Teacher Guide: Rubin Bingo

The Bingo Tour offers a simple, guided path through this First Look Skyviewer image from Rubin Observatory. It features a series of stops where students can discover and learn about the incredible variety of objects found in the Universe.

Teachers can easily lead the game without needing to search for objects manually. Alternatively or for a second round, students or teachers can use the “Explore” mode to search for objects. There are examples of many of the object types in the image.

🎯 Game Objective

Explore the deep field images from the Vera C. Rubin Observatory’s First Look, identify astronomical objects, and become familiar with the Rubin Skyviewer in a fun and interactive way.

👩‍🏫 Target Audience

Advanced middle to high school students, depending on the desired level of complexity. Encourage teamwork for younger students by letting them play in pairs or small groups.

How to play:

1. The teacher should print enough Bingo cards so that each student has their own. *The pdf of all downloadable Bingo cards will be accessed via a separate link on the First Look for Educators webpage.*

2. Each student receives a Bingo card filled with names of astronomical objects. On the bottom of each card is a complete list of all the possible object names in this game so that students can check off words as they are used.

3. In addition to the Bingo card, each student should have a marker, pencil, or small items like beans to mark their cards — depending on whether the cards will be reused.

4. The teacher shares their screen and uses the Rubin Skyviewer Bingo Tour to explore the First Look image. The link to the Bingo game tour is *here*.

5. For each object:
    - The teacher begins the Bingo Tour, where each stop highlights a different object.

    - The teacher shows the object to the class and reads the description provided for that stop.
    - The teacher asks, “What kind of object do you think this is?
    - The students and teacher have a discussion and decide on the object name.
6. Students look for the object's name on their Bingo card and mark it if they have it.
7. Once an object has been used, students should cross off its name on the list of objects at the bottom of the Bingo card.
8. After the name of the object has been established, the teacher may share the information found in the “Did you know?”.
9. The first student to complete a row (horizontally, vertically, or diagonally) wins!
   Alternative version: play for a set amount of time (e.g., 10 minutes) and count how many objects each student found.

🎉 Game Wrap-Up

- Encourage students to pick a favorite object and research more about it.

Tour Stops, Object Names, and Additional Information

Tour Stop	Description	Object name	Additional Information
1	This galaxy has a flattened, rotating disk of stars that form pinwheel-like arms of material, including gas, dust, and stars. Young stars (identifiable by their blue color) populate the arms. A central bulge of stars shines brightly in the middle.	Spiral galaxy (face on)	**Did You Know?** In the 1970s, Vera C. Rubin studied the rotation of spiral galaxies — her work provided the first convincing evidence of the existence of dark matter.
2	Two stars that orbit each other.	Binary Star	**Did you know?** About 85% of the stars in the Milky Way galaxy are part of a binary or multiple star system, but our Sun does not have a partner star.

3	These galaxies do not have a defined shape, and are often distorted by gravitational interactions.	Irregular galaxy	**Did you know?** Irregular galaxies are cosmic rebels—no spiral arms, no smooth shape, just beautiful chaos. Many irregular galaxies are bursting with new stars, thanks to galactic collisions and the resulting turbulence.
4	This galaxy has a distinct bar of gas and dust that crosses through the central bulge. The arms originate at the ends of the bar.	Barred spiral galaxy	**Did you know?** Two-thirds of all spiral galaxies are barred spirals, including our Milky Way. Gas is funneled along the bar toward the galactic center, where new stars form.
5	This star exploded in a spiral galaxy.	Supernova	**Did you know?** A typical supernova explosion is so bright that it can outshine the combined light from its host galaxy for a brief period of time.
5	A group of galaxies bound together by gravity.	Galaxy cluster	**Did you know?** Galaxy clusters are like space cities—home to hundreds or even thousands of galaxies. These giant structures are still growing, slowly pulling more galaxies into their cosmic neighborhoods.
7	A star that glows bright blue and uses up its fuel quickly.	Hot star	**Did you know?** Some stars are so hot they glow blue—and live fast, dying in just a few million years! Hot stars can be 10-35 times hotter than the Sun.
8	These galaxies are spherical or egg-shaped and do not have spiral arms. They contain little gas and dust and	Elliptical galaxy	**Did you know?** Elliptical galaxies are the largest and most common of all galaxy types.

