in front of a green screen.

The special effects department in the studio then uses special filters to form two mattes from the shot of the actor in the kayak. One matte shows the actor's black silhouette on a white background, while the other matte shows the actor's white silhouette on a black background.

These mattes are created when a colored filter is placed over the shot of the actor in the studio. The colored filter causes the green screen in the actor's background to appear black. High-contrast black-and-white film is used to create the mattes of these silhouettes.

Now there are four pieces of film: the two originals (i.e., choppy water and actor in front of green screen in studio) and the two mattes (i.e., black silhouette and white silhouette). These pieces of film are combined in layers to create the final piece of film for the shot.

First, the background (choppy water) is combined with the actor's black silhouette. The resulting piece of film consists of a black silhouette in choppy water. Second, the film is rewound, and re-exposed so that the actor (in color) is placed on the black silhouette. This piece of film consists of the actor (in color) on a black background. The final shot consists of the actor kayaking in the choppy water.

FAST FACT

When a stunt person falls from a building, they can reach speeds up to 125 mph by the time an air mattress breaks their "crash." Gravity accelerates the speed of their descent by a factor of 32 feet per second, per second (9.8 meters per second, per second). This means that by the end of the first second of their fall, they are travelling at 32 feet in their first second. In the next second they are travelling 64 feet in that second, and so on.

Hands-On Activity
Zany Zoetropes

THEME

Persistence of Vision

SUMMARY

Animated cartoons are really just a series of still pictures run together at a specific speed to make our eye think that we are watching an actual moving picture. In this activity, you will build a zoetrope with your students to teach them about a phenomenon called *persistence of vision*.

MATERIALS REQUIRED

- Cardboard ice cream or oatmeal containers (1 per student)
- Rulers (1 per student)
- Sheets of white paper (1 per student)
- Pencils (1 per student)
- 5-6 rolls of measuring tape (to be shared)
- 1 Lazy Susan or record player (to be shared)
- 1 Sharp knife (for teacher's use only)

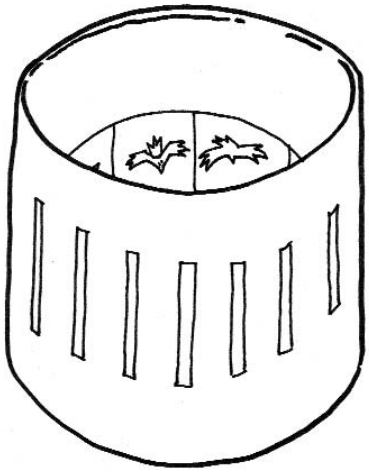
Procedure

1. Ask your students to measure the circumference of their ice cream container with a tape measure.
2. Instruct them to cut out a strip of paper with a width of 2 inches and a length equal to the circumference of the container. This will be the animation strip!
3. Students should use a ruler and pencil to divide the animation strip into identical 1-inch segments.
4. Ask them to draw a design or picture in each segment. Their pictures should represent a movement and occur in sequence (e.g., throwing a ball, a flower growing, an eye winking, etc.).
5. While the students are creating their animations, use a sharp knife to cut small vertical slits every inch or so along the middle of the ice cream container. The slits should be about 1/8 of an inch in length.
6. Instruct students to place the animated strip inside the container near the bottom with the animations facing inward. They should tape the strip in place so that the lower edge is flush with the bottom and it covers the entire circumference of the container.
7. Have the students place their zoetropes (one at a time) on the Lazy Susan and spin it around. Looking through the slits, they should be able to see their animated drawings come to life!

Explanation

Persistence of vision relies on the length of time the retina in each eye retains an image. If we see a light flash every tenth of a second or less, we perceive it as continuous light. Motion pictures actually flash 24 images per second. Each flash of an image remains on our retinas for at least one tenth of a second and therefore we can't tell where one flash ends and the other one begins. As a result, we perceive the flashes of different images as continuous motion.

When you spin the zoetrope, you are observing the images through the slits in the container. Each slit provides you with a flash of light and an image that will persist on your retina until the next image comes along. Therefore you perceive the image as continuous—a moving picture. This is a stroboscopic effect. If you were to look over the top of the drum at the drawings instead of looking through the slots, all you would see would be a blur.



A completed zoetrope

Hands-On Activity
Thauma-What?

THEME

Persistence of Vision

SUMMARY

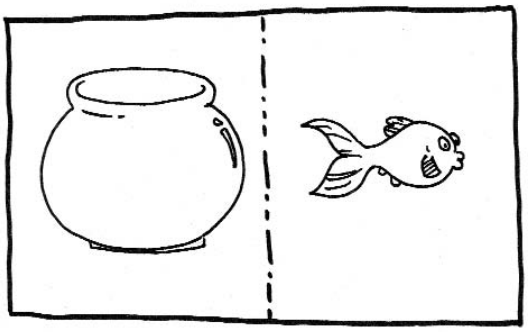
In this activity, your students will build a thaumatrope and learn the basics of modern-day animation.

MATERIALS REQUIRED

- Index cards (1 per student)
- Pencils (1 per student)
- Colored markers (5-6 packs of 8, to be shared)
- Tape (5-6 rolls, to be shared)

Procedure

1. Instruct your students to draw a line down the center of their index card.
2. On the right-hand side of the card, the students should draw an object, person, or animal to be placed into another object (e.g., goldfish outside of its bowl, bird outside of its cage).



3. On the left-hand side of the card, students should draw the object that they would like the first object to go into (e.g., goldfish bowl, bird cage).
4. Instruct your students to fold the index card in half, so that the drawings are facing outward, and then tape the edges together.
5. The students should slip the folded card over the end of the pencil. Make sure they tape along the upper and lower borders to secure the card to the pencil.
6. Instruct your students to place the pencil between the palms of their hands. If they quickly roll their hands back and forth, they should see an interesting illusion.

As the thaumatrope spins, the two separate images appear as one!

Explanation

The thaumatrope, invented in the 19th century, is known as the precursor to modern-day animation. Thaumatrope is just a fancy word meaning "turning marvel." Like the zoetrope, the thaumatrope relies on persistence of vision to create an illusion by blending the two images you drew into one. Your brain has trouble keeping up with the speed of the rotating card, so it blends the two images, and sees a goldfish back in its bowl! Ask your students to experiment with the speed they use to rotate the cards. What happens when they spin the card slowly?

Hands-On Activity
Make Your Own Flipbook

THEME

Persistence of Vision

SUMMARY

Allow your students to become animation experts while making their own cartoon flipbooks.

MATERIALS REQUIRED

- 3-inch square pads of yellow self-stick notes (1 per student)
- Colored pencils and/or markers (5-6 packs of 8, to be shared among the students)

Procedure

1. Ask your students to think of an object that they can easily draw. Tell them to imagine their object moving in an interesting way (e.g., running, dancing, rowing a boat, etc.).
2. Give each student a pad of sticky notes. Tell them to place their pad on their desk so that the sticky edge is facing up. The students will be drawing the pictures in their flipbooks from the back to the front.
3. Instruct the students to draw the object in its final position on the last sheet in the pad. Remember, they are working backwards, so they must imagine that the object has just finished moving.
4. Tell the students to lay the second-to-last sheet on top of the last sheet. They must trace the parts of their figure that will not move and then draw the moving parts in a slightly changed position.
5. The students must repeat the process until they have 10 to 15 sheets. Each time they start a new sheet, they must trace the parts of the figure that will not move and make slight changes in the moving parts. The top sheet should be the object as it is before it starts to move.
6. Tell the students to pick up the stack of sticky notes and flip the pages rapidly from back to front in order to see their character in action.

Explanation

Animation is used in cartoons, television, and film and is the process whereby still pictures are turned into moving pictures. Animation occurs when a series of images is flashed before the eyes in rapid succession. Individual drawings within a series are called cells. When the number of cells per second is greater, the animation effect is smoother. In a non-animated film, still images flash by at a rate of 24 frames per second. Animation cells generally flash by at about 12 cells per second.

In this activity, the students created a flipbook using a pad of sticky notes. Each sticky note within the pad represented a cell. When thumbed through quickly, the images drawn on the sticky notes appeared as an animation. The visual effect of a flipbook is attributed to the phenomenon called persistence of vision.

Persistence of vision is a term used to describe how our eyes can retain a picture for a fraction of a second after seeing it. If a second picture is shown immediately (i.e., within a fraction of a second) after the first, the eyes will see it as a continuation of the first picture and will not perceive the gap between the two. If a series of still pictures depicting something moving in increments is flashed before the eyes in rapid succession, the eyes see it as a scene depicting smooth, flowing action.

Hands-On Activity
Movie Slip-Ups

THEME

Scene Continuity

SUMMARY

In this activity, your students will learn the importance of continuity (i.e., flow) from one movie scene to the next.

