

# **Strategic Programs For Innovations In Undergraduate Physics At Two Year Colleges**

**A Project of The American Association Of Physics Teachers**

## **A Case Study**

### **Delta College Bay County, Michigan**

#### **Institutional Setting**

Delta College is a two year public college offering degrees in academic, professional, and technical programs located in Bay County, Michigan, and predominantly serving the counties of Bay, Midland, and Saginaw. The 640-acre main campus lies midway between the three counties' major cities of Saginaw, Bay City, and Midland. This triangle forms the heart of the Saginaw Valley area. Delta College has major centers in each of the three counties: Delta Planetarium and Learning Center in Bay City; Delta College Midland Center; the Ricker Center and Saginaw Center in Saginaw. The main industrial employers in the area include Dow Chemical, Dow Corning, General Motors, Chrysler, and Ford.

Almost 200 full-time and 400 part-time faculty teach daytime and nighttime classes to a student population of 3,650 full time equivalent students with an unduplicated headcount of over 10,000 students (Fall and Winter). The spring semester (equivalent to a summer session) has roughly half that number. The majority of the population is urban, with roughly 40% of the students in career education, 30 % in a transfer program, and 20% undecided. Approximately 60 % of the students are female. The percentage of under represented students is about 8 %.

Programs at Delta College are organized into eight divisions and the physics program is in the Science Division, which also offers the disciplines of astronomy, biology, chemistry, geography, and geology. Pre-engineering courses (for both 2 year and 4 year programs) are in a separate Technical Pre-Engineering division. Faculty must have a Masters degree and 18 hours in their field to teach in a discipline. Full time faculty teach 68% of the total credit hours at the college, but in physics 80-90 % of the total credit hours are taught by full time faculty.

#### **What Has Been Done**

1. The most innovative aspect of the Physics Program at Delta College is the block scheduling of classes, which allows the integration of laboratory and lecture in a studio physics format during a 110-minute class period. The four-credit courses (Physics 101, Physical Science 101-102, and Physics 111-112) meet for four-110 minute periods each week. The five-credit Physics 211-212 sequence meets for five-110 minute periods each week.
2. All three classrooms used by the Physics Program have the latest in technology for providing audio visual and computer-aided instruction. Students sit and work in groups of 3 or 4 and the furniture can be moved to include MBL activities as needed. Cooperative learning is encouraged and the physics program faculty are committed to active engagement methods.
3. An optional astronomy laboratory has been added that can be taken with the descriptive astronomy course. The laboratory course makes extensive use of a planetarium on campus and a more modern planetarium facility located at a satellite campus. The planetarium on campus is being renovated to make it more useful for laboratory activities and hands-on laboratory work.

4. The physics program has developed a two-semester sequence, Physical Science 101-102 that especially targets pre service elementary teachers. Each of the four-credit courses is taught in the same integrated laboratory-lecture studio format as the other physics courses and promotes learning by inquiry. The courses make use of the curriculum materials from *Powerful Ideas in Physical Science* and *Tools for Scientific Thinking*.
5. Physics 101 has undergone a total transformation in student body. The students in the course are almost entirely female trying to get into the Diagnostic Medical Sonography Program. Some adjustments have been made to the class to meet the needs of the current student body.
6. Ultrasound Physics, DMS 105, is a brand new class that has been developed for the Sonography program. Ultrasound Physics is a 2-credit course taught in a half-semester. Students take a second half semester course on the same subject but taught by an ultrasound technician.
7. Delta College has established several 3 + 1 programs where students take their first three years at Delta and then transfer to Michigan Technological University or Ferris University. In a relatively new program, the fourth year is also at Delta College with the instruction being provided by Michigan Tech.

#### **Indicators of Success**

1. The physics program is experiencing increasing enrollment and class offerings are limited by available faculty and facilities.
2. About 27% of the students graduating from high schools in the tri-county area start their post high school education at Delta College. About 40% of these students attend Delta College at some time during their first five years after graduation from high school.
3. The percentage of females in the Physics 111-112 varies between 30 and 50%, much higher than the national average. The percent of females taking the Physics 211-212 sequence tends to 20 to 25% in the fall semester of Physics 211 but drops significantly during the winter semester of that same course. The number of females in Physics 212 remains fairly constant at 25%.
4. The percent of minorities in the Physics 111-112 and Physics 211-212 sequences varies between 10 and 15%, again significantly higher than the national average, but representative of the demography of the tri-county area where most of Delta's students originate.
5. Surveys of transfer students done by the Dean of Students and Educational Services indicate a high degree of satisfaction with the preparation received at Delta College.

#### **Keys to Making the Changes**

1. *Collegial spirit among the faculty.* Faculty members respect each other and support the program at Delta College. Although all physics program faculty have not adopted extensive use of MBL or innovations such as WebAssign, they support their use. Faculty from other departments in the Science and Technical Pre-Engineering Divisions interact with the physics faculty and support the program.
2. *Commitment to student learning.* All physics program faculty are dedicated to student learning. More than three-fourths of the courses are taught by full-time faculty because of the concern that the faculty have for quality teaching. Adjunct faculty must adhere to the same objectives and outcomes as the full-time faculty.

3. *Mentors for Adjunct Faculty.* The college has a mentors program for adjunct faculty to help insure the quality of courses taught by the adjuncts. Most of the physics adjuncts are high school teachers who have extensive teaching experience.
4. *Implementation of Technology.* The use of technology is stressed in the hiring of new faculty. One of the requirements for the two new faculty hires is that they be interested in using technology such as computer-assisted instruction, MBL, and WebAssign in their teaching. This requirement is supported by the college administration.
5. *Financial Support for Faculty Development.* There is support for curricular improvement in the form of grants and release time. Every full-time faculty member receives \$825 per year that they can use for faculty development. Other faculty development funds are available through the Dean of Faculty. Several faculty members regularly participate in national and statewide meetings and workshops.
6. *Administrative Commitment to the Physics Program.* Both the Science Division Chair and Dean of Faculty expressed strong commitment to the physics program. The physics program receives an adequate share of the funds available for new equipment and recently received special funds to renovate the planetarium into a more useful teaching facility. The administration is will to provide funds for full-time faculty to teach more than 75% of the physics offerings.

**For More Information Contact**

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