



2011 AAAS/Subaru Essay Writing Competition for K-12 Educators Finalist Essay

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Space: The Reading Frontier

Last year, I inherited a semester-long astronomy class two days before the start of school. Although we already had someone teaching astronomy, the only astronomy materials we had were textbooks geared for a year-long class for honors-level students. In addition, I was selected to teach this new class because the principal felt I was particularly able to work with more challenging students, a side-effect of many years of teaching experience. A quick review of our school library revealed a dearth of current astronomy resources, so I went online to gather ideas and activities.

Over the weekend, I read what I could about my students. The class would be small, only about 20 students, and would include all four grade levels, from freshmen to seniors. Three of the students were special education kids and one of the two freshmen was a student recently diagnosed with juvenile arthritis. The rest were a mixed group, but all of them had issues with either attendance, behavior, or both.

I realized that I had a unique opportunity to help these students change their perspective of science. Because we didn't have a set curriculum, we could explore each topic in as much depth as we wanted. I also decided that one skill I would try to help these students with was reading a science textbook, so that they could have a better shot at success in their next science classes. But first, I had to get them hooked enough on astronomy to

want to read about it. We began by talking about what they already knew, or thought they knew. Each idea that was voiced was listed on the front whiteboard without editing or comment until we'd gathered all that anyone wanted to share. After all the students had written their ideas on the board, I asked assistance in consolidating the writing into a few general concepts. It might have surprised some of my colleagues that these students were able to comment on most of our major knowledge about astronomy in that one brainstorming session. We then chose the order in which we wanted to study these ideas.

This may sound like I had all of my students actively participating right from that first day. Far from it. I believe that just as I want to be respected and acknowledged as an individual, so do my students. One of the ways I've learned to do this is to allow them to get to know me before demanding compliance on non-essential issues. That means that during the first few weeks, I generally don't insist that everyone must speak up, come to the board, or otherwise publicly participate. I do require everyone to participate by voting on class decisions and by at least passively engaging in class activities. As the semester progresses and students have the opportunity to feel safer in our classroom, my expectations about participation increase.

The first topic we chose was the relationship between the Earth and all the other objects in space. When the opinion was raised that the early astronomers were stupid to think that the sun moved around the Earth, we discussed the facts they had to work from. This led to Internet research and some interesting field work trying to confirm what they'd found. As my students



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worked to prove that the Earth moved around the sun rather than the reverse, they began to develop a much greater appreciation for the work of the early astronomers. Galileo became something of a hero to many of these kids, for sticking with what he believed to be true even in the face of major negative consequences. I brought in some copies of the textbook we had available, but the format and reading level kept the information out of reach of all but a few students. Since my goal was to help them read science, I knew I had to find a different vehicle. I decided to take a gamble and bring in two books from my personal library. One focused on the NASA lunar missions and the other was a wonderful book about space in general. The best thing about both books was the colorful and exciting photography and art they incorporated throughout.

I introduced the NASA book, *Voices from the Moon* by Andrew Chaikin, using a digital video presenter and reading passages to the students. I was amazed at how intent these kids were on listening to me read and just looking at something that didn't move, make noises, or otherwise entertain them. I recall one student expressing surprise at a passage in which Pete Conrad refers to a launch that went through an electrical storm. My student, Donnie, wasn't surprised by what the astronauts were going through, TV and videos had seen to that. What he was surprised about was that Mr. Conrad spoke like a "regular guy," using the expression, "Every one of those hummers was on!" I think it was the first time that Donnie could actually see himself as someone who could be like the people we were reading about. In fact, it wasn't too long before my students were asking for more reading sessions. I agreed, but with the stipulation that

some of them had to volunteer to be the reader occasionally. I only had a few volunteers initially, and some students never read aloud to the class, but one student-read passage that stands out in my mind for its impact on the students is a short piece in which Jim Lovell compares perspectives from Earth orbit and lunar flight. He states that the astronauts talked in terms of continents and oceans when they were in Earth orbit, but spoke in terms of astronomical bodies (Earth, sun, moon) when in lunar flight. That comparison sparked some terrific discussions among my students about relative sizes and distances. I feel that, overall, this introduction to reading science went well.

I wanted concrete evidence that my use of non-fiction science books was actually serving as a pathway for my students to read textbooks. A few weeks after the initial readings from the *Voices from the Moon*, I suggested we might want to learn more about what problems the NASA space program had to overcome to put people on the moon. Because I only have one computer available in my room and our computer lab is usually booked several weeks in advance, my students accepted that we would need to use other sources. They were finally ready to brave the astronomy textbooks to find some of the answers they needed. We brainstormed questions, divided the work into parts, and each group collected their information. When Discussion Day rolled around, I had my answer. All but one group had successfully navigated the textbooks we had available to collect answers to their questions.

I continued to read to and with these students through the rest of the semester, and then sent them on to whatever science class they were taking



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next with the encouragement that they could always stop by if they needed help.

The second book, *Universe: A Journey from Earth to the Edge of the Cosmos* by Nicolas Cheetham, was an even larger hit with the class, because there were so many unknowns hidden in its pages. My students were absolutely enthralled by images of other galaxies and the paragraphs of information under each picture were short enough to seem manageable. The very first page is a picture of the Earth and moon, with the moon looming large in the foreground. Although some of the vocabulary was challenging, "Our tenure on the universe's largest known rocky planet is as brief as our habitat is narrow: excluded from two-thirds of the planet by the deep ocean, the surface of Mars is

better mapped... ", it also prompted dialogue as my students argued about whether or not Mars was better mapped than the deep oceans. As the book took us farther and farther from Earth, my students began to assume a certain possessive attitude to the astronomical objects we were studying. They even successfully completed independent research culminating in PowerPoint presentations on galaxies that particularly interested them.

I knew that the reading had really made a hit when one of my former astronomy students came in at the start of this year to borrow one of "our" books. She wanted to share the *Universe* with her younger siblings.