

## 20. Astronomy and Navigation

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Astronomy, it can be argued, was the first of the sciences. It can be introduced at the simplest level, requiring no special mathematics skills or equipment. It will develop observation, data gathering, and predicting skills. Even if the school is located in an urban area, observations of the sun and moon are still possible.

During the three years of the Rockford project, the sessions explored astronomy and a related topic, navigation, and included brief presentations on the observatory and other resources available at Northern Illinois University. One of the goals of the sessions was to provide participants with a general knowledge of astronomy and how it could be used in their classes. Activities were used whenever possible to model possible teaching methods. Participants were introduced to Web resources that would enable them to continue their exploration after the sessions were over.

Teachers are usually very interested in astronomy, and the topic is included in most middle school science programs because it is part of the science content standards. Unfortunately, the topic is not included in the science courses that most students take as they prepare to certify as teachers. Few of the teachers in my workshops had ever looked through a telescope or even viewed the pictures of space available on the Web. By the conclusion of the workshops, however, teachers were able to predict what constellations would be visible at specific times and where they would appear. They had also gained access to teaching resources and developed some ideas of how to use those resources in their classrooms.

### *Assumptions and Limitations*

Generally, teachers have difficulty verbalizing their needs, so we try to provide a combination of knowledge about astronomy and ideas on how to teach it. Schools rarely provide instructional funds for astronomy, but occasionally a school will underwrite rental of a StarLab Dome, an indoor planetarium. The students are usually an extremely mixed group. Because the topic is most often taught at the middle school level before any tracking (official or unofficial) takes place, students of all ability levels will be involved.

Originally, most of the sessions were to be devoted to the use of astronomy in navigation, but the teachers wanted information on compasses and maps. They did not know how compasses worked or how they could be used to navigate.

### *Strategies and Modeling*

We employed teaching strategies that teachers should use in their classrooms, mainly cooperative learning, directed instruction, and engaged learning through projects. We kept the materials simple, readily available, and inexpensive. We created a Web page for every topic in the workshop, with links to lesson plans and activities that others have developed.

The state standards affected the content of the workshops. Material directly related to the standards was included to guarantee that teachers understood the concepts and could justify using them. Teachers had to answer questions, perform actions or simple measurements, and share their results. Their ability to do these tasks gave us feedback on how well they understood the topics being presented.

We included a wide range of examples for using technology in teaching astronomy. The examples included online programs for simulating the night sky from different points on earth at a specified date and time, websites with pictures and programs related to space exploration, and demonstrations of the use of a StarLab in teaching astronomy.

### *Results*

Teachers responded to five statements about the workshop. For each statement the teachers were asked to respond whether they strongly agreed (5), agreed, had no opinion, somewhat disagreed, or strongly disagreed (1), and an average response was found. The statements and the average responses are as follows:

- This activity increased my knowledge and skills in my areas of certification, endorsement or teaching assignment. (4.43)
- The relevance of this activity to ISBE teaching standards was clear. (4.35)
- It was clear that the activity was presented by persons with education and experience in the subject matter. (4.93)
- The material was presented in an organized, easily understood manner. (4.31)
- This activity included discussion, critique, or application of what was presented, observed, learned, or demonstrated. (4.50)

The lowest response, to the fourth statement, was due to the fact that four different faculty members presented at the session. Four different methods of presenting and four different subject areas made the session flow somewhat varied. The same argument could be applied to the second statement.

### *Sustainability of Outreach*

There are a couple of obvious ways for sustaining the outreach started in the initiative. The workshop Web pages are maintained indefinitely. The StarLab is available for use by teachers I have trained in its operation. Over the years, this has resulted in thousands of students (and often their parents) having an introduction to astronomy. The practice of loaning the StarLab has made me feel as if I am partner in the learning that is taking place at schools, even though I may not have been there myself.

### *Recommendations*

The biggest problem in offering a workshop on astronomy, as always, is a lack of time because to do more than briefly touch on the topics takes much more than a day. One way of improving the workshop would be to extend its length. If possible, multiple sessions, held a month or so

apart, would allow the teachers to make night observations between sessions and share their observations and conclusions. Also we could have students cooperating across all levels: middle school to high school to university.