MATERIALS REQUIRED

- Movie Slip-Ups Activity Sheets (1 per student) photocopied from the back of this manual
- Movie Slip-Ups Answer Key (1 for the class) photocopied from the back of this manual
- Pencils (1 per student)

Procedure

1. Give each student a Movie Slip-Ups Activity Sheet and a pencil.
2. Tell your students that the Movie Slip-Ups Activity Sheet consists of two images that look almost exactly the same. However, if they look a little closer at the images, they will see that some things are different.
3. Tell your students to circle anything in the second image that is different from the first image.
4. Go through the differences with the help of the Movie Slip-Ups Answer Key.

Explanation

Good observational skills are really important in filmmaking. Directors and set designers must pay close attention to the details of their movie sets. Movies are not filmed the way that we see them. Sometimes directors film the end of a movie first and the beginning of a movie last. At other times they are filming a section where people are eating dinner and then someone forgets their line and they have to start over again. They will be able to use the first part of the scene where the actors ordered their food but will have to refilm the part where they get the food and start eating again. So it is really important that the actors have their hair combed the same way, that they are wearing the same clothes, and that the table is exactly the way it was.

One of the most important skills for the scientist to develop is the ability to make observations. Often, an observation that seems unimportant leads the curious scientist on the correct path of investigation to solve a particular problem. In filming, it is important for set designers to be meticulous in their observations. If one lock of hair is out of place on an actor, the continuity of an entire scene can be disrupted.

Demonstration
Colored Shadows

THEME

Movie Lighting and Color

SUMMARY

Demonstrate how colored lights may be used to create shadows with different hues.

SAFETY PRECAUTIONS

Do not perform this experiment in the vicinity of water.

MATERIALS REQUIRED

- White surface (e.g., a screen or blank wall)
- Red, green, and blue light bulbs or flood lamps, one of each color
- 3 light sockets
- Power bar
- Ruler

Procedure

1. Screw the light bulbs or flood lamps into the sockets, and plug them into the power bar. All three lights should be the same distance from the white surface.
2. Set up the lights in the following order from left to right: red, green, blue.
3. Turn on the lights, and move them around until you achieve a (nearly) white light projecting onto the white screen. Ask your students to gather around the screen while you perform the experiment.
4. Hold the ruler up close to the screen. Slowly move backwards until you see three distinct and differently colored shadows.
5. Try using your hand. When the shadows overlap, how many different colors can you identify? Allow your students to use their hands to create different colored shadow puppets.
6. Experiment with the number of lights you turn on. What happens when you only use green and blue? How about red and green?
7. Try using different paper for the screen. What happens to the colored shadows?

Explanation

Have you ever noticed how the light changes in movies at different times of the day? In the morning and late afternoon, the colors appear to be red and orange. At night, there are a lot of blues. Shadows also change color. Lighting directors need to pay attention to this to create a realistic scene, no matter what time of day it actually is.

Our eyes have three types of receptors for colored light—red, green, and blue. When red, blue, and green lights are shone simultaneously, all three types of light receptors in your eyes are stimulated at the same time, giving the sensation of white light. Placing an object in the path of the light rays breaks the white light into its original colors.

Hands-On Activity
Day & Night

THEME

Movie Lighting and Color

SUMMARY

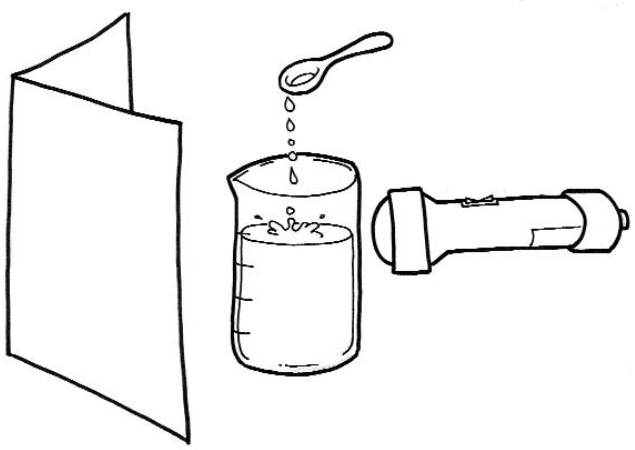
In this activity, your students will discover how computer animators use color to give the appearance of a change in environment (e.g., the appearance of being indoors versus outdoors or day versus night).

MATERIALS REQUIRED

- Empty glass jars (1 per group)
- Water (2 cups per group)
- Milk (1 tablespoon per group)
- Flashlights (1 per group)
- Sheets of white paper (1 per group)
- Colorful objects (1 per group)

Procedure

1. Ask your students to get into groups and give each group a jar, a piece of white paper, a flashlight, and a colorful object.
2. Tell your students to pour the water into the jar and prop up the piece of white paper behind the jar.
3. Have your students shine the flashlight through the jar. What color is the light on the paper?
4. Ask a group member to dribble some milk into the jar as someone else is shining the light into the jar. What color is the light on the paper now? How does the color of the light change as you add more milk?
5. Ask your students to imagine that the flashlight is the sun. How might the sun change the way you see various colors?
6. Ask your students to pay attention to colors the next time they move from inside to outside.



Explanation

Computer animators pay attention to how we perceive colors in different lights and settings. Outside, the colors of a character's fur or clothing may be brighter than it is inside. Because computer animators can't depend on elaborate lighting to give the indoor/outdoor or day/night effect, they use color to give the appearance of a change in environment. For example, lightening the color of a character's clothing or fur gives the illuminating effect of the sun and helps the audience to understand that there is a change in lighting.

Hands-On Activity
Me & My Shadow

THEME

Movie Lighting and Color

SUMMARY

When movie crews film on location, their filming conditions must be precise. Film-makers must pay close attention to the weather and time of day that they are shooting. In this activity, your students will learn how movie crews use special lighting and scrims to control shadows and provide consistency in their film-making.

MATERIALS REQUIRED

- Piece of chalk (per pair)
- Measuring tape (per pair)
- Several sheets of newspaper (per pair)
- 2-3 action figures (per pair)
- 1-2 markers (per pair)
- Bright flashlight (per pair)
- Large piece of black cloth or Bristol board (per pair)
- Large piece of white cloth or Bristol board (per pair)
- Notebook (per student)

Procedure

1. Take your class outside at 2 in the afternoon and ask them to get into pairs.
2. One partner should measure the other partner's shadow and, if they can, draw an outline of it with chalk on the pavement. Have each pair record the length of their shadows in their notebooks.
3. The next day, or later in the afternoon, take the students outside at a different time and ask them to repeat the procedure. Is there a noticeable change in the size and shape of their shadows? How can directors fake shadows?
4. Inside the classroom, provide each pair of students with sheets of newspaper, action figures, markers, and a flashlight.
5. Ask the students to create shadows for their action figures using the flashlight. If they move the flashlight in an arc over the figures, they should see the shadows moving and changing size and shape.
6. Can your students change the shadows by holding up pieces of black and white cloth (or Bristol board) to change the light? Which works best?

Explanation

When movie crews film on location, their filming conditions have to be precise. If it was sunny in Central Park in New York City when the crew was filming yesterday, and it rains today, the crew will not be able to continue filming that scene until another sunny day comes along. Directors also have to pay attention to the time of day when they are shooting. If the actors and crew filmed a scene at noon one day, they will have to continue filming at noon the next day. Why?

Shadows are shorter at noon and longer at 3 in the afternoon because the sun's position in the sky changes as the earth rotates on its axis. Film-makers can't always make movies in LA where the weather is consistent. So, when a movie is filmed outdoors, lighting directors will control shadows with special lighting and scrims—black or white cloth stretched over a frame and held up to block the sun. The scrims are used to absorb and reflect light, as the director requires. Film-makers are aware that their audiences are very sensitive to visual cues and can easily sense if shadows are too long, too short, or misplaced.

HANDS-ON ACTIVITY
In the Spotlight!

THEME

Movie Lighting and Color

SUMMARY

In this activity, your students will learn how spotlights are used to express moods in a movie scene.

MATERIALS REQUIRED

- 1" x 11" strips of colored acetates (2 red, 2 blue, and 2 yellow per pair)
- Sheets of white paper (1 per pair)
- Rolls of clear tape (1 per pair)

PROCEDURE

1. Ask your students to get into pairs.
2. Distribute 6 strips of colored acetates (2 red, 2 blue, and 2 yellow), a sheet of white paper, and a roll of tape to each pair.
3. Ask your students to tape 1 red, 1 blue, and 1 yellow acetate strip onto the sheet of paper.
4. What will happen if strips of different colors are placed on top of the ones that have already been taped to the paper? Ask your students to make hypotheses, or best guesses, and conduct an experiment to help draw some conclusions.
5. Ask your students to take the other acetate strips and lay them down on top of the ones already taped to the white paper. Instruct your students to place the second set of acetates in a different order than the first set of acetates. In other words, if they arranged the first set of acetates in the order of red, blue, and yellow, the second set of acetate strips should be in a different order, such as blue, yellow, and red.
6. Ask your students to observe the colors that are created when they overlap the colored acetates.

