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Southwestern College (SWC) is located in the southern part of San Diego County, 12 miles south of the City of San Diego and eight miles north of the U.S.-Mexico International Border. The College serves a population base of approximately 350,000 people in a region that is one of the most ethnically diverse areas in San Diego County. The Southwestern College District's ethnic "minority" population is 58% of the total population (compared to 35% for the County as a whole); over 40% of the population is Hispanic, almost 12% are Asian, and almost 6% are African American. The median income of households in South County is $5,700 less than in the County as a whole, and the poverty rate for individuals is 15% higher than for residents of the County as a whole (13.0% vs. 11.3%).

The College population mirrors the diversity of its service District. In Fall, 1993, the total enrollment was about 17,000 students; approximately 72% came from ethnic minority groups. Latinos comprised 48% of the student body. One of every three Southwestern College students is a first-generation college student--the first in their family to continue their education beyond the secondary level. In addition, English is not the native language of 77% of Southwestern College's Hispanic students. A third of new students who enrolled at Southwestern College in Fall of 1993 were low income as defined by the U.S. Department of Health and Human Services. As the only public institution of higher education located in the southern part of San Diego County, SWC also serves the nearly 6000 businesses located in the district through its regular vocational and career related programs as well as through customized training programs designed to upgrade the job skills of persons already employed.

To meet its educational mandate, SWC offers over 1500 different credit courses in 90 programs of study. These programs are offered through six instructional divisions: Arts and Humanities, Business, Communication Arts, Engineering and Technical Studies, Math and Sciences, and Physical Education. SWC has a well developed Health Science Department, which is part of the Engineering and Technical Studies Division of the College. The Health Science Department offers six major programs of study: associate degree nursing (AND); vocational nursing; paramedic training; Emergency Medical Technology (including specializations in wilderness and first response training); operating room nursing (for registered nurses); and Surgical Technology. The Department maintains close ties with hospitals and other health care providers in the community (through Advisory Committees as well as direct interaction with
faculty) to ensure that the programs offered are kept up to date. Feedback from these hospitals and health care providers has indicated a need to upgrade our training program in Surgical Technology.

The SWC Surgical Technology Program is a Certificated Program that offers the option of obtaining an Associate in Science Degree in Surgical Technology. This career/technical program is designed to prepare students to function effectively in operating rooms under direct supervision of physicians and nurses. Lecture and laboratory courses offer instruction in basic surgical techniques and procedures, aseptic techniques (disinfection and sterilization), instrumentation, equipment and supplies used in the various types of surgery, and principles of anesthesia. Upon successful completion of the program, the student is eligible to apply to take the Surgical Technology Certification Examination sponsored by the Association of Surgical Technologists. Passing this examination allows the individual to use the title Certified Surgical Technologist.

A professional Surgical Technologist is a vital member of the surgical team. The surgeon relies upon the Surgical Technologist to have all required instruments ready at each step in a surgical procedure. The speed and proficiency of any surgical procedure is a key determinant of the patient's outcome: the shorter and more proficient the surgery, the less danger from blood loss and shock, the lower the patient's risk, and the more rapid their recovery. The Surgical Technologist must be completely familiar with what is happening in any surgical procedure and able to anticipate the surgeon's needs. Surgical proficiency is also an economic issue for hospitals; they need to ensure the most positive patient outcomes possible, and maximize their efficiency and facility use. A slow, inefficient Surgical Technologist is soon an unemployed Surgical Technologist.

The SWC Surgical Technology training program includes classroom lecture on the principles of various surgical procedures and a laboratory component that provides review and demonstration of surgical instruments and training to build skills in surgical technology techniques. The techniques covered include patient preparation, aseptic techniques of disinfection and sterilization, assembling instruments, and interactions with the surgeon and other members of the surgical team. Our students tend to have the greatest difficulty with the laboratory component of the program. There is a tremendous amount of material to be learned; for example, students must demonstrate knowledge of four facets of over 1000 different surgical instruments in the initial surgical laboratory course alone (Surgical
Successful completion of the Surgical Technology laboratory courses requires that students pass a three-part lab test, including a written test an instrument identification test, and a skill demonstration test. The acquisition of new skills is dependent upon the satisfactory development of more basic skills. Students are allowed three chances to pass each skill demonstration test; the failure rate is close to 100% on the first try, and the Surgical Technology faculty must re-test most students at least one time per skill. The learning curve on the acquisition of these skills is very steep, in part because these skills must be taught through demonstration. Students cannot both take notes and observe closely during these demonstrations, and therefore tend to miss components of the technique being demonstrated.

