

LEARN ASTRONOMY WITH US!

How can you work with others to develop their astronomy knowledge? This guide lays out basic techniques to a successful learning experience!

Whether you are planning a star party, a hands-on activity, or an astronomy presentation, use these tips to **build scientific thought, create personal connections**, and prepare for the **hard questions**. Keep reading to discover how you can help learners **develop their observing skills**. Finally, **pull it all together** to plan an out-of-this-world educational event!

BUILD SCIENTIFIC THOUGHT

Catch Their Attention

Start off with a hook! Engaging a visitor with **exciting or relevant information**, or an **intriguing question**, will engage their curiosity and involve them in their own learning process.

Ask Questions

Use questions to engage learners in the process of discovery. Questions help you discover how much they already know. They also help learners build their own connections. You're not only helping them learn astronomy, but you're helping them become better learners in the process!

Customize Your Interactions

Learning astronomy can look different for different learners. Customize your interactions for each visitor so that you are meeting them at their experience level. If you have a group, try asking a variety of questions to support all types of learners.

Sample Conversation:

Facilitator

"Did you see the Moon yet today?"

Learner

"Oh, there it is! I didn't know you could see the Moon during the day."

"What do you notice when you look at the Moon?"

"It's banana-shaped today."

"That's how it looks to me too! What is its real shape?"

"A ball!"



Sample Conversation:

Facilitator

"Where did the Moon come from?"

Learner

"A big rock hit the Earth and knocked the Moon out!"

"That's a great explanation! When did that happen?"

"I don't know."

"And that's OK! When that huge rock hit the Earth, what do you think happened to the Earth?"

"It would have made a big mess."

"I think so too! It would have melted the whole surface of the Earth! Do you think life could have survived that?"

"Probably not."

"So what does that tell you about when the Moon was formed?"

"It happened long ago - before life on Earth!"

Give Learners Time

Creating curious learners also means that we have to give them time to learn. After you ask a question, wait at least six seconds for people to think of a reply. Support learners while they are working through a question. Practice active listening and look for nonverbal cues that the learner is or is not engaged.

Consider All Types of Learners

Engaging in conversation can also help you accommodate learners of all types. Some learners love to touch things, some like to ask questions, and some like to sit back and observe.

Be a Role Model for Persistence

When you are working with astronomy learners, you are the astronomy expert! Be a positive role model for learners by praising them for working hard, debating, and persisting through failure. Science is about hard work and collaboration, not about being right all the time!

Facilitator

"I love how you all worked that out together!"

DISCOVER PERSONAL CONNECTIONS

Astronomy can be exciting for learners of all ages, but the concepts can seem distant—sometimes literally! You can personalize astronomy by helping learners discover relevant connections to the topic. Learners gain more knowledge and leave with a desire to learn more.

Discover a Learner's Entry Point

As astronomy lovers, we often assume, "If I think this is cool, others will too!" However, that isn't always the case. Think about a topic you aren't fond of. If you discovered something that helped you care about it, would you be more interested in learning more? Discover a learner's entry point into astronomy, even if it may not seem related at first. Our learners might make connections through music, through their love of engines, or maybe even through a video game!

Sample Conversation:

Facilitator

"How far away do think the Moon is?"

Learner

"Pretty far!"

"Have you ever been in a car? Where were you headed?"

"My friend's house."

"How long do you think that took?"

"About 10 minutes."

"Well, if you could ride a car to the Moon, it would take longer than to your friend's house. It would take half a year!"

Tackle Hard Questions

Sample Conversation:

Learner

"I thought the Moon was made of cheese?"

Facilitator

"I've heard that too! What makes you think that?"

"Well, it has those holes all over it."

"It does kind of look holey. Those dark areas are what we call maria. They're where lava once flowed on the surface of the Moon. Now they're flat plains of dark rock."

Learner

"I heard we didn't actually land on the Moon."

Facilitator

"What do you think?"

"Well, why aren't there any stars in the photos of the Moon landings? There's no atmosphere, so you should be able to see the stars even in the daytime."

"You're right, the Moon has no atmosphere! But sunlight is just as bright on the Moon as on Earth. Have you ever been under bright lights – like in a stadium – at night? Could you see stars then?"

"No, the light was too bright."

"If you took a picture from under those stadium lights, would you be able to see stars in the photo?"

TACKLE HARD QUESTIONS

You're having a great conversation about the Moon with a group of learners, then you get a question that surprises you!

Sometimes, a question may seem "silly" to astronomy experts, but learners might honestly not know. Use those opportunities to build critical thinking skills by exploring why they think that's true.

Learners may bring up topics that pose a conflict with the scientific consensus. In these cases, figure out whether you can have the conversation. If so:

- Discuss how science, like landing on the Moon, is done. How do we know what we know?
- If you have a large group, acknowledge their comment and redirect the conversation.
- Find the qualified "yes." Uncover the kernels of truth in what they are saying and use those to build a conversation.

"I Don't Know" Is Okay

A learner might ask a question that you don't know the answer to. There are always two right answers to every question: The correct answer and "I don't know." Even experts don't always know the answer. Hearing you say "I don't know," the learner realizes that there is always room to grow and that is okay.

Learner

"How dense is the Moon?"

Facilitator

"That's a great question. I don't know! Let's talk about where we can find out the answer."