EXPLANATION

The spotlights that are used in movies, TV, and theaters set the mood and ambiance for the scene. For example, a red spotlight will give the impression that something "bad" or ominous is about to occur. It represents fear, danger, or a warning that that something terrible may happen. On the other hand, a yellow spotlight might be used to express warmth, love, and sunshine—a generally "happy" or good feeling.

White light is made up of all the colors of the rainbow—red, orange, yellow, green, blue, indigo, and violet (ROY G. BIV). For special effects artists, white light is used, but so are all the other colors. In order to get colored lights, filters like the colored acetates that are used in this activity actually "block" and remove certain colors from white light in order to get the color the need. The students started with acetates of the primary colors (i.e., red, blue, and yellow). When they placed another color on top of the original color, the light was blocked, and certain colors were filtered out to get other colors. For example, if they placed a yellow acetate on top of a blue acetate, they saw the color green.

Yellow + Red = Orange
Blue + Red = Purple
Yellow + Blue = Green

Hands-On Activity
Funky Foley I

THEME

Movie Sound Effects

SUMMARY

In this activity, your students will use everyday materials to create their own movie sound effects!

MATERIALS REQUIRED

- Tape recorders (1 per group)
- Cassette tapes (1 per group)
- Sheets of lined paper (1 per group)
- Pencils (1 per group)
- Various items that can be used to make noise (e.g., balloons, empty bottles, cellophane, Popsicle® sticks, shoes, sandpaper, cardboard, cookie sheets/pans, rubber bands, etc.). Have one set for each group of students.

Procedure

1. Divide your students into several groups.
2. Give each group a set of 10 items and a tape recorder.
3. Ask the groups to experiment with the items you have given them to create different noises. Tell the students to create new sounds by manipulating two or more items in combination. If possible, allow them to cut things apart and/or glue them together to create sounds.
4. Have the students write out a list of their sound effects and how they will create them.
5. Allow the students to record their sound effects. They may then play their cassettes for other groups to see if they can guess what the sounds are.

Explanation

The sound in movies is actually recorded separately from the filming and added in afterward. Moreover, the sound you hear is not necessarily what it seems! For example, the sound of a horse's hooves on a cobblestone road might actually be a man in a studio banging two coconut shells together. Likewise, the sound of a person walking on snow might actually be someone squeezing a box of cornstarch.

The sound effects added to the film during post-production (after the shooting stops) are called *Foley effects*. Foley effects include sounds such as footsteps, clothes rustling, paper folding, doors opening and slamming, punches hitting, glass breaking, etc.

The Foley crew includes the *Foley artist* (a.k.a. the "walker") who makes the sounds, and technicians who record and mix the sounds.

Foley artists stand on a *Foley stage*, which contains a variety of objects for making noise. These objects may include shoes, tin pie plates, empty soda cans, hubcaps, knives, boxes of cornstarch, staple guns, cellophane, etc.

DEMONSTRATION
Funky Foley II

THEME

Movie Sound Effects

SUMMARY

Make an instrument called a "rainstick" to simulate the sound of rain for your students.

MATERIALS REQUIRED

- Hammer
- 10-20 nails
- Mailing tube or poster tube with end-caps
- Duct tape
- Dry beans

PROCEDURE

1. Following the seam that spirals around the mailing tube, hammer nails into the tube an inch or so apart. Make sure that the nails go in just enough to reach the center of the tube.
2. Once you have hammered in enough nails to cover the entire seam of the tube, cover them with duct tape to keep them from coming out.
3. Place one of the tube caps onto the end of the tube.
4. Place a handful or two of dry beans into the tube and secure the tube with the remaining cap. If you wish, decorate the tube.
5. Turn the tube slowly for a long-lasting rainy sound effect. Give your students an opportunity to use the rainstick.

EXPLANATION

Sound effects help us to feel like we are right in the action of the movie and to experience what is happening to the characters. Often the wind blows or there are storms with rain and thunder. Cars race down the street, doors creak, and windows break. In the movies, these sounds are often created by using various materials rather than recording the real thing.

Foley artists use a variety of objects like the ones that you experimented with today to create the sounds of footsteps and other incidental noises in a film. Believe it or not, even simple items like tearing heads of lettuce can be used to simulate the sound of shredded paper. The history of sound-making has advanced from using simple items to electronic recordings and devices. There is an actual audio library of sounds that sound artists and technicians add to movies after the film has been shot. Up to 80 percent of a movie's sounds may have been added after the actors have gone home. Many types of instruments are used to create sound effects. Here are a few examples:

Echo Chamber: A box-like enclosure housing a microphone and speaker. When sounds are emitted from the speaker, there is reverberation (i.e., echo-like sound). This kind of audio effect is often used to simulate a conversation as if it were occurring in a cave or to create sounds that seem to be coming from a distance.

Mixing Console: A wooden slat consisting of numerous switches. Also known as a mixing board, this device is used to mix several different sounds together so that a single, unique sound can be created.

Splash Tank: A container filled with water used to create water-like sound effects.

Walla: A sound effect term used strictly by the film industry. Walla is the murmur of a crowd or conversation among people in the background of a movie scene.

Hands-On Activity
Funky Foley III

THEME

Movie Sound Effects

SUMMARY

In this activity, your students will have the opportunity to act as real Foley artists as they not only create their own sound effects, but also add them to movie footage.

MATERIALS REQUIRED

- TV (1 for the class)
- VCR (1 for the class)
- Videotape of a scene from a TV show or movie (1 for the class)
- Tape recorders (1 per group)
- Cassette tapes (1 per group)
- Sheets of lined paper (1 per group)
- Pencils (1 per student)
- Various items that can be used to make noise (e.g., balloons, empty bottles, cellophane, Popsicle® sticks, shoes, sandpaper, cardboard, cookie sheets/pans, rubber bands, etc.). Have one set for each group of students.

Procedure

1. Divide your students into several groups.
2. Show a videotaped scene from a movie or TV show with the volume turned off.
3. Tell the students that they are about to complete the scene with their own sound effects.
4. Give each group a set of various items to make noise. Ask the groups to make a list of all the sounds they will create for the scene and how they will create them. The students may use the items you gave them, their own voices, or anything else they can find.
5. Show the scene again for the first group and ask them to add in their sound effects at the moments when the sounds should occur.
6. Show the scene again for the other groups, allowing each group a chance to add their sound effects to the scene.
7. If possible, record each group's "soundtrack" on a cassette tape. They can then play the tape along with the videotaped scene.

Explanation

Foley artists match live sound effects with the action of the picture. The sound effects are laid "manually" and not cut in with film. Foley artists stand on a Foley stage (an area with a variety of possible surfaces and props) in a Foley studio (a specialized sound studio). The Foley artists can clearly see a screen displaying the footage they are to add sounds to—they perform the sound effects while watching the screen for timing. They may tap shoes on wood to create the sound of someone walking or running or break various objects to create large crashes or explosions—all while watching the screen so they can coordinate the sounds with the movie footage.

Increasingly, many simple Foley effects are done electronically, without Foley artists. Many sounds are stored electronically and integrated by a sound engineer on a keyboard while watching the movie footage. Electronic Foley is much cheaper than hiring live Foley artists but often does not sound as good as the real thing.

Hands-On Activity
Bigger Is Better

THEME

Special Effects & Perception

SUMMARY

In this activity, your students will learn how film-makers create the illusion of huge animals or monsters attacking people and cities.

MATERIALS REQUIRED

- Balloons or balls of different sizes (3 per group)
- Table (1 per group)
- Empty toilet paper or paper towel roll (1 per group)

Procedure

1. Divide your students into groups. Have each group work around a table.
2. Instruct your students to arrange their balloons on the table so that one of the balloons is close to them, one is in the middle, and another is far away.
3. Ask your students to look at the balloons with one eye through the paper towel roll.
4. Challenge your students to rearrange the balloons to make the biggest balloon seem smaller. Can they rearrange the balloons to make the smallest balloon seem closer or farther away?

Explanation

Objects that are closer to us appear to be bigger than those farther away. This is what we call perspective. Perspective is the appearance of objects in depth as perceived by normal binocular vision (meaning vision with two eyes). By using our two eyes, we are able to see depth. When using only one eye, we perceive objects that are farther away as being small and objects that are closer as being large.

Hands-On Activity
Shoebox Studio, Inc.

THEME

Special Effects & Perception

SUMMARY

In this activity, your students will learn about a special effects technique called *forced perspective* while creating their own mini-movie set in a shoebox.

SAFETY PRECAUTIONS

Ensure that your students use scissors with caution.

