Astronomy Education in the Two-Year Colleges

George F. Tucker
Sage Junior College of Albany
140 New Scotland Avenue
Albany, NY
USA 12208

Tel.: (518) 445-1754
E-mail: tuckeg@zeus.sage.edu

Let me begin by introducing myself and my institution. I am the only faculty member teaching physics and astronomy at Sage Junior College of Albany (SJCA). I have been teaching at SJCA for four years and before that was a visiting professor at a four-year institution. SJCA is a private two-year college with an enrollment of approximately 700 full-time students. It is located in Albany, New York, half a block from the original site of Dudley Observatory. Unfortunately that beautiful facility was torn down in the 1960's, and is not available to our students. The reason I was asked to speak to you is because I am serving this year as Chair of the American Association of Physics Teachers' Area Committee on Physics in Two-Year Colleges.

Before I begin to discuss some differences between astronomy education at two-year and four-year colleges, I want to describe the makeup of the two-year college community. The majority of two-year institutions are public community colleges. The remainder includes other public institutions and private junior colleges. Many of these colleges are experiencing declining student enrollment and budget tightening. While no recent studies have been conducted, it is believed many, perhaps a majority, of all college students take introductory astronomy at two-year institutions.

Two-year college instructors face a series of challenges to providing astronomy education. While these challenges are not unique to two-year institutions, they occur far more often than at four-year colleges. While some two-year colleges have their own observatories and planetariums, they are the exceptions. The norm would be for the college to have available a few older portable telescopes that would have to be setup for each observing session. Most two-year colleges are in urban areas where light pollution is often a serious problem. For example, at my college about 15 stars are visible on a clear night. Telescopes with CCD cameras, which can be useful in light polluted areas, are seldom available. Most two-year colleges do not have dormitories and students usually leave the campus before nightfall. Most students have either evening jobs or family responsibilities that make their return for observing sessions difficult. These factors make it difficult for two-year colleges to provide the hands-on experience that many students expect from an astronomy course.

Budgets tend to be smaller at two-year colleges and there is generally less instructional technology available. Many institutions do not have computer labs available for use by astronomy students and Internet access is often unavailable. Computer projection panels for use in classroom computer demonstrations are rarely available.

Two-year college astronomy instructors usually have received their highest degree, not in astronomy, but in physics or chemistry. They generally have heavy teaching loads and are not given much time or support for faculty development.

Qualified student workers who could assist with telescope setup and act as tutors are not often available. This places the burden for all aspects of the course on the instructor. Little emphasis is given to faculty or student research at the two-year colleges level.

Two-year college students vary widely in background and preparation. Women, minorities and older students are strongly represented and teachers should be sensitive to the instructional needs of these groups. In introductory astronomy courses, students who have previously had physics and calculus may be sitting beside returning students who have never had physics and whose last mathematics course was high school algebra taken ten years before. This disparity in preparation can really challenge the instructor to prepare a course that interests and challenges all the students in the class. Finally, for those students who do become interested in astronomy, there are usually no advanced astronomy courses available at two-year colleges so they may be unable to immediately continue their education in the field.

On a personal note one of the most difficult aspects of two-year teaching is the fact that students remain for at most another year at the college. We do not get to see them develop intellectually for four years, and seldom see the effects of our teaching. Occasionally a student will return to campus and stop by to discuss some development in astronomy. This is very rewarding, but I envy my four-year colleagues opportunities for further interaction while the students are still attending their institutions.

Balancing the negative aspects of two-year astronomy education are many positives. Urban settings bring with them the opportunity for instructors to avail themselves of the many resources found in our cities. Planetariums and science museums can be visited. The observatories of other educational institutions and research organizations can often be used. Most cities have amateur astronomy clubs that can provide observing opportunities and guest speakers.

Control over how astronomy instructors at two-year colleges spend their budgets usually resides with one or two people, the instructor and possibly a division chair. This affords flexibility in selecting new equipment and materials without having to convince a large group of a need. Similarly, two-year college faculty have more control over course content and instructional methods. This allows two-year colleges to rapidly adopt innovative teaching methods and incorporate new material.

