



# Binoculars Bonanza!

## Overview

Students will explore the bird world through binoculars and learn basic bird identification strategies.

## California Science Standards

Grade 6: 7.b.-I&E

Grade 7: 7.a.d.-I&E

## Oregon Science Standards

Grade 1: 3S.1

Grade 2: 3S.3

Grade 3: 4D.3

## National Standards

Content Standard A:  
Scientific Inquiry

## Materials Included

- \* Student Journal
- \* 15 Binoculars
- \* Checklist
- \* *Common Lava Beds*  
NM laminated guide

## Activity Time

Preparation: 15 min.

Activity Time: 35 min.

## Best Season

All Seasons

## Vocabulary

- \* Objective Lenses
- \* Eyepiece Lens
- \* Magnification
- \* Aperture
- \* Adjustable Eyepiece
- \* Binoculars
- \* Central Focus

**Grade Level:** All ages (O.S.S.: 1st-3rd) (C.S.S.: 6th-7th)

## Learner Objectives

Students will:

- Identify and label the features on binoculars
- Demonstrate the appropriate use by properly handling binoculars
- Use binoculars to observe and watch birds

## Background Information

Binoculars bring students close to birds without disturbing the birds in their natural habitat. This allows for observation, identification, and marveling at birds. By properly handling and using binoculars, students can easily observe bird field marks, plumage (color of feathers), bill shape, feet as well as flight patterns, feeding, and nesting. This does not mean you cannot enjoy birds without binoculars! Sometimes birding by ear is just as rewarding, and students can enhance their observation skills by noticing bird sounds (see *Birding By Ear*). Nevertheless, binoculars are a great way for students to get up close and personal with birds.

The invention of binoculars can be credited to two scientists: Galileo and Ernest Abbe. In 1609, Galileo developed the first simple telescope consisting of a positive objective lens and negative eyepiece lens, which is still used today. In 1893, Abbe developed the first prism binocular that caused the path of light to zigzag or fold upon itself. Unlike the simple Galileon telescope, prism binoculars allowed a higher range of magnification and a larger field of vision. Our modern binoculars are essentially two telescopes mounted side by side. Both the external and internal components work together to magnify visual images that can be clearly seen through binoculars.

This activity presents information that will guide your teaching about binoculars. It includes a pre-lesson introducing the structure and components of binoculars to enhance students' understanding before working in the field. Remember binoculars are fragile, expensive instruments, and proper care is a must! Rattling, shaking, or bumping binoculars could permanently damage the binoculars. For this reason, review the "safe use of binoculars" section in the lesson before distributing binoculars to students.

# Lesson Plan

## Getting Ready!

1. Read the background information and teacher tips.
2. Review “Safe Uses of Binoculars.”
3. Make copies of *Student Journal: Binoculars Bonanza* sheets.

## Discuss!

1. Let students know that in this investigation, they will go outside and use binoculars. Before doing so, students will “warm up” their binoculars skills.
2. Ask students why one would use binoculars (*observing birds, watching a play or sports game, etc.*).
3. Introduce binoculars and the 6 different components: eye piece lens (*lens closest to the eyes*), objectives lens (*lens closest to the object*), central focus (*primary focusing component*), adjustable eyepiece (*secondary focusing component*), lens barrel, and prisms (see following page).

## Investigate!

1. Give each student a Student Journal.
2. Give students ample time to fill out student sheets.
3. Have students share their answers and then reveal actual answers.

## Demonstrate!

1. Discuss “Safe Uses of Binoculars” (see next page) and perform demonstration. Don’t forget to explain that binoculars are expensive! Dropping them could permanently damage them!
2. Pass out binoculars and have students demonstrate the “Safe Use of Binoculars.”
3. Ask students to correctly identify the 6 different components on the binoculars (see next page).
4. Explain how to correctly focus binoculars.
5. Give students *Common Birds of Lava Beds National Monument* laminated guides.
6. Take students on a walk outside to practice using binoculars and observing birds.
7. Ask students to try to identify birds using laminated guides.

## Follow-up!

1. Ask students 2-3 questions to re-cap lesson (see right panel)



### Take A Hike!

Take students on a hike along a trail at Lava Beds National Monument or close to school. Students can practice using binoculars. Observe, identify, and marvel at birds!