NOTES

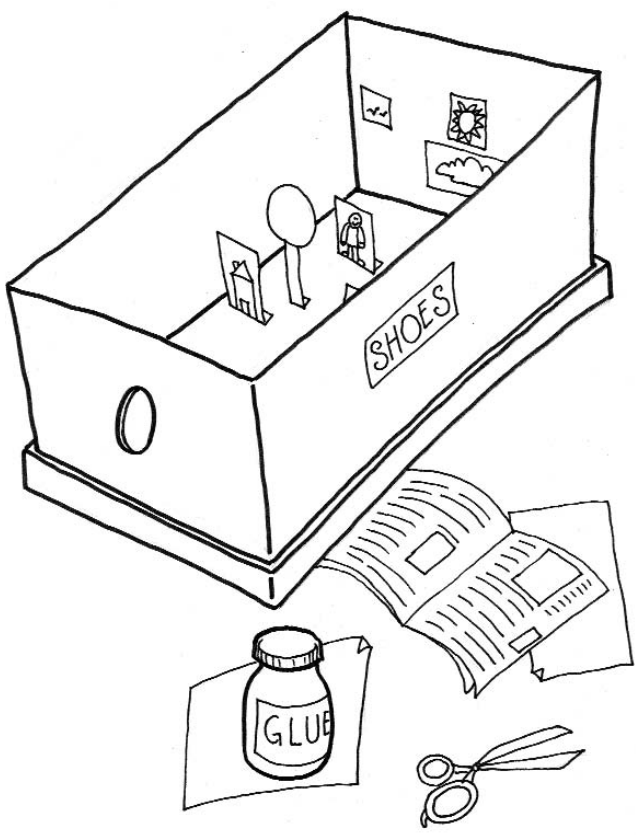
The day before running this activity, ask students to bring in a shoebox, toy action figures, and a self-portrait/photo.

MATERIALS REQUIRED

- Shoeboxes (1 per student)
- Scissors (1 per student)
- Magazines (5-6 to be shared among the students)
- Index cards (2 per student)
- Small photos or self-portraits (1 of each of your students)
- Toy action figures (e.g., people, monsters, animals, etc.) (1-2 per student)
- Glue (5-6 sticks/bottles to be shared among the students)

Procedure

1. Instruct your students to cut an eyehole approximately 1/2 inch in diameter in one end of the shoebox. This hole will be the camera viewfinder.
2. Your students can cut out pictures from magazines to create a backdrop for their shoebox. The backdrop will show where the scene takes place. Tell your students to put the backdrop at the other end of the shoebox so that it can be seen through the eyehole. The students may cut out more scenery and props (e.g., buildings, trees, furniture, etc.) to add to the shoebox if they choose.
3. Give each student an index card and tell them to cut out a piece that is the size of their photo or self-portrait, leaving an extra inch of the card at the bottom.
4. The students should then glue their photos/self-portraits to the top of their cards and fold the card so that the photo is at a right angle to the extra inch of the card at the bottom. This will allow their photo/self-portrait to stand up. Instruct the students to repeat this with their scenery and the props.
5. Ask students to arrange the scenery, props, photo/self-portrait and action figure(s) in the shoebox so that they're ready for the scene. Tell them to look through the eyehole to make sure that the scene is set up the way they want it.
6. Instruct the students to arrange the scene so that their photo/self-portrait is bigger than the action figure(s) and vice versa.



Explanation

Film-makers must often create scenes in which actors or objects appear to be much larger than they are in real life. Many of the differences in size between characters in a movie are created through the use of special effects, while others rely on special film tricks that alter our perception.

Camera trickery plays a large part in making certain actors or objects look small compared to others. Consider a movie scene in which you see a car traveling on a distant road. How could this scene be created inside a studio? Movie-makers commonly use a technique called *forced perspective*. Using this technique, movie-makers might film the movement of a small, remote-controlled dinky car in order to give the impression that a normal-sized car is moving some distance away.

Another form of miniature effect uses stop-motion animation, a form of animation that allows otherwise lifeless objects to move or change. To photograph stop-motion, film-makers secure the camera on a very sturdy tripod and shoot a model or puppet, frame by frame, making small changes in movement. Projected, this creates a fairly good illusion of movement. Stop-motion and miniature photography created very realistic looking special effects in early Hollywood films.

Demonstration
Is It Real?

THEME

Special Effects & Perception

SUMMARY

Ask your students to use their observation skills to determine whether an object is real or artificial.

MATERIALS REQUIRED

- 1-2 real flowers
- 1-2 artificial flowers

NOTES

Try to find real and the artificial flowers of the same type.

Procedure

1. Display two separate vases filled with flowers—one vase with real flowers and another holding artificial flowers—on a desk or table at the front of the classroom.
2. Ask your students to write down their observations about the flowers. Depending on the age and the ability of your students, you may want to guide them by asking questions such as: What do the flowers look like? How are the flowers different from each other? How are the flowers the same?
3. Explain to the children that, based on their observations, you would like them to hypothesize, or make their best guesses, about which of the flowers is real.
4. Have your students come forward to verify which flowers are real and which ones are artificial.

Explanation

In movies and on TV, we see a lot of things that appear to be real, but are actually not what they seem. These illusions are called *special effects*. Special effects might involve the use of models to make objects look bigger or smaller than they really are, camera trickery, or costumes, masks, and makeup.

In this experiment, your students used their observational skills to determine which items where real and which ones were not. Film-makers generally try to create films in which it is difficult for viewers to distinguish what is real and what is not. In a really good movie, special effects are used to ensure that a particular scene is believable. Movies that have good special effects are more exciting, as imaginary scenes are made to look so real.

Hands-On Activity
The Green Screen

THEME

Special Effects & Perception

SUMMARY

The following activity illustrates how the green screen technique works.

SAFETY PRECAUTIONS

Ensure that your students use scissors with caution.

MATERIALS REQUIRED

- Overhead/acetate sheets in various colors including clear and green (3 per student; 1 clear, 1 green, and 1 of some other color)
- Scissors (1 per student)
- Index cards (1 per student)
- Magazines (5-6, to be shared among the students)
- Glue (5-6 sticks/bottles, to be shared among the students)
- Colored permanent markers (5-6 packs of 8, to be shared among the students)

Procedure

1. Divide your students into groups.
2. Tell your students to use the clear overhead sheet for their scene. They can make their scene as outrageous as they like, as long as they keep in mind where they want their actor to go. The students can use permanent markers to draw on the overhead sheet or cut out items from magazines to glue on the sheet.
3. The students should also cut their actor (or whatever they want to move through the scene) out of a magazine but they should not glue the actor down.
4. Students must use the green overhead sheet for their green screen and another colored overhead sheet for their filter. Instruct the students to find the right color combination by putting the green overhead sheet on the table/desktop with the actor on top of it, and then looking at it through the colored filter.
5. Explain to your students that the colored filter will stop certain other colors of light from getting through to your eye. When the students have found the right combination, the background will have turned completely black, but the actor will still be visible.
6. Instruct the students to put the clear overhead containing "the scene" over their green screen so that the actor is between the clear overhead sheet and the green overhead sheet. The students should then look at their scene through their colored filter.
7. If there is time, instruct the students to glue a little piece of folded index card to the back of the actor and cut a slit in the green screen so that they can move the actor through the scene.
8. Ask your students what two colors worked best in creating their green screen effect and why. Is there more than one combination that works? Ask your students if a green screen has to be green.

Explanation

How is it that movie-makers are able to put actors in seemingly impossible situations? For example, how do movie-makers create scenes where actors are walking on the moon? Are the actors really sent up to the moon and filmed there? Of course not—sending actors to space would make for a very costly film!

The vision of an actor walking on the moon, through fire, or flying through the air like Superman is created by a special effects technique known as a *green screen* (also known as a *blue screen*) or *traveling matte*. The green screen or traveling matte allows film-makers to combine two or more pieces of film into one piece that looks very real (see the Background Information section for more information on green screens).

Hands-On Activity
Gelatin Makeup

THEME

Special Effects & Perception

SUMMARY

How do makeup artists create real-looking scars or age people realistically? Use unflavored gelatin with your class to make authentic-looking scars and other alterations!

SAFETY PRECAUTIONS

Ensure that none of your students are allergic to gelatin or makeup before performing this experiment!

MATERIALS REQUIRED

- Unflavored gelatin powder
- Teaspoon
- Paper cup
- Hot water
- Red and blue food coloring (optional)
- Face powder or other types of makeup (optional)

Procedure

1. Ask your class if they have ever seen a movie in which one of the characters had a scar. Do they think the scar was real? Tell your students that you can create fake scars for them right in the classroom!
2. Measure 1 teaspoon of unflavored gelatin powder into a small cup.
3. Add 1 teaspoon of hot water and stir quickly until the mixture is gooey in consistency.
4. Ask for a volunteer. Apply the gooey gelatin mixture to your volunteer's skin wherever they would like to have a scar or skin alteration.
5. If you want to make authentic-looking "bloody" scars, use a combination of red and blue food coloring. Add it to the gelatin and water mixture. Use the makeup and face powder after the gelatin has dried to make the scars look even more lifelike.