	have little to no active star formation.		
9	A small galaxy that can contain fewer than a hundred or as many as a billion stars—tiny compared to giants like the Milky Way.	Dwarf galaxy	**Did you know?** One way that large spiral and elliptical galaxies increase in mass is by accreting dwarf galaxies. Rubin Observatory will discover numerous ultra-faint dwarf galaxies, including some in orbit around the Milky Way.
10	These tiny solid particles block starlight, creating dark patches in galaxies or nebulae.	Dust	**Did you know?** Clouds of dust serve as the building blocks for new stars and planets.
11	A galaxy that has a stream of stars and gas extending from it.	Galaxy with tidal tail	**Did you know?** Tidal tails are trails of stars and gas pulled out from a galaxy after a gravitational interaction with a nearby galaxy.
12	Galaxies that are close enough for us to see details in their structure, such as arms, a disk, or a bulge.	Nearby galaxy	**Did you know?** Some nearby galaxies, like Andromeda, are visible without a telescope—and they're moving toward us! In a few billion years, the Milky Way and Andromeda will merge together to form one giant galaxy.
13	A star that is red or orange, and has a long lifespan.	Cool star	**Did you know?** Cool stars like red dwarfs can live for trillions of years—way longer than the Universe has existed so far! Even the coolest stars are hotter than anything naturally-produced on Earth's surface.Their surface temperatures are 2000-3000 degrees.
14	A tight-knit group of galaxies, usually 4-7 in number, that are	Compact Galaxies Group	**Did you know?** In compact groups, galaxies are on a slow-motion collision

	so close together that their mutual gravitational interactions pulls and distorts their shapes.		course—and in the end, most of them are expected to merge into a single, giant galaxy.
15	This image was assembled from observations over a 7 day period. Moving Solar System objects show up as colored streaks in the image. The colors are a result of different filters being used on different days.	Asteroids	**Did you know?** Most asteroids orbit the Sun between Mars and Jupiter, but some travel close to Earth. A few have even been visited by spacecraft!
16	Distant galaxies whose light is bent and magnified into arcs or rings by the gravity of a massive object between them and Earth.	Lensed galaxies	**Did you know?** Gravitational lenses can bend all forms of light, such as radio waves, visible, and X-rays.
17	Some galaxies appear to have outer layers arranged in concentric shells.	Shell galaxy	**Did you know?** Shell galaxies are the result of gravitational interactions caused by a smaller galaxy passing through a larger galaxy, causing ripples of stars and gas to form shell-like structures.
18	This galaxy shows a flattened disk marked by dark dust lanes. The central bulge extends above and below the disk.	Spiral galaxy (edge on)	**Did you know?** The majority of all spiral galaxies have a supermassive black hole at their center.
19	This stellar remnant is all that is left of the collapsed hot, dense core of a Sun-like star.	White dwarf	**Did you know?** A white dwarf is about the size of Earth. It is so dense that a single spoonful of its material would weigh as much as an elephant! Although they are called “white dwarfs,” many of these