### Suggested Questions

*What are prisms?*

*What are two focusing components on binoculars?*

*What is the first step when using binoculars?*

# Teacher Tips

## What are Binoculars?

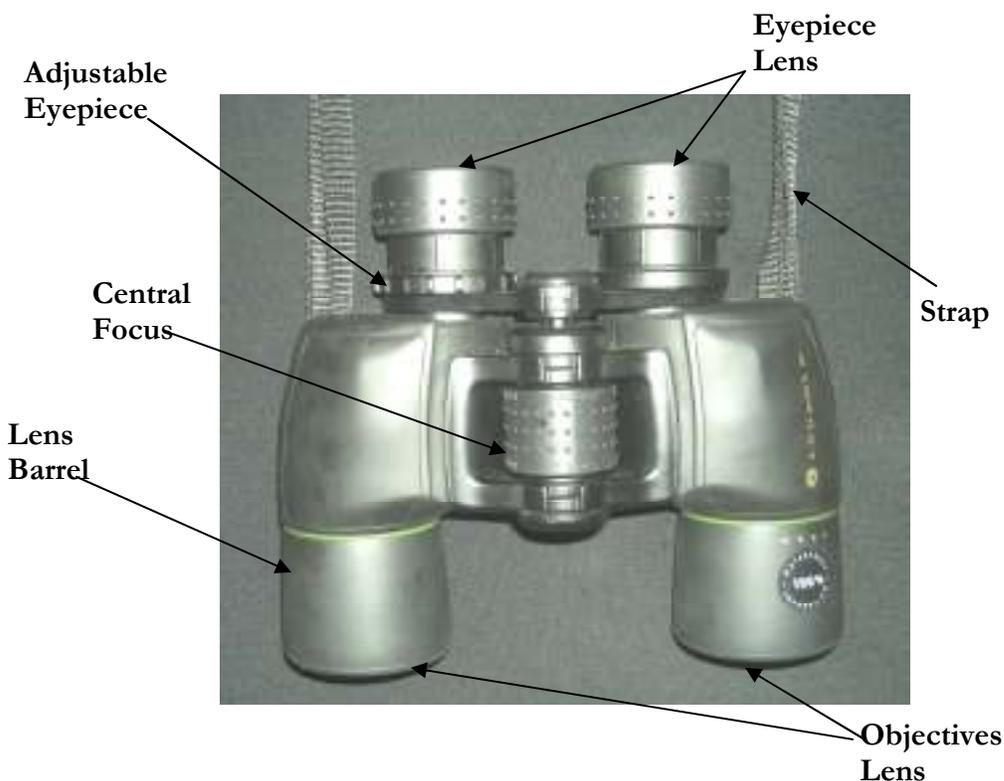


### Structure

Binoculars are essentially two identical telescopes mounted side by side and aligned to point in the same direction. At the front of each telescope is an objective lens where light enters, is magnified, and formed into a visual image. The image produced is upside down and backwards. With the help of prisms (blocks of glass functioning as mirrors without reflecting back), the visual images are turned right side up and viewed properly left to right.

### Magnification

Binoculars are described by a pair of numbers such as 7x35 or 8x40. The first number represents the magnification, or “power,” of the binoculars. This means the 7 in a pair of 7x35 binoculars makes an object appear seven times closer than when viewed by the naked eye. The second number represents the aperture, or the diameter of each objective lens. Aperture is especially important because it determines the amount of light entering the binoculars. The larger aperture, the brighter the image.



## Safe Use of Binoculars



- \* Keep the strap around the neck at all times.
- \* Stand still when using binoculars.
- \* Never look at the sun with binoculars.
- \* Do not rattle, shake, or bump binoculars.
- \* Never touch binocular lenses with fingers or dirty cloth.

## Cleaning & Protecting Binoculars

1. Clean lenses with soft cloth. Make sure to blow off any dirt particles first so the lenses don't scratch.
2. Thoroughly wipe off metal parts.
3. Never try to open up binoculars (leave internal cleaning to professionals).
4. If there is a dirty film on the lenses, put a drop of lens cleaner on a tissue and wipe in a circular fashion.
5. Keep binoculars clean, dry, and off the ground.

# Teacher Tips

## How to Focus Binoculars

*Have students stand about 30 feet away from an object or enlarged bird photo before beginning the lesson. Explain the following 10 steps of how to focus binoculars to students.*

**Step 1:** Put binoculars strap around the neck.

**Step 2:** If you wear eye glasses, fold eyecups (extra rubber protecting eye from contacting eyepiece lens of binoculars) back.

**Step 3:** Locate the adjustable eyepiece (most are located on the right eyepiece lens and read “ - 0 + ” (see right panel). Set adjustable eyepiece to “0”, or in the middle of the scale.

**Step 4:** Locate stationary object (or enlarged bird photo) first with the naked eye.

**Step 5:** Hold binoculars with two hands and bring binoculars up to your eyes, which are still looking at the stationary object.

**Step 6:** Move the two halves of the binoculars (connected by a hinge) until one field of view is seen. If you see a dark patch or crescents in the center or on the sides, the binoculars are too close together. If you see through two circles or see two images, the binoculars are too far apart. Adjust binoculars to your eye width.

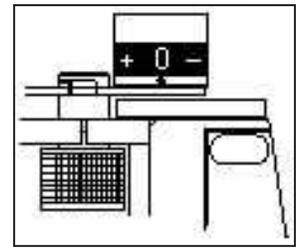
**Step 7:** Open both eyes and use a finger or two to locate the center focus wheel. Turn the wheel back and forth until the object becomes clearest. Close right eye (left eye open) and turn wheel again until image is clearest in the left eye.

**Step 8:** Continue looking at the object and close the left eye (keep right eye open). Use a finger on your right hand to locate the adjustable eyepiece. Adjust the eyepiece back and forth until the image becomes the clearest in the right eye. For some, the eyepiece will be closer to the “-”, for some it will be closer to the “+” or the “0”.

**Step 9:** Use the central focus for further adjustments during birding, but try not to touch the adjustable eyepiece once focused.

**Step 10:** Now you are ready for birding. Have fun!

### Step 3: Adjustable Eyepiece



Student learning how to correctly focus binoculars.



Students using binoculars while watching birds.