Explanation

Makeup and special effects artists use pretty much anything and everything to make alterations to their actors. One method of making alterations to the skin (e.g., scars) is to use clear, unflavored gelatin. Red and blue food coloring can be used in combination to make realistic looking blood, and makeup can be added to make the scars look even more lifelike. Makeup and special effects artists also use liquid latex to make artificial scars.

Hands-On Activity
Masks

THEME

Special Effects & Perception

SUMMARY

How do the scars and burns you see on actors look so real? How can a young actor look so old in a movie? Makeup artists are very talented people who make use of a wide range of technologies in makeup special effects. Try this activity out with your class to create new faces for your students.

SAFETY PRECAUTIONS

Before running this activity, ensure that none of your students are allergic to plaster of Paris.

MATERIALS REQUIRED

- Resealable sandwich bags (3 per student)
- Plaster of Paris (3 tablespoons per student)
- Water (6 tablespoons per student)
- Small paper plates (1 per student)
- Tablespoons (1 per student)
- Ballpoint pens (1 per student)
- Clock (for the class)

Procedure

1. Hand out 3 resealable bags to each student. Guide them through the following steps. Depending on the age of your students, you may want to do step 2 for them.
2. Ask your students to put 2 tablespoons of plaster of Paris powder into each of their 3 resealable bags.
3. Instruct your students to add 1 tablespoon of water to the first bag, seal it, and label it (using a ballpoint pen) with "1 part water, 2 parts plaster of Paris." They should then add 2 tablespoons of water to the second bag, seal it, and label it with "2 parts water, 2 parts plaster of Paris." Finally, they should add 3 tablespoons of water to the third bag, seal it, and label it "3 parts water, 2 parts plaster of Paris."
4. Instruct your students to squish their bags with their hands to completely mix the water and plaster of Paris. Ask them to observe the mixtures in the bags every two minutes.
5. What do they notice about the temperature of the contents inside the bags? Pass around a thermometer (if possible), for an accurate measure, or ask your students to judge the temperature with their hands.
6. Ask your students which of the three samples they would use to create a mold.? Tell them to use the recipe they think worked best. Allow them to pour the mixture onto a paper plate and create a cast of their handprint or of some other object.

Explanation

Prosthetic makeup involves the use of prosthetic casting techniques to create advanced cosmetic effects. Prosthetic makeup was revolutionized by Dick Smith, who used prosthetics to simulate gun shot and other kinds of wounds. Some artists use foam latex to create this type of three-dimensional special effect makeup; others rely on gelatin for a more economical alternative. After foam latex has been molded, it has to be baked, which means there is a long time to wait before it can be used (similar to your students' masks). The setting time for gelatin is much shorter, and it can be blended much more easily. However, if the actor starts to perspire, the gelatin could melt and slide off your students' faces! Applying makeup is a very tedious job—some actors will spend hours in makeup, just to shoot a two-minute movie scene.

Hands-On Activity
Movie Slime

THEME

Special Effects & Perception

SUMMARY

Ghost trails, gremlins, and gory, green alien slime is everywhere in the movies. In this activity, you'll get to make some with your class!

MATERIALS REQUIRED

- 30 ounces of school glue gel (1 ounce per student)
- Paper cups (1 per student)
- Green food coloring (1-2 drops per student)
- 30 ounces of liquid starch (1 ounce per student)
- Popsicle sticks (1 per student)

Procedure

1. Pour approximately 1 ounce of glue gel into each student's paper cup.
2. Add 1-2 drops of food coloring to each student's cup and ask them to stir it with their Popsicle stick.
3. Add approximately 1 ounce of liquid starch to each cup and ask your students to continue stirring with their Popsicle stick.
4. Once the slime starts to polymerize (solidify), your students can take it out of the cup and knead it with their hands. The slime can be stretched until it is so thin it is almost transparent. It is so stretchy you can even blow bubbles with it! (Pinch a small piece around the end of an ordinary drinking straw and blow!)

Explanation

Polymers are chemicals made up of thousands of atoms. If we examine the structure of a polymer molecule, we will see groups of atoms connected together. These groups, called monomers, are hooked together to form long chains. A freight train is a good example of a polymer. Each freight car is an individual unit made up of similar parts. The individual cars can be connected into a long chain to make a train of cars that moves together as a unit. Likewise, the polymer is made of many monomers that, together, produce one molecule. Mixing two substances that are already composed of very long chains of molecules creates a substance that is very viscous or thick—slime! The polymers in this substance are straight and slide past each other easily. When you mix the two substances together, those molecules begin to stick to each other, and the liquids begin to thicken and become sticky like slime.

Hands-On Activity
Bubbling Volcano

THEME

Special Effects & Perception

SUMMARY

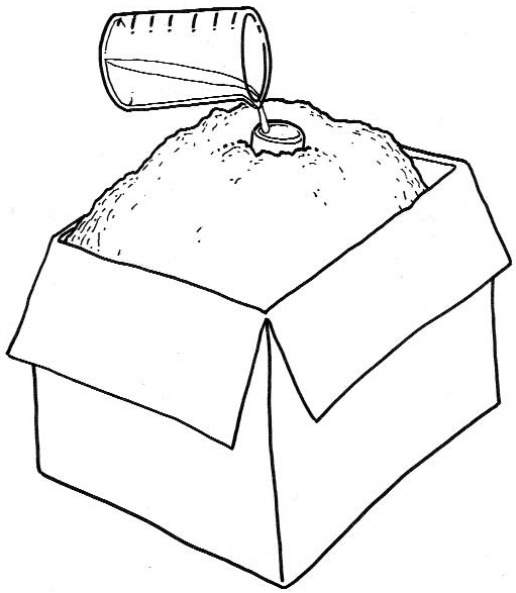
Bubbling potions, fog, and smoke are very commonly seen in movies. In this activity, your students will experiment with baking soda and vinegar to simulate the frothy lava seen in some volcanic eruptions.

SAFETY PRECAUTIONS

Ensure that none of your students are allergic to gelatin before doing this activity.

MATERIALS REQUIRED

- 500 mL soda bottles (1 per group)
- Vinegar (1 cup per group)
- Baking soda (1/4 cup per group)
- Tablespoons (1 per group)
- Tissues (2 per group)
- Small cardboard boxes a few inches deep (1 per group)
- Dirt (1-2 cups per group)
- Red gelatin powder (1-2 tablespoons per group)



Procedure

1. Instruct the groups to place the small soda bottle (mouth-end up) towards the center of the cardboard box.
2. The students should surround the bottle with dirt to make it look like a volcano.
3. Instruct your students to add 1-2 tablespoons of red gelatin powder to 1 cup of vinegar until their "lava" is the right color and viscosity.
4. Your students should then wrap 2 tablespoons of baking soda in a sheet of tissue, drop the tissue into the bottle, and pour the "lava" over it. What happens?

Explanation

In the above experiments, the bubbling lava was produced following a chemical reaction between the baking soda and the vinegar. When the baking soda and vinegar combined, they formed carbon dioxide gas. The production of this gas made the volcano bubble. The carbon dioxide in the volcano bubbles are denser than those created in the bottle as a result of the red gelatin powder. The red gelatin powder helped to make the lava look real.

Hands-On Activity
Frosty Windows

THEME

Special Effects & Perception

SUMMARY

In this activity, your students will learn how to make a special frost that doesn't melt indoors.

MATERIALS REQUIRED

- Epsom salts (1/2 cup per student)
- Styrofoam cups (1 per student)
- Plastic spoons (1 per student)
- Small paintbrushes (1 per student)
- Sheets of dark construction paper (1 per student)

Procedure

1. Instruct your students to fill their Styrofoam cup halfway with hot water.
2. Tell them to stir spoonfuls of Epsom salts into the hot water until the salts dissolve and a layer of salt can be seen collecting at the bottom of the cup (i.e., super-saturation).
3. Tell your students to dip a paintbrush into the top part of the solution and paint a design on a sheet of dark construction paper.
4. What happens as the solution dries on the dark paper? Ask your students to compare their homemade "frost" to the salts that were originally poured into the hot water.
5. Ask your students why the windowpane effect created with Epsom salts might work better for movie sets than real frost.

Explanation

How do film-makers create the effect of snow and window frost in an indoor studio? Do they use real snow and real frost? Of course not—it would melt!

The simulated frost in this experiment was actually made of salt crystals. When the Epsom salts were poured into the hot water, they dissolved. When this salty solution was painted on dark paper, the temperature of the solution dropped. The volume of the solution also dropped as water evaporated. This caused the salts to recrystallize and accumulate on the dark paper, taking on the appearance of frost. This technique can also be used to create frosty beer mugs and bottles or to add a layer of frost to frozen food packaging.

