



THE UNIVERSE IN THE CLASSROOM

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The Universe at Your Fingertips — More Than Just Astronomy

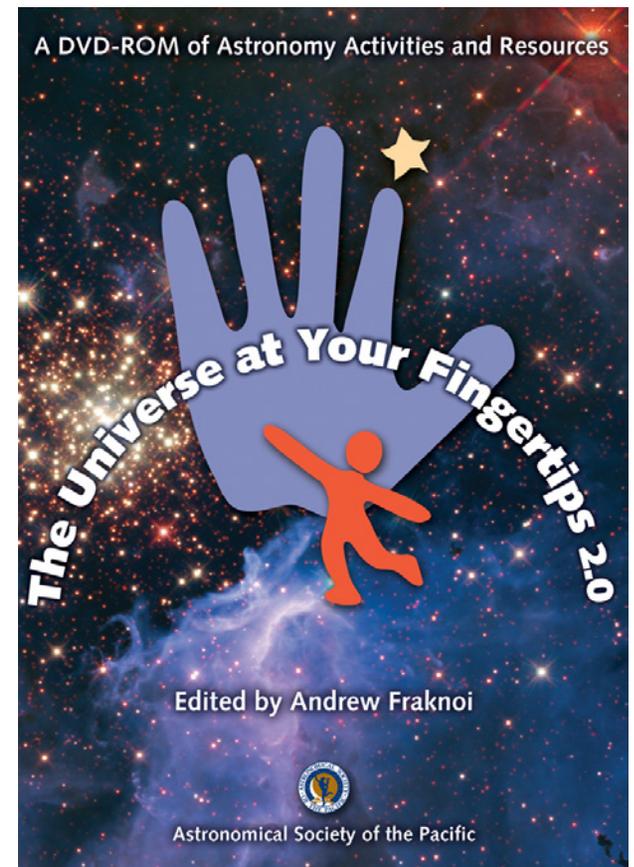
by Dr. Karen Schwarz (West Chester University, Pennsylvania)

Project ASTRO is a fabulously successful program that has been connecting educators with volunteer astronomers for over 20 years. These educator-astronomer pairs work to bring hands-on inquiry-based astronomy education into classrooms all across the U.S. Many years ago I got involved in this program in Tucson, Arizona as an astronomer volunteer for a third grade classroom. I loved being a part of the program, seeing the kids really “get” the concepts such as the phases of the Moon or the seasons. I knew from my experience teaching at various colleges and universities that many (most?) adults don’t truly understand these seemingly simple concepts, despite having “learned” them years ago in grade school.

When I ended up moving to the East Coast I figured I would join up with a new teacher when I got settled in. I quickly discovered that there was no Project ASTRO site nearby. After a couple of years I managed to set up a Project ASTRO site at West Chester University (WCU) and we’ve been happily matching teachers with astronomers since 2008. However, over the years I’ve had a harder and harder time getting teachers to sign up for

the Project ASTRO program. They have so much material that needs to be covered that there’s no room for anything that’s not in the standards or on the test. This isn’t their choice; this is just the reality that they’re working in. Some of them have lamented that they’ve had to leave out some of their favorite topics, including astronomy, due to changes in standards. Some of them have been moved to different grades and/or subjects and now astronomy isn’t part of their curriculum anymore.

When my daughter was in first grade I was invited in to talk to her class about astronomy. I decided a short presentation about constellations would be fun and, of course, turned to my copy of “The Universe At Your Fingertips” (UAYF) to find an activity to include. “Create Your Own Constellation” was an obvious choice. I had used it several times in the past at various events with young children. When I passed out the papers and got the kids started on making their own pictures and stories to go with them, the teacher remarked that she loved the fact that the activity involved writing. Now, this may seem silly but I had never thought of the activity as a “writing activity”.



Remember, I'm not a K-12 educator. I had simply thought of it as an "astronomy activity". Jump back to the complaints of my teachers today and I realized that these teachers were doing the same thing I was. They were seeing these activities as only having to do with *astronomy* when in reality they are so much more than that! While all of the UAYF activities have an astronomy component, they also involve math, writing, presentation skills, art, critical thinking, scientific literacy, and research methods. These other aspects are quite apparent in some of the activities. For others they may not be as obvious but they're there. The bottom line... Teachers who don't have astronomy in their formal curriculum can still use these activities and sneak a little astronomy into their classrooms!