With less emphasis on research comes less pressure on the instructor to spend large amounts of time on research simply to "publish or perish." The instructor can concentrate on teaching and doing research that really interests them. Since most prospective two-year colleges instructors know this is the case, two-year colleges tend to recruit faculty whose first love is teaching. If support is available, the instructor also has more time available for faculty development.

Class sizes at two-year colleges tend to be smaller than at four-year institutions. If there is a laboratory with the course, the course instructor is usually the laboratory instructor. These circumstances foster more contact between instructor and student and can contribute to a better learning environment for students.

Students at two-year colleges do work to maintain a high grade point average, but grade pressure is usually less than at four-year colleges. This allows students to view astronomy courses as a learning experience not just an opportunity to pad their average. They are more willing to accept the fact that not all aspects of astronomy

are completely understood and not every question asked has a pat answer. The diversity of the student population offers an opportunity for the astronomy instructor to provide a wide range of students with an appreciation not only of astronomy but also of science as a discipline. Often the course may be the only science course students are planning to take. Included in this group are students Sheila Tobias has called the "second tier," those are students who are capable of having successful careers in science but whose lack of preparation has left them convinced they cannot succeed. If properly designed, an introductory astronomy course can provide these students with the motivation to attempt to pursue a scientific career and the self-confidence necessary to believe they can succeed.

To summarize, two-year colleges serve an important function in astronomy education and can become even more important in the future. While the two-year college instructor faces many challenges, two-year colleges offer tremendous opportunities for promoting astronomy education. If the astronomical community wants to introduce innovative teaching methods and materials into introductory astronomy courses, look to the two-year colleges. If the astronomical community wants to reach under-represented groups, look to the two-year colleges. And finally, if the astronomical community wants to assist in luring the "second tier" into science careers, look to the two-year colleges.

Discussion

French.

As someone who teaches at a small, 4-year tuition-driven college, I'm impressed by the overlap of positives and negatives from your list. I'm convinced that we in 4-year colleges can learn much from our 2-year colleagues – thanks for sharing.

Hoff.

Most astronomy teaching in terms of numbers of students is happening at two-year and four-year middle scope universities. We must not forget that you are central to the teaching of astronomy.

Wasiluk.

As Adjunct Professor of Astronomy at Lord Fairfax Community College in Middletown, VA we are the home base to the Shenandoah Astronomical Society an amateur group that has recently donated time and talents to having an observatory built on our campus.

Also, I'd like to know any information as to how many astronomy instructors at two year colleges are part time faculty like myself.

Tucker.

The American Institute of Physics Statistics Division has received National Science Foundation funding to survey physics instruction at two-year colleges during the coming year. I have been in contact with the principal investigators and they have agreed to include some questions about astronomy education. So we may have some updated data in the near future to answer your question.

SECTION II. REPORTS OF SMALL-GROUP DISCUSSIONS

In order to provide for focussed discussion on key topics, the symposium participants divided into eight groups, each led by a chair and a recorder/reporter. The groups convened late Saturday afternoon for a preliminary meeting, then reconvened on Sunday morning to prepare a report. In some groups, there were brief invited presentations, some of which are included in the third section of this volume. The reports were presented and discussed in the plenary session on Sunday afternoon. The reports and discussions are contained in the following pages. The writer of the report is the individual whose address is given in full at the beginning of the report; the other leader, and all of the other members of the group, also made substantial contributions to the report. We thank them all.

The evaluations of the symposium pointed out the obvious: much more time should have been allotted to the small-group discussions. It might even have been advisable to divide into sub-groups, to enable more participants to take an active role in the discussion, and to enable more topics to be covered. The session on K-12 astronomy could have been divided into elementary, junior high school, and high school astronomy, for instance. Nevertheless, the groups worked well, and we encourage future symposium organizers to include them.