Fascinating Film Facts

DID YOU KNOW?
Sylvester Stallone wrote the script for *Rocky* in three days.

DID YOU KNOW?
One of the fight scenes in *Rocky* was filmed in reverse order starting with the fifteenth round and Stallone and Weathers in heavy make-up. As filming continued, the make-up was slowly removed until they were at round one. Because of this technique, the movie won an Oscar for Best Film Editing.

DID YOU KNOW?
Rocky was the first major motion picture to employ the use of the stedi-cam. The Stedi-cam is a camera stabilization device that, in the hands of a skilled operator, combines the image steadiness of a dolly with the freedom of movement of a hand-held shot

DID YOU KNOW?
Reese Witherspoon was allowed to keep all of her costumes after filming *Legally Blonde*.

DID YOU KNOW?
A special designer made 63 different pairs of shoes for Reese Witherspoon for her role as Elle Woods in *Legally Blond 2: Red, White and Blue.* Ms. Witherspoon got to keep all the shoes after filming.

DID YOU KNOW?
In *Legally Blonde 2*, the scenes on the steps of the U.S. Capitol and inside the Capitol were actually filmed at the Utah State Capitol Building, which was modeled after, and looks similar to, the national Capitol.

DID YOU KNOW?
The photograph of Frankie Muniz that accompanies Cody Bank's CIA profile in *Agent Cody Banks*, is actually a publicity still from his television series *Malcolm in the Middle.*

DID YOU KNOW?
The "Pink Panther" is actually a rare and valuable diamond that has a piece of pink amber in the center that looks like a leaping panther.

Additional Extension Ideas

Math

- Integrate special effects vocabulary into math word problems. For example, a very scary movie is being filmed and there are a number of monsters in the movie. There are three werewolves, two Frankenstein look-alikes, and a strange man with a humpback. How many monsters are there all together?

Language Arts

- Have your students imagine that they are the newest movie star, but that their film is going to include some *really* special effects. For example, maybe they have an extra arm, or can make sounds that only dogs can hear, or have purple skin. Ask them to write about their adventures on the set.
- Challenge your students to write poems about special sound effects. Ask them to include as many descriptive words as possible. You may even want to have them tape record their poems with all of the interesting sound effects they included recorded in the background.
- Ask your students to write a guidebook to special effects. They should include special instructions as well as safety concerns. It should be a step-by-step guide to how to create special effects and why they are used.

Art

- Make masks with your class that may be used in a movie. You can either purchase pre-made masks or they can be made from papier maché and decorated with paint, tissue paper, glitter, etc.
- Have your students create 3-D pictures from their favorite movies.

Social Studies

- Challenge your students to conduct research projects about those involved in the production of special effects. Ask the class to learn more about when the first special effects were used in films and how they were created.
- Ask your students to use the library to research the movie industry, especially the history of film.

Field Trip Ideas

- Go to a movie that has a lot of special effects.
- Invite someone from the movie industry to visit the classroom. It would be interesting to have a professional involved with the stunts, special effects, or sound effects speak with the students.
- Visit a movie set, if possible.
- Visit a local theater company and go backstage to see how the makeup and special effects are created.

Director's Dictionary

ANIMATION
Giving spirit or movement to inanimate objects or drawings. Computer animators can generate moving pictures from only one or two images from photographs, moving pictures, audio files, cartoon drawings, or computer-generated images that are stored and manipulated on the computer.

CONTINUITY
A natural flow of events in a video scene that must be kept consistent in order to maintain the viewers' sense of belief.

LIGHT
A form of electromagnetic radiation. Visible light produces a visible sensation. White light is composed of the colors red, orange, yellow, green, blue, indigo, and violet. Special effects artists use filters of different colors to create different moods simply by changing the lighting on a set.

FOLEY EFFECTS
Sound effects that are added to the film during post-production (after the shooting stops). Foley effects include sounds such as footsteps, clothes rustling, paper folding, doors opening and slamming, punches hitting, glass breaking, etc.

FORCED PERSPECTIVE
A technique that provides the illusion of great distance by using props that are physically smaller than the real objects. Small props are placed in the background of a set to give the impression that they are located some distance away. The viewer of such a scene is forced into this perspective. This technique is typically used when a movie set provides limited space.

GREEN SCREEN
A special effects technique in which two or more pieces of film are combined into one piece that looks very real. A green screen allows movie-makers to create the illusion of an actor walking on the moon, through fire, or flying through the air like Superman.

MAKEUP
Materials that are used to prepare actors for their roles on camera. It can range from powders to remove the sheen caused by reflected light off of the natural oils of the face or the costume the performer will wear. Purposes for makeup extend from making a performer look younger to making them look older or uglier. Makeup artists often use gelatin or foam latex to create scars, moles, burns, or alien heads!

MOTION CONTROL
A form of technology in which computerized manipulation of a camera is used in synchronization with the motion of a similarly controlled model (such as a spaceship).

OBSERVATION
The act of noting and recording something, often with instruments. Observation is a very important skill that scientists hone throughout their careers.

PERSISTENCE *of* VISION
A phenomenon that relies on the length of time the retina of our eyes retains an image. If a different image is flashed on our eyes every tenth of a second or less, we perceive it as continuous, and therefore as a "moving picture."

PERSPECTIVE
The appearance of objects in depth as perceived by normal binocular vision (with two eyes).

SPECIAL EFFECTS
Cinematographic techniques that create illusions in the audience's minds. Effects are not limited to visual illusions, but can include audio illusions as well. Most effects are achieved through manipulation of the lens, film, or sound waves. Other effects are achieved by mechanical manipulation of the actual set.

Some Reel Reading

There are numerous books available on movie effects. Below are some suggested resources for students from Kindergarten to Grade 6.

Reference Books

Title: Film: Eyewitness Books
Author: Richard Platt
Publisher: Knopf
ISBN: 0679816798
Description: This book is a collection of facts pertaining to the technical, scientific, and artistic aspects of film-making. It is intended for students in grades 3 to 6.

Title: Movie Magic: Behind the Scenes with Special Effects
Author: Elaine Scott
Publisher: William Morrow and Company
ISBN: 0688124771
Description: This book provides a tour of the world of special effects and highlights the people involved in creating the visual, physical, and makeup effects for movies. It is appropriate for students in grades 3 to 6.

Title: Special Effects
Author: Jake Hamilton
Publisher: DK Publishing
ISBN: 078942813X
Description: This book reveals the fascinating secrets of the world of special effects. It is intended for students in grades 3 to 6.

Title: Making Movies
Author: Perry Schwartz
Publisher: Lerner Publications Company
ISBN: 0822516357
Description: This book describes what happens during the production of a motion picture and the jobs of the people involved. It is appropriate for students in grades 3 to 6.

Title: The Young Oxford Book of the Movies
Author: David Parkinson
Publisher: Oxford University Press
ISBN: 0195212444
Description: Explores the history of movie-making around the world. It presents information on casting, costumes, makeup, and brilliant special effects. It is intended for students in grades 3 to 6.

Title: Movies: The World on Film
Author: Deborah Hitzeroth and Sharon Heerboth
Publisher: Lucent Books
ISBN: 156006210X
Description: A history of motion pictures, discussing such aspects as their technological development, movie stars, social aspects, censorship, and violence. It is appropriate for students in grades 3 to 6.

Experiment & Activity Books

Title: Movies: Scholastic Discovery Boxes
Author: Kate Waters
Publisher: Scholastic Trade
ISBN: 0590896555
Description: This book is an introduction to movies and cartoons and provides activities that demonstrate how special effects work. It is appropriate for students in grades 3 to 6.

Storybooks

Title: Miranda and the Movies
Author: Jane Kendall and Diana Kendall
Publisher: Harcourt Brace
ISBN: 0152020578
Description: Miranda plunges into an adventure with film-making back in its earliest days. This book is appropriate for students in grades 3 to 6.

Title: Nutty, the Movie Star
Author: Dean Hughes
Publisher: Aladdin Publishing Company
ISBN: 0689715242
Description: Nutty has deservedly lost his popularity by eavesdropping and generally being a not very nice person. A friend suggests that one way to rectify the situation is to make himself a movie star. This book is intended for students in Grades 3 to 6.

Welcome to the World of Mad Science®

In March 1985, brothers Ariel and Ron Shlien, teenagers at the time, began launching rockets at birthday parties in their neighborhood. They quickly realized that their means of extra income was very appealing to educators, parents, after-school programs, and community centers. Fun, cool, hands-on science experiments were in demand. As a result, the first franchise was opened in 1994 and has grown to include over 144 franchises all over the world.

