Strategic Programs For Innovations In Undergraduate Physics At Two Year Colleges

A Project of The American Association Of Physics Teachers

A Case Study

Rose State College

Midwest City, Oklahoma

Institutional Setting

Rose State College offered its first classes in September 21, 1970. Originally named Oscar Rose Junior College in memory of the well-known Midwest City-Del City Superintendent of Schools, the school was renamed Rose State College in 1983. In 1973 the College became a member of the Oklahoma State System of Higher Education. The College has grown from an initial enrollment of 1,700 in 1970 to a regular fall enrollment of approximately 8,000 in 2002. The demographics of the student body are similar to most suburban community colleges except that the number of Native Americans is slightly higher. The campus now includes twenty-one buildings on approximately 116 well-groomed acres. The College is located in Midwest City, Oklahoma, a suburb of Oklahoma City and is adjacent to Tinker Air Force Base. The College has a typical administrative structure beginning with a board that is appointed by the governor down to departments that are headed by a departmental coordinator.

The Physics Program is a unit within the Division of Engineering and Science that is administered by a Dean and Associate Dean. The Division offers nine Associates of Science Degrees and six Associates of Applied Science Degrees. There are three options available to students within the physics program - chemistry, engineering, and physics although almost all students choose the physics option.

The physics program provides a wide range of courses including a one semester physics course for liberal arts majors, a one semester course in astronomy, a one semester physical science course, a one semester applied physics course, a two semester algebra-based physics sequence, a two semester separate physics laboratory sequence, and a two semester calculus-based physics sequence. In addition, the physics program also offers an advanced physics laboratory course for engineering and physics majors, an Acoustics course for non-science majors, and a Modern Physics course for physics majors. RSC has two fulltime faculty members and several adjunct faculty members.

What Has Been Done

Over the last few years, the Physics Program at Rose State College has developed a successful program. To accomplish this program change, RSC's Physics Program has done the following.

1. To re-vitalize and rebuild a dying physics program, RSC hired an energetic and dedicated faculty member in 1999. A second physics faculty member was hired in 2002 to help in the development of the physics program and to accommodate the increase in physics enrollment.

2. The physics laboratory and demonstration equipment was consolidated from various locations into a single dedicated physics lecture/laboratory room. Adequate support was provided to purchase additional laboratory and demonstration equipment to complement the existing equipment. New and greatly expanded spaces for physics and astronomy laboratories will be in place for the Fall 2003.

3. There have been additions, expansions, and upgrading of computer facilities, student access to these facilities, and necessary software in the physics area. A portion of one of the stockrooms in the physics laboratory has been turned into a computer room with four internet-accessible, networked computers for student and laboratory use.

4. By having great flexibility in scheduling, the RSC physics faculty has been able to offer lecture and laboratory courses that meet student availability and has led to increased enrollment. Physical and multimedia demonstrations are used extensively by faculty and accompany all courses.

5. A special two-credit hour, advanced physics laboratory course was created to provide additional laboratory experiences for physics and engineering majors. A three-credit hour course on Modern Physics was added to help the physics and engineering majors prepare for transfer to four-year institutions.

6. A new course in Acoustics and a second course in Astronomy are being added Fall 2003.

7. Individual student research projects are encouraged. These honors projects have resulted in a great deal of student interest as well as collegial interest in the physics program.

8. One-on-one student-faculty interactions are encouraged. The physics faculty are available at all times to their students and spend many hours outside of class interacting with students.

Indicators of Success

The Physics Program at Rose State College has a number of strong indicators to demonstrate their success over the last few years.

1. RSC has a large number of physics majors. It has had 6 or more students during each of the last 2 years who have received an Associate Degree in Physics and an even larger number who have transferred to four-year institutions as physics majors.

2. The RSC physics program has a large number of STEM majors. The strength of the physics program has led to a steady increase of engineering majors with more than 10 students now electing to obtain an Associate in Engineering degree every year. The number of students obtaining Associate Degrees in Mathematics and Life Sciences is also rising according to SMET faculty, due in part to a strong physics program.

3. There has been a remarkable increase in physics enrollment during the last three years in all courses in physics. The calculus-based sequence has grown particularly fast in the last three years leading to the hiring of an additional engineering faculty member.

4. The number of females taking physics has increased during the last three years exceeding the national average in the calculus-based and algebra-based sequences. The number of minority students taking physics is much greater than the general RSC student population and the national average with the calculus-based course now having over 50% of its students as minorities.

5. The RSC Physics Program has received strong administrative support in the form of funding for equipment and facilities. Additional funds have been obtained to greatly increase the use of computers in the physics program.

6. Strong collegial support from other faculty members in mathematics, engineering, life sciences, and other physical sciences have led to a common goal in the SMET programs. Faculty members work together to conduct science educational programs for the community and conduct K-12 school visits giving science shows and talks.

7. The dedication of the faculty has fostered a strong student-learning environment. Physics students feel they are part of the physics program and are valuable members of the physics team. Students know that the faculty are concerned about their learning of physics, are willing to help them learn both inside and outside of class, and will help them make the transition to their transfer institutions after finishing at RSC.

8. The physics faculty has implemented honors components in several of their physics courses. An honors physics student has been awarded the Outstanding Honors Project at Rose State College for the last 3 years.

Keys to Making the Changes

There are several "keys" that have allowed the RSC Physics Program to make the programmatic changes that have led to its success.

1. *Aligned and in-tune administrative awareness and support of the physics program.* The administration at Rose State College from the Division Dean level all the way up through the College President support the Physics Program and are aware of their efforts. Interaction between the faculty members in the Physics Program and administrators at all levels is collegial and open. There is a sense of sincere interest and pride in the accomplishments and recent growth of the Physics Program among all administrators. The administration makes every reasonable effort to provide support to the Physics Program with funds, physical facilities, and moral support.

2. *Charisma And Dedication Of Physics Faculty*. The enthusiasm and love of the subject matter exhibited by the faculty in the Physics Program is quite infectious, resulting in a corresponding interest and zeal for the subject among students in the program (particularly among those students who take the calculus-based sequence). The faculty has built a student-friendly environment in the physics area and they encourage students to utilize both the facilities and them in their studies.

3. *Collegial Spirit Among Faculty*. There exists a strong sense of team effort among the STEM faculty members. Most of these faculty members joined Rose State College about the same time, creating a foundation of cohesive, team-oriented faculty that work well together and can be in place for many years to come. These faculty members take pride in each other's accomplishments and have a philosophy that successes in one program benefit all of the programs in Math, Engineering, and the Sciences. These faculty members are willing to work together to juggle both physical and financial resources so that students get the best possible experience throughout the Division.

4. *Strong Student Support Of the Physics Program*. There exists an extraordinary amount of student support for the Physics Program. Students feel a sense of ownership in the program and clearly feel that the faculty of the Physics Program are on their side. There is a strong sense of community among the students who take courses in the Physics Program.

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