In addition to learning the myriad of surgical instruments and techniques required for the job, the surgical technology student must become familiar with the large variety of surgical procedures commonly performed. There are thirteen selective surgical services (such as general surgery, orthopedics, urology, obstetrics/gynecology, neurosurgery, ophthalmology, pediatrics, cardiovascular, thoracic, etc.), and each surgical service has sub-specialties. Each surgical area may contain one hundred or more procedures. At present, our training program includes lecture and print illustration of surgical procedures. There is little opportunity for students to obtain an understanding of what actual operating room procedures are like and what really happens during surgery until late in the program, when they begin their clinical practicum studies. This often puts them at a disadvantage in their practicum work, because they have only a theoretical understanding of what they will encounter in the operating room.

The Surgical Technology program requires that students attend 20 hours per week of instruction, and spend at least that much time reviewing course materials and memorizing instruments and techniques. The difficulty of the program has resulted in an annual student attrition rate of over 30%. There are two areas of need for improvement in the Surgical Technology program:

1. To be able to provide students with more realistic demonstrations of the surgical procedures and visual images the will encounter in the operating room, and

2. To be able to offer students additional opportunities to review surgical techniques to develop and enhance their skills.
To address these needs and increase the number of surgical procedures taught to the surgical technology students, SWC proposes to incorporate two forms of state-of-the-art computer technology into the surgical technology program:

ADAMS Software. Medical schools have turned to computer-aided instruction to help train physicians in the variety of surgical procedures they must know. The standard computer technology application used by medical schools today is the ADAMS surgical demonstration software package. This software package demonstrates the actual impacts of surgical procedures on the body, and can illustrate procedures with as much realism as desired. For example, the ADAMS software can be used to demonstrate the impact of making an abdominal incision; the section of the body appears on the computer screen, showing the scalpel making the incision, bleeding that will result, and what the surgeon will see when the abdominal cavity is opened. If desired for instructional purposes, the output can exclude the bleeding, show the impact of cauterizing a blood vessel, different levels and implications of body fat, etc. The ADAMS software will allow our Surgical Technology Instructors to illustrate surgical procedures for students outside of the operating room, at no risk to a live patient. This will make the students much better able to understand the surgical theory they are learning and better prepared for their practicum experience. The use of this computerized instructional technology will help our students retain and apply more of the surgical technology training than current teaching methods. The ADAMS software combined with the current curriculum will represent a potential of virtual reality application for instructor and student.

V-Tech Software. We propose to utilize an additional computerized instructional software package to help our students learn surgical techniques more effectively. SWC currently has a copy of the V-Tech software package at the SWC Engineering Division's computer center. This software was developed by a Consortium or occupational, educators to develop standards for proficiency in various occupations. It offers detailed descriptions of procedures in a variety of fields, including surgical technology. This software has the potential to serve as an excellent instructional complement to our laboratory demonstrations by providing hard-copy, step-by-step descriptions of surgical techniques. However, the surgical techniques currently included in the software are in need of updating to reflect changes in operating room and surgical procedures. In addition, it is missing descriptions of several techniques that are critical components of the curriculum. The software is designed to accommodate such changes and expansions by its users. Therefore,
the application of this software in our program requires that the surgical technology content be thoroughly reviewed, updated and expanded.