The franchise system, which continues to expand, consists of a network of thousands of Mad Scientists who work with schools, camps, community centers, and scout groups to spark imaginative learning in millions of elementary school children. All of the programs are inquiry-based, age-appropriate, and are tested by both children and scientists prior to their integration into programs.

Mad Science sparks the imagination and curiosity of children everywhere. Our array of programming fosters confidence in children as potential scientists and engineers.

WORKSHOPS

This is a hassle-free and convenient way to bring hands-on science programs directly into your class. All workshops meet state and provincial curriculum requirements and offer teachers the flexibility to continue enriching their class with Pre and Post Packages that contain an assortment of experiments and additional activities all related to the topic of the workshop. Children from Kindergarten to Grade 6 can learn more about the intriguing world of light, sound, magnets, chemistry, measurement, ecosystems, and so much more.

AFTER-SCHOOL PROGRAMS

Mad Science sparks imaginative learning even when school is out. We offer fun, hands-on science classes that will keep your students entertained and engaged. After-school programs are held during lunchtime or after school and range from four to eight weeks in length. Parents pay a low, all-inclusive fee at no cost to the school. Children create and take home projects after each class, like model rockets, Mad Science Putty, periscopes, and more.

BIRTHDAY PARTIES

Mad Science birthday parties are exciting, high-energy, and interactive shows that make all children feel extra special on their birthday. Our entertaining Mad Scientist will come to your home or party room and perform exciting experiments both for and with the children to introduce them to the exciting world of science with bubbling potions, laser lights, and slippery slime.

SPECIAL EVENTS

Thrill and captivate your school assemblies with an extraordinary Mad Science Special Event. In large groups, children will participate in conjuring up foggy dry ice storms and take a ride on a Mad Science Hovercraft. Special events can be customized to suit any group size, theme, or budget.

SUMMER & VACATION PROGRAMS

Our summer camp programming relates science to life for children. With interactive and unique activities, children learn to discover the world around them with fascinating experiments such as soil testing, using the power of the sun to bake nachos, and using their engineering skills to build bridges and domes.

PRESCHOOL WORKSHOPS

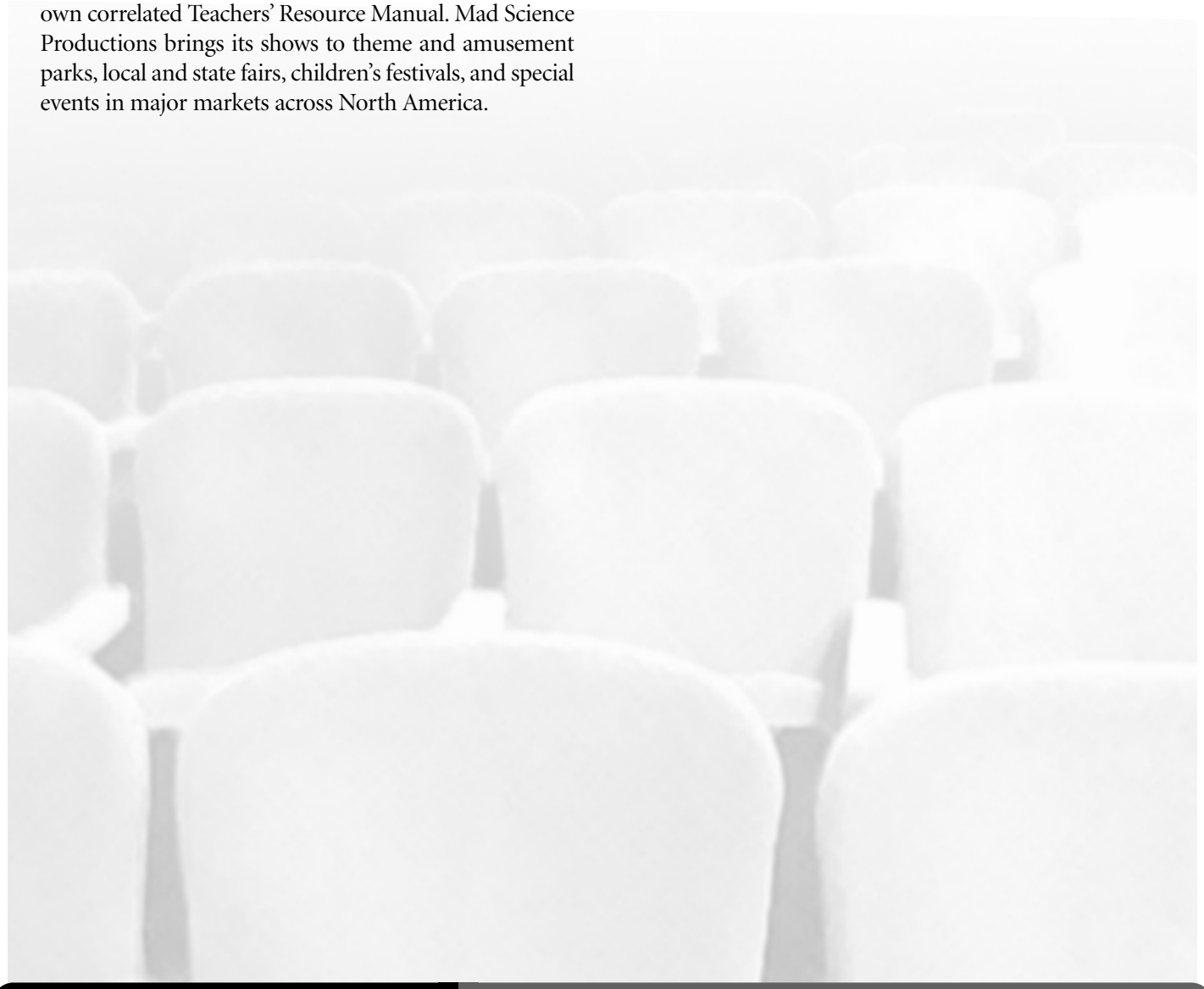
Mad Science Preschool workshops are designed specifically to present experiments and activities to children ages three to five. Science is made fun with hands-on programs on color, sound, sight, dinosaurs, and much more. Children also have the opportunity to make projects to take home. Finally, teachers can continue the learning process with Mad Science Teacher Resource Packages

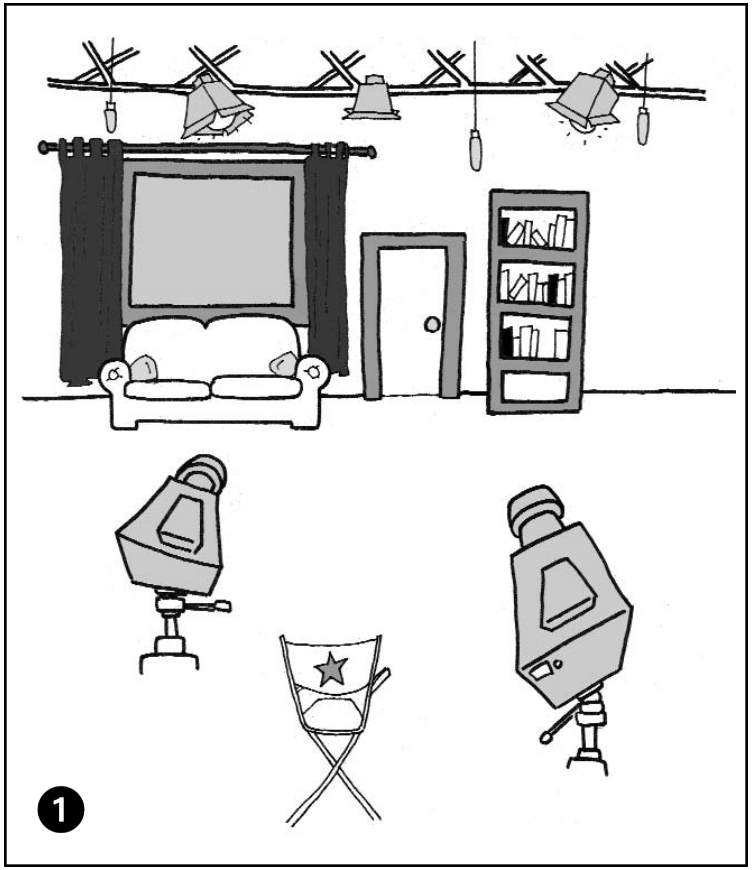
that accompany each class and contain an assortment of activities related to the theme of the program.

