

Pamela P. Cote

Using a Star Chart to Identify an Object in the Night Sky

Audience, Task, and Environmental Analysis

Background:

Our Task: using a star chart, find out what that point of light is that we're viewing in the night sky through the telescope.

My husband received a telescope for a Christmas present from our daughter, Laura. We visited over the holidays so it was under the tree in Salem, MA. I had known about this present in advance so purchased some accessories, a star chart and a book for new astronomers.

Laura's husband, seeing her apparent interest in the telescope decided it was the perfect gift for her as well.

While in Salem, we visited the Museum of Science in Boston where in conjunction with a special show on Ancient Egypt, the planetarium focused on how Egyptians used the stars. The program discussed their beliefs regarding what happens to the stars and gods during the day, and how they are important in life after death. Orion was featured prominently, and I can now find Orion's belt easily, although I still haven't learned the surrounding constellations.

We also put her telescope together. Naturally, we had to try it out. We found the brightest point of light with a spotting scope and then tried to discover what it was. It seemed to move awfully fast, so we thought it must be a planet. We no sooner got it in the crosshairs of the spotting scope and tried to resolve it than it was moving out of range.

Note: At this point, we didn't know that a star chart doesn't show planets or phases of the moon.

Analyzing the User

Who is the audience?

This is a short list of individuals and groups that I could imagine using a start chart:

People new to telescopes, astronomy, and constellations

Outdoor enthusiasts such as hikers camping out overnight

People on boats and ships using the stars to chart courses

Professional astronomers using it as a reminder or reference

Amateur astronomers both children and adults

Youth group members such as cub scouts earning merit badges

Astrologers

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Farmers using ancient methods in tune with the universe
Science fiction writers

What is their motivation?

Everyone using a star chart is interested in the subject of stars or constellations. They could be motivated as teachers and pass on their knowledge of legend and fact. They might want to learn how to reckon their earthly or oceanic location based on the stars. They could be romantically motivated and use their knowledge to impress or relate fantasy stories. They could be religiously inclined with basis in the relationships of the stars and constellations to the moon and planets. Or feel accord with their relationship to the universe. They may be Stargate or StarTrek fans trying to locate their favorite heroes latest adventure's galaxy location. They may be motivated by a thirst for knowledge to find previously unknown objects (whether simply new to them or new to the world).

What are their tools?

The tools required for using a star chart to identify a star are the star chart, the night sky, enough light to view the chart, and the unaided eye. A compass or knowledge of direction, hemisphere, and the month, day, and time are important. It isn't necessary to use a telescope or even binoculars to see constellations. Although in my case, I was motivated to learn because of the telescope. The ability to read is required in order to put the names together with the stars, constellations, and other anomalies – to put the name to the points of light that the star guide gives them. The ability to pronounce them correctly is another story.

What are their mental models?

They generally view stars at night, and occasionally in the early morning and early evening when the sky is not totally dark.

People looking at the stars are using their previous experience with the night sky. They may or may not bring basic recognition of constellations and their relationships to each other. They may or may not have an idea of galaxies, what the Milky Way is, or how and why the stars and planets appear to move during the night or that what is viewable changes from day to day.

It is safe to say everybody recognizes the moon. I think most everybody can pick out the big dipper. I learned early in life to find the big and little dipper and the North Star. I never learned to recognize Orion's belt. My early learning was hampered because I had very poor undiagnosed distance vision at an early age. My vision deteriorated at a quick enough rate that my glasses were often not strong enough to see the stars as most people do.

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I took an astronomy class in college, have watched many shows on the universe, but still don't retain much in the way of astronomical vocabulary or history. For me, the current experience and enjoyment are enough.

My husband was interested in astronomy when I first met him 30+ years ago, and we have purposely set out to view total eclipses of the moon and meteor showers, as well as finding ourselves driving through the southern California desert and seeing shooting stars we didn't expect. This was for simple enjoyment and was fodder for our conversation for a period of time, but that was the extent of the experience. This could be similar to the experience when someone visits Disney Land – fun.

Task Analysis

Goals and Motivation

What goals could these groups have for using a star chart? Maybe they have a specific star picked out that they want to know the name of. They may want to know if it is part of an overall constellation. Maybe they are just trying to familiarize themselves with the bodies in the sky, or looking for specific anomalies that have never been defined. Maybe they have heard of a constellation and want to find out where it is or learn relationships of the one to another. These goals may be for personal interest, a leisure individual activity, a social group or club, or a professional interest such as farming according to nature's guides, or familiarity of religious tenets, or passing on the knowledge through teaching.

How do they identify a star or constellation without a star chart?