EXPLORE OBSERVING STRATEGIES

Looking at astronomical objects, either with your eyes or with equipment, is called “observing.” Many of us look up at the sky, but not everyone has a chance to look through telescopes. You can help others build their observing skills!

Teach By Doing

Demonstrate the best way to observe or use equipment by doing it yourself. Never assume that everyone knows what you already know. They may have never looked through an eyepiece

Try starting with a question instead of telling them what they’ll see. Starting from their experience is always valid. You’ll need to be flexible, because they may surprise you with what they observe!

Harness Frustration

Sometimes observers will experience frustration. They might not be able to see anything through the telescope. Reassure them that observation is hard and is a skill they can build with practice. Have them try again, or if there is a long line, invite them to get back in line. There is a good chance that after a few tries and with your support they will be able to observe!

Sample Conversation:

Facilitator

“Would you like to see the Moon through our telescope? The best way to use it is to put your hands at your sides, like a penguin! Then put your eye gently up to the eyepiece.”

“What do you notice when you look at the Moon through the telescope?”

Learner

“It’s blue!”

“Is it blue all over or in some parts?”

“All over.”

“Why is that? Take a look upward. What do you see?”

“The blue sky.”

“We have to look through the blue sky to see the Moon!”

“How about you, what do you see through the telescope?”

“Nothing.”

“Try moving your head up and down a little, and side to side. Or try wrapping your fingers around the eyepiece, gently and without pulling.”

“I still don’t see anything.”

“I often have to look several times, and every time I practice it gets easier and I see more. You are doing a great job practicing. You can get back in line to try again!”

Put It All Together

Sample Conversation:

Facilitator

*"Thanks for coming!
What was your
favorite object that
you observed?"*

Learner

*"I liked seeing the
Moon."*

*"Keep watching the
Moon for the next few
nights – see how its
visible shape
changes!"*

Ignite Their Next Experience

You just helped someone build astronomy skills and knowledge. Perhaps this was their first astronomy experience, or perhaps they are already experts. Either way, you can help them plan for their next astronomy experience.

Help them choose their next observing target. Keep in mind, learners don't need special equipment to observe.

While most learners will not own a telescope, they may have access to wonderful resources in their community like a local astronomy club. Suggest they attend their club's next meeting or star party.

Amazing news about the universe is shared every day. Recommend some reputable resources for learners to find out more such as the Smithsonian, their local science museum, or [NASA's Astronomy Picture of the Day](https://apod.nasa.gov/apod/) (apod.nasa.gov).

PULL IT ALL TOGETHER

In this guide, we've explored how to have a successful astronomy interaction with a learner. Astronomy programs and events can happen anywhere. Planning an astronomy outreach event? Use our Open Space Toolkit to get inspired! Planning a star party? You don't need the darkest sky or the highest mountain to be able to observe astronomical objects. All you need are the techniques in this guide and a few other things.

Research Your Topic

Check out the Open Space resources, search the Smithsonian or NASA website, or pick up a book from your local library. You don't have to know every detail, but it's good to start off with some basic information.

*"Did you know our
local astronomy club
has a free star party
coming up?"*

*"Wow, we have a
local astronomy club?"*

"Check out their website!"

Put It All Together

Get To Know Your Audience

You know your audience best. Do your learners always gather in one spot? Do they like to ask questions about constellations? Do they love when you play music during events? Plan a unique experience based on their needs. If you are unsure, just ask! Send out a survey, ask casual questions, or read up on events that are popular in your area.

Gather Your Equipment

Learning astronomy and observing can be done without anything, but observing equipment or hands-on elements can improve the experience. Think about having the following tools.

- Binoculars and/or telescopes
- Laser pointers for constellation tours (make sure you know the rules on laser pointers in your area!)
- Sky Guide: There is no one perfect way to get around the sky. Find what works for you. It might be a combination of a great book on observing tips, a sky map, or an app on your phone.
- Activities: When discussing abstract concepts, you can create a concrete experience and engage multiple types of learners by using hands-on objects, physical activities, models of astronomical objects, images, videos, and more.

Make a Plan

You'll need to look up the time of sunset/sunrise. It gets dark about an hour after sunset. However, it doesn't need to be dark for you to see some great objects like the Moon and planets!

Choose Your Targets:

- **Urban:** The Moon and bright planets like Jupiter, Saturn, Mars, and Venus are all great targets in the city. With safe solar viewing equipment you can even observe the Sun. If you have a higher power telescope, try looking at double stars. Constellations can be easily recognized in urban areas as only the brightest stars in the constellation are visible.
- **Suburban:** You can look for all of the urban targets, plus some brighter nebulae and star clusters. In some darker places, with larger telescopes, you may be able to see another galaxy or two.
- **Rural:** The sky's the limit! With a truly dark sky, there can be so many stars that constellations might be hard to recognize.



Put It All Together

Keep in mind that the visibility of your targets, will change depending on the time of day and season. The Sun, Moon, and planets generally appear in the southern sky.

Don't have the time or resources to prepare some of these tools? You're in luck! Your local astronomy club is likely willing and excited to work with you. Astronomy clubs are run by amateur astronomers that know a great deal about astronomy equipment and observing techniques. They are a great resource and can help make your program a success!

Now you're ready! Not just to become an astronomy expert, or to lead a program, but to be an astronomer yourself. By observing, discussing, and sharing, you engage in one of the oldest ways that humans have explored our world – by looking up!



**Smithsonian's
National Air and Space Museum**