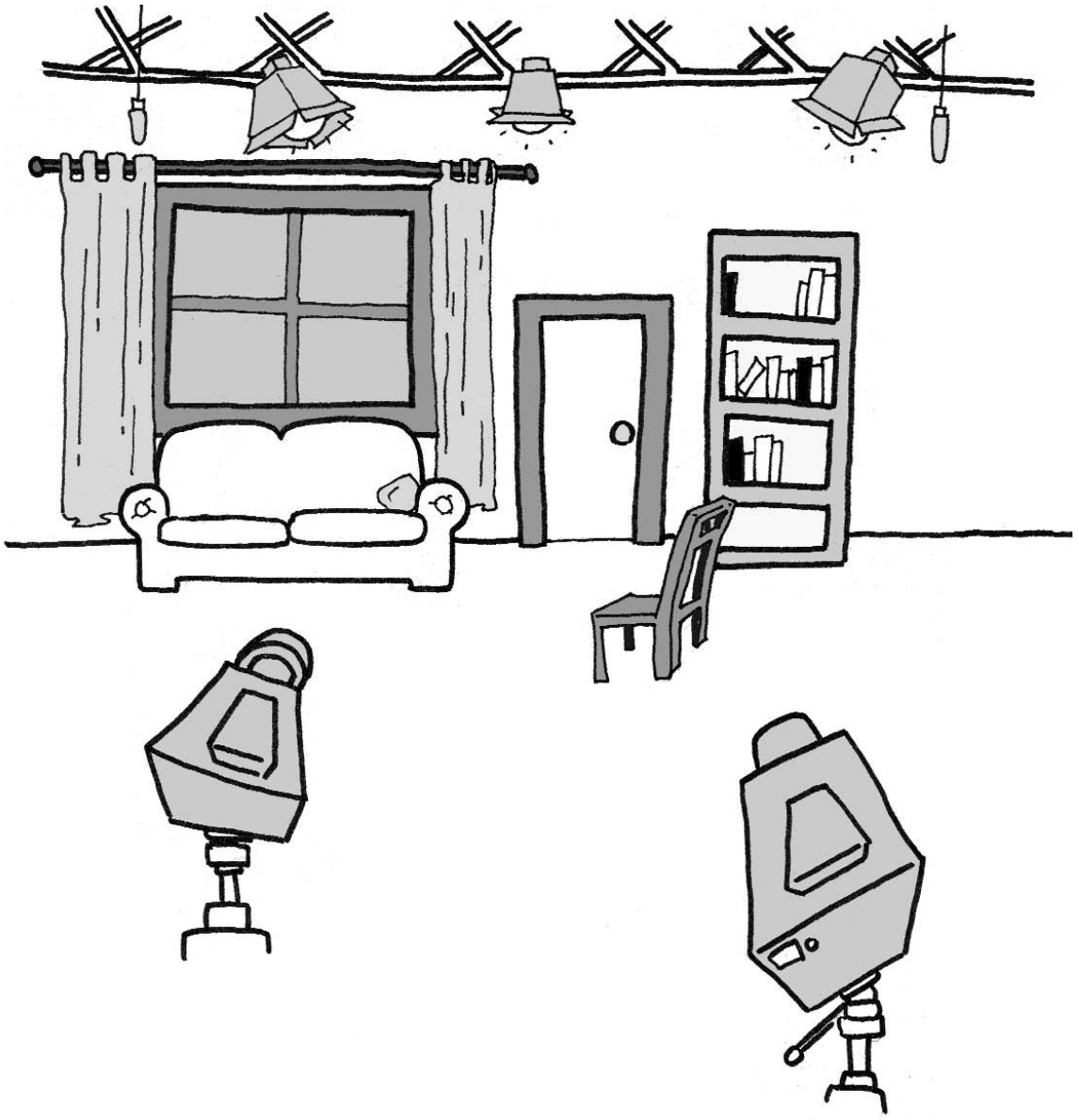
To invite Mad Science into your school, home, summer camp, or community center, call toll-free **1-877-900-7300** *or visit our Web site at* **www.madscience.org**.

MAD SCIENCE PRODUCTIONS

Mad Science Productions is the live stage show division of the Mad Science Group specializing in large-scale, interactive theatrical productions. In addition to *Movie Magic*, Mad Science Productions has also produced *Funky Farmworks*, *Don't Try This at Home II: Newton's Revenge*, *Mad Mission to Mars: 2025*, *Don't Try This at Home*, and *Taking the World by Storm*—each with their own correlated Teachers' Resource Manual. Mad Science Productions brings its shows to theme and amusement parks, local and state fairs, children's festivals, and special events in major markets across North America.

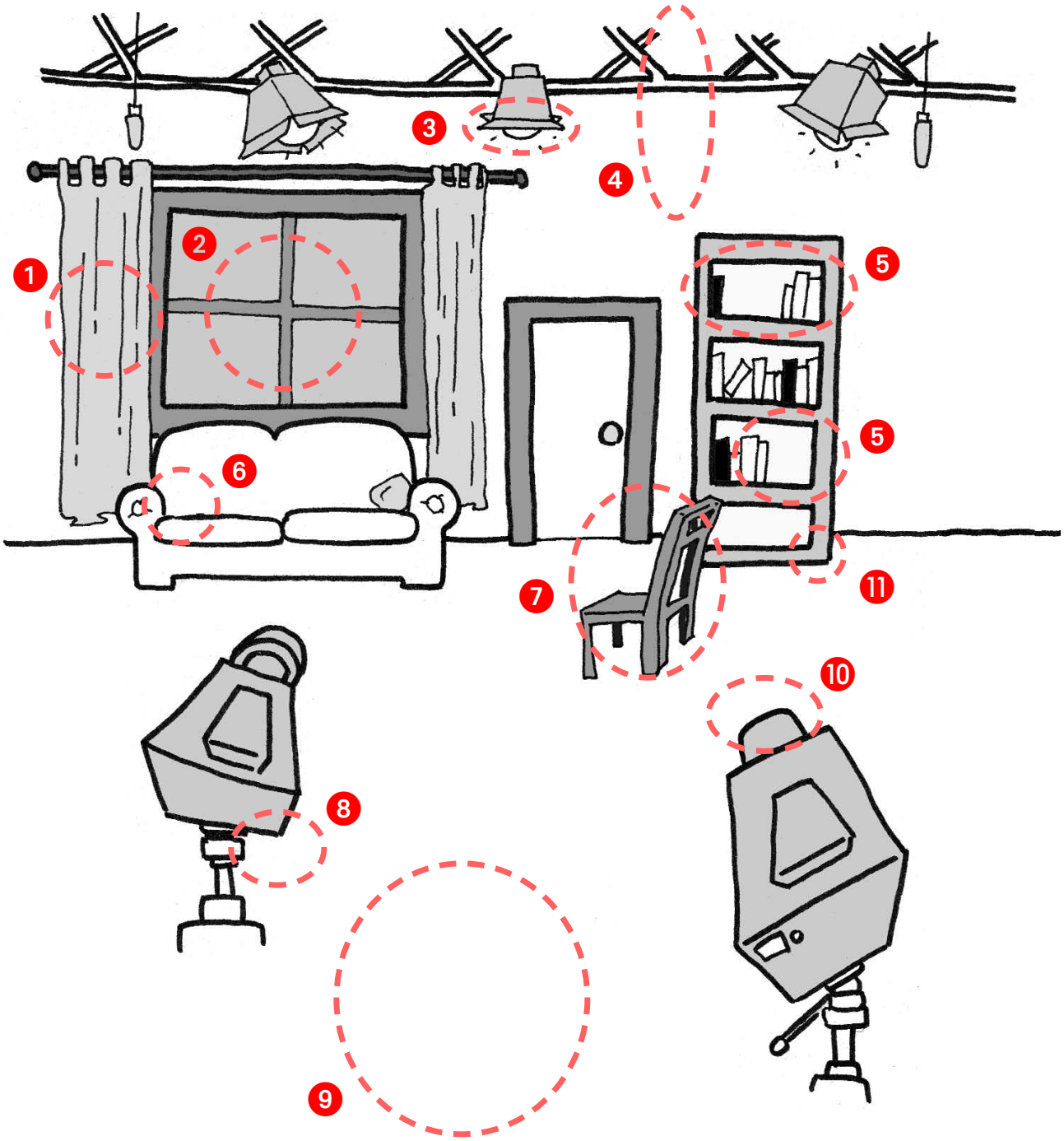






Activity Sheet:
Movie Slip-Ups

Circle anything in this image that is different from the first image!



Movie Slip-Ups **Answer Key**

1. The curtains are a much lighter shade.
2. The window is not a picture window (it has 4 panes).
3. There is a lamp installed and working in the middle light.
4. The middle microphone is missing!
5. Books are missing from the first and third shelves of the bookcase.
6. A cushion is missing.
7. There is a chair in the scene that was not in the original.
8. A grip is missing from the camera at the left.
9. The director's chair has gone missing!
10. The camera at the right has lost its lens!
11. BONUS: The bookshelf is a lighter shade than the original!

- Science Activities
- Classroom Demonstrations
- Additional Extension Ideas
- Vocabulary
- Reference Resources

Call **1-800-586-5231**
for information on any
Mad Science® production.

www.madscience.org