They may have a photograph or drawing of a group of stars. They may view a star or group, make a drawing, and then try to find the same in reference material at the library. They may ask someone for help. They may go to the internet or other software application that can identify what should be visible at that particular time of year. They compare what they saw in the sky with what they see in other formats.

Steps in the Task

The specific tasks required to achieve the goal can be shown using the Norman model in the book and Robert Krull's model from his Electronic Coaching Systems class.

Norman's cycle	Activity	Krull's coaching model
Forming the goal	See a star in the sky and wonder what it's name is.	Motivation
Forming the intention	How do I find out? Do I have the tools?	Imaging/naming
Specifying the action	Yes, I have a star chart. I know what	Imaging/naming

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	time, day and month it is and in which hemisphere.	
Executing the action	Dial in the day, month, year. Follow the directions for how to hold the chart. Look at the star chart and compare what I'm seeing in the sky to what I'm seeing on the star chart.	Doing
Perceiving the state	Do I find it?	Evaluating
Interpreting the state	Nothing seems to match.	Evaluating
Evaluating the outcome	What did I do wrong? Where can I find help? Go back to the beginning and repeat the actions with more information or find better tools and try something new.	Evaluating

My goal/motivation: find out what I am looking at through the telescope, which happens to be the brightest object in the sky.

Specifying the action/imaging: think about how I would go about doing this with the tools at hand, read the instructions on how to use the star chart and review the visual images both from the telescope and the sky in general to determine relationships to use while trying to resolve this question.

Executing the action/doing: focus the object in the telescope, look at where it is in relationship to the horizon, compass direction, and other stars. Look at the star chart, follow the directions on it's use: turn the dial to month, day, and time; turn the chart so the arrow points in the direction of north; hold it as directed; and compare to what I see in the sky.

Perceiving, interpreting, evaluating: the object doesn't seem to match, and I can't relate what I see on the chart to what I see in the sky. I determine that I must be doing something wrong. I need more information.

Description of My Continued Attempts

The star chart I bought was called David H. Levy's Guide to the Stars. It gave three simple instructions, but they didn't make sense. Turn the inner dial (24 hour scale) to

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match up the outer dial (month and day). Face either north or south, then hold up the chart in front of you. It didn't seem to match up for me or my daughter. It did have a reference to a website www.whatsouttonight.com so we tried to find a better description there with little success, except to find out that Jupiter should be viewable. Another problem with this chart is that the background was white with black spots for the stars and a blue river to show the milky way. The blank space on the chart was filled with misc. information that was very confusing for someone just trying to find out what they were looking at. Another problem was that the black spots were sized according to brightness rather than to actual size of the object. So in my mind, the chart wasn't actually a very good likeness of the night sky. There was an illustration of how to hold the chart, but when I followed the instructions, it seemed to be upside down or backward.

Another chart, called a planisphere was included in one of the new books. It showed a better visual representation with a blue background and white stars, but the dots representing the stars were too big, and they were connected with heavy white lines to show the constellations. This made it hard to distinguish specific stars. Also, silly me, I thought "plan"-isphere meant something to do with the planets and was hoping to find Jupiter on it because that was what we thought we were tracking. It did give an instruction to "hold the planisphere over your head so that the arrow marked "South" points toward South. (That actually gave me a clue as to how to use the first map.) But I think I'm supposed to cut out an elliptical hole depending on my latitude in order to use it correctly. What's my latitude?

The best guide by far was the Orion Star Target Constellation & Celestial Object Finder (for latitudes 30 to 50 degrees). Although it introduced a new concept of latitude, it gave a more realistic representation of the stars. It used a dark blue background and white dots for stars. The Milky Way was represented as a pale blue river. Even the use of magnitude made sense because the brighter stars looked brighter on the chart because they were bigger. It had the best instructional set yet, and told me to hold the "Star Target in front of you so the horizon labeled "N" (North) is down" when facing north. And similarly that east is facing down when facing east. It also tells me that if I see a bright object in the sky that isn't on the chart, it's probably a planet, and tells me that they aren't on the map because of their movement along the "elliptic". The elliptic and lines connecting the constellations are all finely and faintly drawn. Constellation names are all in pale violet. My guess is that they aren't visible when using the recommended red light for night viewing. There was a better illustration indicating how to hold the chart and that the edges of the elliptic are the horizon line.

All these instructions are complicated in that a reflector telescope resolves all objects upside down.

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Experience Level

A good method of learning is to view the sky while someone else identifies and points out the constellations and stars and tells you stories and lore about them. It would have been very helpful if someone with experience using a star chart had helped us figure out how to use it, because they could have provided error correction in the case of holding the chart improperly. They could have told us that if the bright object couldn't be found on the chart it was probably a planet, and even known which were the likely planets.

