

HANDS-ON ASTRONOMY FOR MIDDLE SCHOOL GIRLS AND BOYS

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Astronomy and planetary science are of great interest to most middle school students. Many students who find traditional biology, chemistry, and physics courses dry or irrelevant are fascinated by the aesthetic and philosophical sides of astronomy. Thus, basic scientific and quantitative reasoning can be taught through astronomical examples to students who might otherwise remain “tuned out” to science. During the period 1989–1992 the author had the opportunity to teach astronomy as well as more traditional sciences to middle school students.

At the Park School, an academically rigorous independent school in Brookline, MA, eighth graders study astronomy for approximately half the school year as part of an introductory physical science course. The topics and activities in astronomy are largely drawn from the Project *STAR* curriculum developed at the Center for Astrophysics. The remainder of the curriculum can be described as “hands-on chemistry.” It is based on the text *Introductory Physical Science* by Haber-Schaim *et al.* (1987). The two broad curriculum areas converge with the topics of light and spectroscopy: students learn to identify ionic compounds by doing flame tests, then study the atomic model and learn that the color of light emitted by an atom is characteristic of that element. Finally, they build a spectrometer, observe absorption lines in the solar spectrum, and learn how astronomers use light to study distant objects.

Twice a year, students are asked to evaluate their science classes. The questions are simple:

1. What topic did you enjoy most and why?
2. What topic did you enjoy least and why?
3. What should definitely be taught again next year?
4. What suggestions can you make to help improve this course?

The 48 students in the eighth grade class during the 1991–92 school year gave the following responses:

1. 85% of the girls preferred hands-on astronomy, 10% preferred chemistry, and 5% expressed no preference.
2. Approximately equal numbers of boys preferred astronomy and chemistry.
3. Most students preferred the mathematical approach used in the Project *STAR* astronomy curriculum, which was based on geometry and similar triangles. The ratio problems found in the chemistry part of the course were originally algebraic in nature, and many students had difficulties setting up the ratios initially. Once they had been introduced to similar triangles, however, several students (all girls) devised methods of solving ratio problems using similar triangles. Even the students who preferred chemistry subject matter said that the mathematics used in astronomy was easier to comprehend.

Sample Student Comments

From Girls:

“Astronomy lets you think about where we came from and where we’re going. It’s cool.”

“I liked learning about photons and light and how stars shine.”

“I got ideas for new abstract artwork looking at pictures of the clouds of Jupiter for my research report.”

“Similar triangle problems helped me see how to set up ratios.”

“I preferred chemistry but doing similar triangles really helped students who had trouble. Both subjects were fun.”

From Boys:

“I liked both but chemistry was cooler because we got to light matches and do flame tests.”

“It was really neat to see how the two match up—astronomers have to know about atoms, too.”

“All the experiments with Bunsen burners should definitely be repeated. Those felt more like *real* science labs than playing with lenses did.”

Discussion

The survey described here was informal and obviously based upon a small number of students. One possible source of bias should be noted: the students knew that their teacher was a professional astronomer. Since girls are more likely to want to please authority figures than boys, some responses of girls may have been shaded toward astronomy. A more positive interpretation is that perhaps having a woman astronomer for a teacher intrigued and inspired the girls. A longer term study in collaboration with the current Park School science faculty is planned.

These results suggest that astronomy may attract and keep the interest of girls more effectively than the study of chemistry, physics, or earth science. Among both boys and girls there was a slight tendency to see chemistry as more “real science” than astronomy. All of the students (male and female) who preferred chemistry would be ranked as outstanding science students by any criterion. The group preferring astronomy was much more mixed in composition, including some outstanding science students but also some who struggled more. These results suggest that astronomy can play a valuable role in the middle school science classroom, as a subject area that attracts diverse students and as a means for introducing basic scientific reasoning.

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