SWC requests Fund for Instructional Improvement funding to allow our Surgical Technology faculty to utilize these computer applications to update and upgrade the Surgical Technology curriculum and add independent learning and Test Preparation modules to the training program. Students will be able to enhance learning skills with independent study and prepare for academic and national test review. The combination of ADAMS and V-Tech software will assist in the preparation of surgical technology students for their roles in surgery. This new knowledge base will provide students with the ability to obtain more skills in their internship (clinical) setting.
Surgical Technology programs throughout California and the United States are facing the same need to upgrade their training programs to reflect the rapid changes in the medical field. The application of state-of-the-art computer instructional technology in the Surgical Technology curriculum, and the upgraded curriculum and lesson plans that will be developed to incorporate these computer applications, will serve as a model for other community colleges and educational institutions offering training in the Surgical Technology field. Mr. Terry Davis, the Project Director, serves on the Educational Review Committee for the National Association of Surgical Technologists. This national group has identified a critical need to upgrade surgical technology curriculum and training methodology across the United States. The model curriculum developed for this program, with its integration of state-of-the-art computer applications, will be presented to this committee for their review and consideration for adoption as a national model.
The Fund for Instructional Improvement eligible program targeted by this proposal is nontraditional forms of instruction. The proposal addresses the Board of Governors' 1993-94 Basic Agenda Focus on Economic Development and Vocational Education.
The specific educational problems addressed by this proposal are the excessively steep learning curve for instrument identification and skills development in surgical technology techniques and the related high attrition rate from the program. To address these educational problems, the Surgical Technology Program at SWC must (1) enhance the instruction in surgical technology to better prepare students for the reality of the occupational demands of the operating room environment; and (2) provide students with additional instructional support materials that will allow them to review each step in a variety of surgical procedures, test themselves in preparation for course examinations, and prepare for the National Certification examination.
The SWC Surgical Technology program enrolls thirty students each Fall for the two year program. These students reflect the ethnic diversity of the College district and student population: approximately 50 percent are Hispanic, 25 percent are Caucasian, and another 15 percent are Asian/Pacific Islander (with many Filipinos). There is a high attrition rate from the program; of the 30 students who began the program in Fall 1993, only 18 are still in the program in March 1994 -- an attrition rate of 40 percent so far this academic year (higher than the usual attrition rate of about 30%). This is an impacted program: there is a waiting list for admission each year, and there are currently over 40 students on the waiting list for admission into the program. In addition, the California Employment Development Department projects that employment in the field will grow approximately 18% between 1990 and 1997 in San Diego County (compared to a 10.7 percent average growth rate for all jobs); EDD predicts a 40 percent growth rate in surgical technology employment in California through the year 2000. With employer demand for new surgical technologists so high and demand for enrollment into the program so much higher than program capacity, it is critical that we graduate as many of our enrollees as possible.
The goal of this Instructional Improvement grant is to enhance the quality of surgical technology training at SWC, thereby making students significantly better prepared to work in the demanding area of surgical technology. Upon completion of this program, students must pass the National Certification Examination to become a Certified Surgical Technologist, at which point they are teamed with surgeons, anesthesiologists and nurses to form an integral part of the surgical team.

The objectives of the proposed Instructional Improvement program are:

1. To incorporate state-of-the-art computerized instructional technology into the SWC Surgical Technology training program.

2. To develop instructional support materials using V-Tech software for student instruction, review and preparation for the national certification examination.

3. To evaluate the effectiveness of the ADAMS software instruction and V-Tech instructional materials in Surgical Technology classes.

4. To disseminate the results of the project to national associations, statewide associations, and California Community Colleges.
The first step in the process of incorporating the state-of-the-art ADAMS computerized instructional technology into the Surgical Technology training program will involve faculty training on the use and application of the software in an instructional setting. Mr. Terry Davis, the Project Director, will complete 20 hours of training on the full use and application of the ADAMS software at the UCSD Biomedical Research Learning Center. Mr. Davis has a close working relationship with the UCSD biomedical training program; he participated in a vocational instructor inservice training program with the UCSD Medical Center in the summer of 1993. Once he has completed the training and the ADAMS software has been received and installed on a SWC computer, Mr. Davis will continue to work intensively with it to become fully familiar and proficient in its application. He will identify the surgical procedures that are best suited to ADAMS training, including procedures not currently included in the Surgical Technology curriculum. It should be noted that it will not be possible to incorporate the ADAMS training into all surgical procedures currently in use or even all taught in the SWC Surgical Technology training program during the term of this grant. Therefore, Mr. Davis will concentrate his efforts on the most common surgical procedures that students will be expected to know. The ADAMS software training will be incorporated into the lesson plans for additional surgical procedures in the years subsequent to the completion of this grant.

Mr. Davis will write lesson plans to incorporate ADAMS instruction into the Surgical Technology curriculum for the selected procedures during the Fall 1994 semester. He will pilot test these lesson plans and the use of the instructional methodology in the classes offered in Spring, 1995, and will revise the lesson plans as needed on a continual basis throughout the semester, based on student feedback and his in-class experience.