A star chart is appealing to a very wide audience as far as experience goes. The **novice** may know some popular object names, and can learn where they appear in relation to other important and popular objects by using references such as the star chart. They are probably interested in only a few objects at a time. By combining the telescope with proper tools I have started to actually store some terminology. But I am still a novice.

The **advanced beginner** probably knows major constellations by sight, and can follow their progression through the night. They probably recognize the line the zodiacal constellations follow. They understand that there are stars and constellations that can't be seen during certain times of the year. They use the star chart to find out what they are looking at and the relationships to other objects. They read the newspaper or other periodicals to find pointers on the best times and locations in the sky for stargazing. They have purchased additional eyepieces, and inexpensive aids to increase their enjoyment.

The **competent user** probably uses a star chart to find out in advance what will be visible and plan their observations from that information. They have used other forms of the chart and found ones they feel comfortable using. They know which nights will be good for star gazing and will try to go to other sites to find better viewing opportunities. They probably have favorites and know which things are rarely seen and can appreciate being able to see them under favorable conditions. Most likely, they have learned how the planets track and understand the basic concepts that cause phenomena such as retrograde. They have purchased additional filters to refine their enjoyment.

The **expert** probably has committed the entire viewable sky to memory, knows what can't be seen in the winter, and what constellations the specific planets will show up within during the next month. They are used to watching the orderly progression and have learned certain relationships. They may not be able to recall all the names of the objects, but know where to find those names, and can use the star chart to do so. They are comfortable in their knowledge and can apply the concepts to predicting rare phenomena and will know when they see something totally new.

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Analyzing the Environment

Physical Environment

The environment for stargazing can be quite pleasant if you have a window facing a large chunk of sky. Otherwise, you might need to set up your telescope outside. When you live in the northern latitudes such as Massachusetts and Minnesota, outdoors viewing isn't as inviting during the winter even though the nights can be crystal clear. Lights, double pane windows, and reflection from the moon off the windows can complicate viewing from inside.

Physical requirements when using a telescope include special hand adjustments meant to keep the lenses lined up with the movement of the objects through the sky during the night. There are motorized accessories that can do this automatically. But it seems you need to know your latitude for this to operate correctly. The telescope needs to be mounted on a tripod or some other base with special regard to external light and a good viewing area. This can be outside or inside and that can affect comfort and consequently how long you spend at the task.

Stargazing can be limited because of city lights and visual acuity. Distant and pale objects can be difficult to discern when surrounding light washes the viewing area. The darker the surroundings, the more you see. This is true even with the naked eye. I remember visiting my sister in Montana while living in Las Vegas. I looked up and saw the Milky Way for the first time in many years. I hadn't realized what I had been missing.

Social Environment

This can be a social activity with one person spotting the object with a special scope, tuning in the image, sharing the image with another, or one person can find the objects on the star chart and relate that to what is seen in the night sky. Stories about the constellations can be shared. Someone with more experience can help someone with less experience. Synergy at the same level can enhance the experience through interaction and communication. When some truly rare event occurs, astronomers of all experience levels seem to come together.

Cultural Environment

Culture may have some affect on the experience. A culture where the sky plays an important part, such as farming and seagoing may use the movement of the stars as guides for decision making and so are inculcated at an early age. The hemisphere from which you view determines or limits what you can see. You can buy a better viewing environment, better equipment, better education, training, and accessories with money. But if you live near someone who shares your interest, you may be able to pool resources to provide when money isn't available. If this hobby isn't of interest to anyone else in your circle, you can be perceived as unusual or eccentric, certainly a loner. Your culture can also affect how you get additional information. A younger person would think

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of using the internet, while an older one would think of using the library, or calling someone they know who can answer their question. How quickly we expect answers can depend on age and whether we are tuned in technically.

Follow Up to My Attempt to Use the Star Chart

Our biggest problem was that we focused on the brightest point in the sky on our first attempt. We didn't know that Jupiter is one of the brightest bodies and that it isn't shown on a star chart because it doesn't keep the same relationship to stars as they do to each other since it is so much closer to earth. This point in the sky had three other tiny points pretty much in a line, two on one side and one on the other. We thought we were having problems focusing. As it turns out, Jupiter has four visible moons. So we are pretty sure we were looking at Jupiter. At some point we will feel comfortable that our identifications are accurate instead of wondering if we got it right.

Final note: The planets are still difficult to understand because they don't stay in the same relationships as the stars do. They have to be plotted with a totally separate method. In books that illustrate the planets, the plotting maps are quite complicated showing the movement along the elliptic by month and year.