			remnants are blue in color.
20	A galaxy surrounded by a large circle of many bright blue stars.	Ring galaxy	**Did you know?** Ring galaxies are loners, typically not found in galaxy clusters. Only 1 in 10,000 galaxies are ring galaxies, making them among the rarest of galaxy types. The outer ring in this galaxy, NGC4378, is thought to have formed from dissolving a galaxy bar or an arm.
21	A galaxy with very few stars spread over a large area, making it faint and difficult to detect.	Low surface brightness galaxy	**Did you know?** Low surface brightness galaxies can be larger in size than the Milky Way Galaxy but have hundreds of times fewer stars, making them very faint. Rubin Observatory's capabilities will allow astronomers to detect and analyze these galaxies with much greater detail than previously possible, helping scientists better understand the nature of dark matter.
22	This massive red-orange star has already expanded and cooled after using up the hydrogen at its core.	Red Giant star	**Did you know?** When a star like the Sun becomes a red giant, it expands so much that its outer layers could possibly reach as far as Venus' or even Earth's orbit!
23	This object is too big to be a planet but too small to fuse hydrogen like a star. It doesn't have enough mass to trigger the kind of nuclear fusion that powers stars, but it does glow because	Brown dwarf	**Did you know?** Brown dwarfs are not brown as their name suggests - they are red in color. For a while, astronomers thought these objects might help explain dark matter — the invisible stuff that makes up most of the universe's mass.

	of the heat it produces.		But there just aren't enough of them to account for it!!
24	Galaxies can distort each other when passing close by, or even merge into one galaxy.	Interacting galaxies	**Did you know?** When galaxies merge, their gas, dust, and dark matter will interact, but there will be almost no star-to-star collisions.
25	A star, similar to our Sun, steadily fusing hydrogen and shining with a yellow-white light.	Sun-like star	**Did you know?** The Sun is about 5 billion years old and is halfway through its main sequence lifetime of 10 billion years.
26	A galaxy with a supermassive black hole at its center. The black hole feeds on gaseous material from the galaxy, producing a swirling accretion disk around it.	Active galaxy	**Did you know?** The Hubble Space Telescope imaged the area around the black hole of this galaxy. Radio telescopes have imaged two large jets coming from the galaxy's nucleus.
27	Very distant galaxies whose light has been stretched to longer, redder wavelengths by the expansion of the Universe.	High redshift (faraway) galaxy	**Did you know?** High redshift galaxies are so distant that their light started traveling billions of years ago! When you look at a high-redshift galaxy, you're seeing what the Universe looked like when it was young!
28	A galaxy that has a disk, dust lanes, and central bulge, but no spiral arms, little gas, and no young stars.	Lenticular galaxy	**Did you know?** Lenticular galaxies appear like a mix between spirals and ellipticals! They have a flat disk like a spiral galaxy but their stars move in random directions like those in an elliptical galaxy.

29	After the giant phase, lower-mass stars like the Sun experience an explosive event that forces the star's outer layers to be blown away from the core, forming a greenish sphere of gas.	Planetary nebula	**Did you know?** A typical planetary nebula is about 1 light year across, and has a lifespan of about 30,000 years before fading away.
30	These rare stars are super hot and luminous, with strong stellar winds. Their lifespan is short compared to most stars, typically only 200,000 to a few million years.	Wolf-Rayet star	**Did you know?** Wolf-Rayet stars are so hot that the peak of their radiation is in ultraviolet wavelengths (invisible for human eyes), so they may not appear as bright in visible wavelengths as you would expect!
31	This group of galaxies appear as tiny red objects. The red color is caused by their light being stretched to longer wavelengths due to the expansion of the Universe.	High redshift galaxy group	**Did you know?** These galaxies are really far away, and their light has been traveling for billions of years. As a result, we are seeing them as they looked a long time ago, early in the history of the Universe.
32	This type of star changes its apparent brightness. Sometimes stars change brightness with regular cycles, while other stars change their brightness unpredictably.	Variable star	**Did you know?** This variable star (CI Virginis) is a pulsating giant with an unpredictable period.
33	This star-like object is the ultra-bright core of a distant galaxy, powered by a supermassive black hole and outshining the rest of the galaxy.	Quasar	**Did you know?** This quasar is now 169 billion light-years away from Earth, and we see it as it appeared 12.6 billion years ago.