Mr. Davis will work with William Maddox, an adjunct Surgical Technology professor, to develop instructional support materials using the V-Tech software. They will work with the V-Tech software to become fully familiar with its use and application during the summer of 1994, and review the descriptions of surgical technology techniques currently included in the program at this time to determine which need to be updated and what techniques should be added to the software program. They will then spend the Fall 1994 semester updating and revising the V-Tech program contents to provide analysis and descriptions for all identified surgical techniques. Hard copies of the instructional support materials will be
produced and duplicated for use in classroom instruction. They will then incorporate the V-Tech applications and instructional materials into the lesson plans for the classes offered in Spring 1995, and pilot test the use of these materials in the Spring classes. In addition, they will design lesson plans incorporating the V-Tech software for student use in preparation for the National Certification Examination. The instructional materials developed for both in-class use and exam preparation will be revised as needed, based upon student feedback and in-class experience.

Data collection processes for a comprehensive outcome evaluation will be incorporated into the project activities throughout the term of the grant. The process and outcome evaluation design is described in more detail in the evaluation section of this proposal. Student performance data from comparison courses will be collated into an evaluation database during the Fall 1994 semester; student performance data from the pilot classes will be collected during the Spring 1995 semester. The outcome data will be reviewed and analyzed in June, 1995 for incorporation into the final project report. Longer-term outcome data (including pass rates on the National Certification Examination) will be collected, reviewed and analyzed as it becomes available following the completion of the term of the grant.

The results of the project will be disseminated to other California and U.S. community colleges and educational institutions at conferences of national, regional and state educators, and in response to specific requests. The dissemination activities for the proposed project are described in more detail in the dissemination section of this proposal. Please see the project work plan spreadsheets on the following pages for more detail about project activities and time lines.
The following outcomes will be achieved as a result of this project:

1. State-of-the-art computerized instructional technology (ADAMS and V-Tech software) will be incorporated into the SWC Surgical Technology training program.

2. Instructional support materials using V-Tech software will be developed for student instruction, review and preparation for the national certification examination.

3. The effectiveness of the ADAMS software instruction and V-Tech instructional materials will be evaluated in Surgical Technology classes at SWC.

4. The results of the project will be disseminated to national associations, statewide associations, and California Community Colleges.

Impact of the Project.

The impacts on the SWC Surgical Technology program that are expected from the project include:

A reduction in the number of times students must repeat the skills tests on surgical techniques in the laboratory classes.

A reduction in the rate of student attrition from the Surgical Technology program at SWC, from an average of over 30% to an average of 20%.

An increase in the pass rate on the National Certification Examination to the national average of 78% per class.

Upon completion and dissemination of the project, we may anticipate the following systemwide and national impacts:

Incorporation of the model curriculum and instructional materials into Surgical Technology programs at other California Community Colleges and educational institutions.

Evaluation of the model curriculum and instructional materials by the Committee for Educational Review of the National Association of Surgical Technologists. The model
curriculum may be adopted in whole or in part by the Committee for use as a national standard for surgical technology training.

Potential for continued support after the expiration of the grant

This grant will allow SWC to purchase and apply the identified state-of-the-art computerized instructional materials in the SWC Surgical Technology curriculum. The project will allow the Project Director, who is the lead faculty member in this program, to develop a system and methodology for incorporating the instructional materials and methodology into the lesson plans. He will continue to incorporate the materials into the other courses in the training program after the completion of the grant as a regular part of his teaching at SWC. In addition, more intensive work on these activities may be supported through the College's annual VATEA funding, through funding from the County Department of Education's Regional Occupational Program, and through the District's program of small grants for curriculum development.

Potential for adaptation to other institutions or programs.