Last winter I led a small project to look at the UAYF DVD and modify and/or supplement the activities to enhance these multi-discipline aspects. Our group consisted of three in-service teachers and seven WCU education majors. We had two elementary teachers and one middle school teacher. The WCU students were a mix of elementary education and secondary education majors. The teachers were excellent mentors to the students. Within in each team, the teacher spent some amount of time talking with the students about curriculum standards, lesson development, and classroom management, within the context of the project. This was very practical information that the students will be able to use in their own classrooms. Despite their lack of classroom experience, the students had a lot of really great ideas.

I had hoped that each team would be able to produce 2-3 revised activities during the course of the two weeks, leading to a total of 6-9 new activities. By the end of the project the teams had produced

a total of 18 activities, some of which were entirely original works as opposed to revisions. Below are examples of some of the supplemental activities that our group came up with. Letter/number combinations refer to the indexing for activities in the UAYF compilation.

Writing Additions

- **A6 — Dark Side of the Moon**

Have students write a narrative where the setting is the far side of the Moon. Think about what the main character would see in the sky. Would s/he see the Earth? Would s/he see the other planets or the Sun?

- **B5 — Observing Where the Sun Sets**

Correspond with students at another school and compare observational results.

- **I3 — Invent An Alien**

Have students write a story about their alien. Make sure they include the details that they brainstormed earlier in the activity. For example, they may want to include a scene where the alien is eating.

Have students teach someone about how their alien came to be and include information about who they are today. Examples: where and when your alien was born, their hobbies, their family life, etc.

- **K4 — Moon Landing Hoax**

After completing their research, have students write a persuasive essay using details from articles to support their point of view.



(Image credit: Brian Kruse)

Math Additions

- **B5 — Observing Where the Sun Sets**

Graph the movement of the Sun's setting locations over the period of observations. Transparencies preprinted with coordinate grids can be used. Students should overlay their pictures with the transparency to graph the location of the sunset.

- **M9 — A Flag for Your Planet**

Students can design their own flag using geometric shapes. The teacher can require a certain number of different shapes such as three hexagons, eight pentagons, two rectangles, etc. They could also be required to make the flag symmetrical.



(Image credit: ASP/Family ASTRO)

Presentation Additions

- **K4 — Moon Landing Hoax**

Have students create interviews with experts and present these in front of the class. Try to get interviews with a variety of people.

Break the class into two sides (pro and con) and hold a debate.

An unexpected byproduct of this project was a few entirely new activities. On the following page you'll find an example of a student-created activity that starts with math concepts but then cleverly folds in astronomy and even some writing. All of the supplements and activities that our group designed can be found on the website which accompanies the UAYF DVD.

Based on the success of our small group, I'm confident that any teacher can find ways to make use of the UAYF activities in non-astronomy lessons. Or to take an astronomy lesson and expand it across the curriculum. So the next time you're looking for a different kind of writing activity or a new twist on an old math lesson, try flipping through the UAYF and see if you can sneak some astronomy into your classroom while you're at it!

Technology Additions

- **D2 — Toilet Paper Solar System**

Students can learn how to generate a bar graph from a table with Excel using the Leader's Version of the table (found on page 3 of the activity).

Create Your Own Constellation

Grade 3–5

Kasey M. Goldberg and Rachael Pinsley

Create Your Own Constellation, Plot Your Constellation on a Grid, and Create a Story About Your Constellation

What's this activity about?

Main ideas to be covered in this activity

- Students will learn about constellations as well as how to plot ordered pairs of numbers. They will create a coordinate grid of their personally designed constellations, work with partners to look at each other's constellations, create a narrative piece on their constellations that they have created, and do an extension game.

Concepts

- Coordinating grids and understanding how to read and make ordered pairs
- Creating an appealing narrative about their constellation that they have created

Inquiry Skills

- Recording

Big Ideas

- Models and simulations
- Creating a narrative

Materials

- Black poster paper for each student
- Single hole punchers (to be shared among students)
- Pre-labeled coordinate grid (two per student:

one for their constellation and one for plotting the points of their partners' constellation

- Rulers
- Notebook paper for their constellation story drafts
- A computer/printer to type and print the final copy about their constellations
- Paper clips
- Stapler (to staple the narrative to the coordinate grid)

What will teachers do?

