

BACKGROUND:

- A. Wofford College has introduced several new features into the curriculum this year. A unique one is the new Science 1-2 course designed for non-science students. This is emphatically not a general science (broad coverage) course. Its goal is to give the non-science student a sympathetic understanding of science through the opportunity to work closely (small groups) with an active scientist practicing in that area of science which most evokes his enthusiasm and interest. This should be an effective context in which the student can capture the flavor and methods of science and avoid the two extremes of a weak course "about science" and a rigorous pre-professional course in a given area such as physics.

Wofford has also adopted a 4-1-4 calendar, providing the month of January for intensive projects not otherwise available in the curriculum and significantly different to warrant their inclusion in this new educational format.

- B. Computers and associated data systems touch everyone's life and will do so increasingly in the future. Some knowledge of the capabilities and limitations, the language, the concepts and the use of such systems is a valuable asset in modern life. Many schools are recognizing this and computers are now being used in education at all levels. They are helping first graders learn to read, fourth graders do their own programming, graduate students carry out computer based research. Many strong authoritative statements are made concerning the significance of computer facilities for education. The report of the "Pierce Panel" of the President's Scientific Advisory Committee is frequently quoted. This report includes such statements as:

"...we find ourselves compelled to believe that within a decade essentially all university and college students will require some basic understanding of digital computation. We believe this will require all institutions offering collegiate level instruction to have on campus sufficient input-output facilities to permit students to prepare problems for digital computation and to receive results...The freshman enrolling in 1966 will be employed in 1970 in a world using more than twice the computing capacity now available....Students who have not learned to use computers are badly equipped for the postbaccalaureate world....In all fields where computing has been used, it has added a new dimension to education, and has led the students to better comprehension of complex problems and greater insight into the meaning of complex problems. We predict that in the future almost all undergraduates will use computers profitably if adequate computing facilities are available."

Our student body currently has more interest in, more experience, and more capability with computer systems than our faculty. Some are now working programmers and others hold other positions in computer oriented data systems. This is a further indication of the significance of the proposed program for current educational needs.

PROGRAM:

Science 1-2.

The use of an introduction to computers as one of the topics in this course has the following advantages:

- A. It automatically generates a responsive interest in most freshman.
- B. Background material includes some study of various mathematical systems of logic, of language structure, and of all of which are significant components of education.
- C. Computer programming requires a precision of thought and expression that cannot be overly stressed in any field of intellectual endeavor.
- D. If a computer is available to test the programs, immediate reinforcement or correction results (assuming real-time operation). The computer "grades" programming efforts immediately and unequivocally.
- E. Since a computer can be described as a "high speed moron," the task of instructing one to solve a problem (not necessarily a mathematical problem) requires careful advance analysis. Each step and possible alternative must be foreseen and provided for. One who has learned to program a computer has learned care and precision in thought and problem analysis, a requisite of an educated man.

This remains, of course, only one of the topics in the Science 1-2 course.

Interim.

The same considerations apply to the use of "Computer Uses" as an Interim topic. This provides an additional means of presenting "computer age" concepts to an even larger segment of the student body. The project has no prerequisites (is designed especially for those with no background) and aims to give an introduction and broad background rather than produce practicing experts in some specialized area such as programming. The Interim format allows the individual student considerable freedom in course of study and emphasis. This is especially true for those students who may elect to do a further interim involving computer applications in their own area of specialization--which could be handled on an individual project basis.

Physics Students.

- A. The computer is finding increasing use in undergraduate physics curricula. It is being used both as a computational facility and as a teaching machine. A growing number of very useful programs of each type are becoming available. Many topics are not well covered in physics education because of the computational burden they impose. When a computer shares this task, the student is freed to build a firmer grasp of the concepts. Furthermore, easy and immediate results of calculations made with well-chosen changes of problem parameters provide the student an opportunity to "see the forest rather than the trees." Cases can be examined with sufficient speed to enable the student to achieve a "feel" for the physics of the situation rather than being lost in the computations. Many topics requiring laborious hand calculation cannot now be justified. Understanding can greatly be augmented by use of a computer facility in this connection.

- B. Computers are now being used as teaching machines. In a conversational mode, real-time situation, a machine can present information and questions, evaluate responses, and continually select appropriate new statements or questions.

Graduate work in physics is frequently dependant on computers. Many research projects are going "on-line." Programming ability is a requisite in many places. Since we now offer no experience along this line, our graduates are not prepared. For example, one was required to take a sophomore level course in computer use upon entering graduate school. Graduates from larger places (and some smaller places) have this experience.

Other Fields.

The general concepts used in the discussion of physics applications are also useful in other fields of learning. Economics departments, for example, use computers to simulate business situations and make analyses or evaluate decisions. They are used in connection with many applied math courses such as statistics, and in departments requiring students to perform statistical analyses such as psychology, and in faculty research problems in many fields.

SOLUTION:

Educational reasons alone justify the existence of a computing facility on the Wofford campus. Administrative uses will almost surely exceed instructional uses, considering the quantity and variety of data processing and record keeping now being done. Together, these uses make an undeniable justification for such a system. Financial inertia, as well as inertia of other types, has limited our progress toward this goal.

The immediate installation of a time-sharing terminal here would be an excellent first step. Such a system would have the advantages of:

1. relatively low cost which could be regulated as needed.
2. no long-term commitment (30 day contracts).
3. time-sharing conversational terminals offer the educational advantages of hands-on use and instant communication not supplied even by rather large on-campus installations.
4. through the terminal, a large, fast, modern computer is available-- even on an unlimited basis! Such equipment is more sophisticated than any we hope to have on the campus.

A disadvantage of the system is its limited input/output speed, making it inappropriate for large volume uses. Many institutions can justify maintaining time sharing terminals as well as in-house systems, finding they complement each other quite well. Until Wofford becomes a large volume user (and perhaps even then), the time-sharing terminal provides an excellent introduction to the computing age.

CONCLUSION:

Familiarity with the possibilities and limitations of computer systems is a vital part of modern education. Wofford now has courses which are handicapped by a lack of hardware. We must take initial steps immediately and obtain at least limited hardware capability through a time-sharing terminal.