Both the ADAMS and the V-Tech software are commercially available software packages. As noted earlier, ADAMS has become a standard instructional application in medical schools. If proven as effective a training tool in surgical technology programs as we expect, the application of the ADAMS program could be replicated by surgical technology programs at other institutions across the United States. The extent of this replication will be dependent in part on the evaluation by the Committee for Educational Review of the National Association of Surgical Technologists, and their adoption of the model curriculum as a national standard for surgical technology training. The Committee has expressed enthusiasm for the idea, and are following the progress of this project with interest.
The project will include both formative and summative evaluation components. The formative evaluation of the project will be conducted by the SWC project supervisor (Charlotte Erdahl) and the project director (Terry Davis) through periodic personal meetings during the project time span to ensure that development is consistent with the needs of instruction. In addition, they will review the feedback of the students enrolled in the classes that will pilot test the model curriculum and instructional materials to evaluate student response to the materials. The curriculum updates and instructional materials will be reviewed with the members of the Surgical Technology Advisory Committee for their review and comments (committee members represent 18 local private sector hospitals and medical centers; a list of the membership is presented in Appendix B). In addition, the curriculum updates will be submitted to the SWC Curriculum and Instruction Committee for review and approval as required by college procedures.

Summative, outcome evaluation will be conducted during the pilot test of the model curriculum to determine the effect of the new materials and instructional methodology on the performance of students in the pilot classes. Students are tested each week on the material presented in the laboratory classes, to ensure that they have developed the base of knowledge needed to allow them to develop additional skills. Detailed results of these examinations (for example, how many times they had to repeat a skill demonstration test) are maintained for each student in each class. The short-term outcome evaluation will utilize the records collected in the past as comparison data for the performance of students in the pilot classes. The Project Director will work with the Project Supervisor during the Fall of 1994 to identify the specific class sections for pilot tests of the model curriculum and instructional materials. They will then identify comparison class sections from previous semesters. To ensure that any changes in student performance are not due to extraneous factors (such as the specific semester in which the class was taken or overall differences among students), additional comparison classes will be identified -- courses offered in Spring 1995 that are not selected as pilot classes and matched classes from previous semesters.

The Project Director will work with the Project Clerk to collate all student performance data from the comparison classes (including results on specific tests as well as overall course outcomes) and enter this data into an evaluation database. The same measures of student performance in the pilot and comparison classes offered in Spring
1995 will be collected and entered into the database. The Project Director will then work with the College Research Office to analyze the data to determine if there are significant, reliable differences in student performance between the pilot and comparison courses. The data collected on the additional comparison classes will be used as a statistical control for potential effects of time.

Student feedback on the model curriculum and new instructional materials will be collated and summarized. This information and the results of the short-term outcome evaluation analysis will be summarized in a report of the results of the program evaluation. These results will also be incorporated into the project final report. Longer-term outcomes, including student attrition rates and pass rate on the National Certification Examination, will be assessed beyond the term of the grant. These longer-term outcomes will be reported in dissemination materials and presentations to local, state and national groups on an ongoing basis following the termination of the grant.
The final outcome of this project will be a report documenting the project outcomes and successes. The report will summarize the applications of the ADAMS and V-Tech software, describe and provide samples of the instructional materials developed to strengthen students' content learning, review the results of the formative and summative project evaluation, and suggest additional applications. The final report will make recommendations to the Chancellor's Office for project improvement and implementation of similar programs at other California Community Colleges.

This report will be submitted to the Chancellor's Office for approval and, upon receipt of that approval, will be disseminated to all California Community Colleges through the following activities:

1. Abstracts of the report will be mailed to the Vice President of Instruction, Academic Senate, Dean of Vocational Education, and the Dean responsible for Health Science Programs each California Community College. Full copies of the report will be provided upon request.

2. At least three copies of the final report and related project materials will be submitted to the Chancellor's Office.

3. The curriculum updates and instructional materials will be reviewed with the members of the Surgical Technology Advisory Committee for application to their own programs as desired.

4. The final report will be submitted to the ERIC system.

5. Full copies of the Project Report and related materials will be provided to interested parties upon request on a cost-reimbursement basis. In addition, Project Staff will answer inquiries about the project and provide technical assistance to other colleges implementing similar projects as time and resources permit.

6. The Project Director and Coordinators will present reports of the project design and outcomes at appropriate state, regional and national conferences, as time and
budgets allow. Potential dissemination opportunities include regular conferences and meetings scheduled by the following groups:

a. The California Association of Community Colleges

b. The Conference of California Vocational Education Deans

c. The Committee for Educational Review of the National Association of Surgical Technologists.
Southwestern College requests $25,506 from the Fund for Instructional Improvement to develop and implement the proposed Computerized Instruction in Surgical Technology Project.