- Teachers will facilitate examples of constellations (perhaps hang them around the classroom or just bring them out to show to the students once, place them on a table, and allow students access to them if needed.)
- Teachers can also engage students by asking what constellations students already know.
- Teachers will have materials printed and ready to go (such as the coordinate grids printed, rulers available, poster paper, etc.)
- Teachers will be able to pair students who are finished with the project early or around the same time to do the coordinate grid extension activity.
- When students are finished with their grids, the teacher can then turn off the lights and shine a flashlight onto each of the students' constellations.
- Have students write a draft about their constellation. Have their final draft be one page, typed, printed, and then stapled to the bottom of their coordinate grid.

What will students do?

- Students will create their own constellation by

first drawing the dots on their grid and then connecting dots by drawing lines.

- Students will write down their ordered pairs corresponding to the locations of their dots.
- Next, students will hole-punch the stars plotted on their grid using a hole puncher.
- Students will then place a black piece of paper behind their coordinate grid and paper-clip the two pieces of paper together. They will use a visible coloring utensil to color in the holes to transfer their stars onto the black pieces of paper. Finally, they will remove the paperclip from their coordinate grid and the black sheet of paper and hole-punch the black piece of paper where the star markings are.
 - While students wait for each other to finish, they can be matched by the teacher for the Constellation Grid Game Extension.
 - Constellation Grid Game extension: Have coordinate grids and have students work in partners. Students will exchange their ordered pairs for the constellations and they will have to see if they plot the right points for their constellations that they have created.
- Students will draft a narrative about their constellation.
- After their drafts, students will type and print the final copy of their narrative and staple it to the bottom of the black paper. The coordinate grid with their ordered pairs can be turned into the teacher.

Tips and Suggestions:

- This activity should be done after learning about constellations. Examples can be shown

of different constellations for ideas.

- Allow students another coordinate grid paper if they do not like the appearance of their constellation and they can't erase it completely.
- Have the coordinate grids premade but let the students fill in the labels for the x- and y-axis and other appropriate labels.
- Have students who are finished with their constellation projects first work together for the coordinate grid extension activity.
- Ask students/parents to bring in a flashlight for each child prior to the lesson.
- Give all students adequate time to do the coordinate grid and the extension activity.

Steps of doing the activities:

1. Plot the stars (points) onto the coordinate grid.
2. Have students then decide where to connect the lines to create their constellation.
3. Write down the ordered pairs of the stars plotted.
4. Use a hole puncher to punch the stars plotted on the grid.
5. Paper-clip the coordinate grid onto a black piece of paper, using a visible coloring utensil to color in the holes (stars) onto the black paper, remove the coordinate grid from the black paper and hole-punch the colored marks on the black piece of paper.
 - If finished, the teacher will match students together with students finished to do the extension.
6. The teacher can move onto the narrative about their constellation activity.
7. The final copy will be typed, printed, and stapled to the bottom of their black constellation paper and the coordinate grids can be turned in and assessed by the teacher.

8. When all are finished with the coordinate grid (and extension) and writing the narrative, you may wish to have a publishing party. For this, the teacher can turn off the lights in the classroom and have one child at a time share their constellation narrative while another student is called on to shine a flashlight through that publisher's constellation so it shines onto the wall.

Other Resources for Integrating Math and Astronomy

Amazing Space: an educational resource from the Space Telescope Science Institute, home of the Hubble and James Webb Space Telescopes. Amazing Space contains modules on Statistics, Estimating and Sampling, and Measurement.
<http://amazingspace.org>

Space Math @ NASA: a series of modules with math lessons focusing on its application to space science and exploration. Modules cover a wide range of grade levels, and include links to specific missions and topics, including: Mars Math, Lunar Math, Magnetic Math, Northern Lights and Southern Sprites, and more.
<https://spacemath.gsfc.nasa.gov>

Imagine the Universe: a NASA education site for students ages 14 and up. Site content includes lesson plans with math connections with content including: algebra, statistics, problem solving, and communication.
<https://imagine.gsfc.nasa.gov/home.html>

Originally developed for Project ASTRO, and published by the Astronomical Society of the Pacific,

The Universe at Your Fingertips 2.0, a compilation of astronomy activities and resources for educators and classroom use, is available here:

<https://myasp.astrosociety.org/product/DV122/theuniverseatyourfingertips20dvdrom.php>

The Universe at Your Fingertips 2.0 has many activities not mentioned above which focus on math skills, including [How High Up Is Space?](#)