The status of computer education in the community and junior colleges—Needs and alternatives

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INTRODUCTION

The community and junior college is usually a multi-purpose, comprehensive, open-door institution, offering traditional transfer programs, career programs, continuing education courses, and community service courses. Each college is usually funded by both state and local taxes, and serves the citizens of a local geographic political division or sub-division. They offer access to higher education by means of generally lower tuition and by being within commuting distance of the citizens they serve. They are not often residential campuses, generally having a clientele who work part-time and maintain their role in their regular family situation.¹²

Although the first public community and junior college was established in 1901, it was not until the 1940's that the President’s Commission on Higher Education called for making education more generally available through the establishment of two year colleges. Later commissions, in 1960 and 1970, recommended that a college be within commuting distance of almost every citizen of the United States. By serving as the “open-door” of opportunity to those who had no chance for higher education before, the two-year institutions have been credited as the “social leveler” in our society, and have brought this country closer to the goal of universal higher education.²

COMPUTER EDUCATION

The earliest programs in the computer field in the two-year colleges were those offered in California in the late 1950's. These early programs were generally built around unit record equipment and computers acquired through substantial discounts from IBM, in conjunction with support from the federal government. Because business data processing is the name generally used for record-keeping activities of a business or industry, most of the early programs carried this name and were offered through the auspices of the Business or Business Administration department. Many of these programs still exist, and often are named Data Processing Technology, Information Systems, Computer Programming, or Computer Science.

A typical career program in a two-year college offering an Associate in Arts or Sciences includes anywhere from 62 to 70 semester credits of coursework. This generally includes 24 credits of general education work, including English, Mathematics, and Social Studies, 12 to 15 credits in subjects in Business, and 18 to 24 credits of computer courses. Most of these programs generally include: three credits of an introductory data processing, three credits of an introductory computer programming language, as many as eight credits of COBOL programming, perhaps three credits of RPG programming, and six credits of systems analysis and design. Students sometimes have an opportunity to take one course in operations, and in some instances are included in an internship or work-study program. The mathematics requirement is generally either Business Mathematics or General College Mathematics, sometimes including a course in Elementary Statistics.

Additions to the offerings of the two-year colleges included, in many instances, a “scientific” option. These programs emphasize the use of the computer in the programming of statistical and data-gathering applications, in forecasting, and in mathematical and engineering work. Many of these programs are offered under the auspices of the mathematics departments; some of them are called computer science. More recently, two-year colleges near four-year programs have initiated the first two years of a transfer program, also generally entitled computer science. The scientific option generally differs from the business data processing or commercial option in these ways: classical mathematics up through the calculus is substituted for the courses in business, statistics is required, emphasis in computer language is on FORTRAN, and assembler programming is stressed in more depth. The transfer program, however, generally offers a course in data structures, one in computer organization or architecture, and a course in numerical methods.

A few schools offer an option within the Engineering or Electronics Departments. Students learn fundamentals in digital and analog computer logic and circuitry, and often
are employed by the manufacturers of computers to be further trained as customer service engineers. Certificate programs are offered in some two-year schools. These are generally one year in length, but sometimes are one semester. Most computer operations certificate programs are one year, while certificate programs in data entry are generally shorter. In many states, these types of programs are offered by the secondary vocational-technical schools rather than in the community and junior colleges.

Many of the community and junior colleges offer courses about computers as a service to other departments and programs. Students majoring in Business or Accounting generally take one introductory course, as do students in medical records and paraprofessional health programs. Some schools offer "professional development" courses for industry, although the popularity of these courses has decreased at the community and junior college level as states have begun to limit the number of credits that may be transferred from these institutions to upper division colleges. Community service courses for no credit or for continuing education units (CEU's) remain popular with local community groups, especially within off-campus centers in local industry.

CURRICULUM GUIDELINES

Several curriculum guidelines for two-year programs have been prepared by the U.S. Department of Health, Education and Welfare Office of Education. A business data processing curriculum was prepared and released in 1963, covering a broad range of careers in the computer field. In 1964, a report on scientific data processing technology was released in 1970, and in 1973, the earlier 1963 report was revised. The 1963 publication was perhaps the most important influence on the establishment of programs during the 1960's.

In 1969, the American Association for Community and Junior Colleges (AACJC), sponsored the publication of two reports, with the assistance of a grant from Hewlitt-Packard Corporation. One concerned curriculum, the other concerned college-wide computer usage. There are currently no plans to update these reports by AACJC.

A report giving recommendations and guidelines for a career program in computer programming for community and junior colleges was recently released by the Subcommittee for Community and Junior College Curriculum of the Association for Computing Machinery (ACM). This report is based on the results of extensive discussion held between June 1975 and February 1977 with community college educators, industry representatives, and professional society representatives. The report appeared as a working paper in the SIGCSE Bulletin, along with a working paper for an undergraduate program in computer science, prepared by the Committee on Curriculum in Computer Science of the ACM, to receive reactions and comments before final publication.

This report represents the first set of curriculum recommendations to be produced for the community and junior college level by a professional society. In earlier ACM curriculum reports, however, providing educational programs for applications programmers is credited to the community and junior colleges. The 1977 report is intended for the preparation of entry-level or trainee computer programmers who will work in an applications setting to support the general, administrative, and organizational functions of industry, commerce, business, and government service. Even though it is designed to prepare students for jobs, it emphasizes the need for a sufficient foundation for continued learning and advancement in the field. It is hoped that this report will encourage the re-evaluation of existing programs as well as serving as a guideline for the creation of new programs.

The ACM Community and Junior College Curriculum Report gives 14 objectives of the program, covering technical and non-technical skills. Instead of providing one sample or recommended curriculum structure, it offers guidelines for the local institution to adapt to the needs of their local community. It provides a detailed topical outline of the content of the program, and recommends that each college teach this content by giving depth instruction in a major procedural language (such as COBOL), some additional instruction in a second, or minor, language (such as RPG), and a foundation of concepts based on whatever assembler language it has available to use. It is recommended that the program include an "applied area" of study to be the major applications area. This feature of the curriculum recommendations allows the purpose of the program to be toward the commercial or business field, toward the scientific area, or toward any applied field of interest to the institution or to the student.

The report recommends laboratory experiences of a variety of types, with one type in one course, and perhaps another type in other courses. It is recommended that immediate turnaround of computer runs be provided during the scheduled laboratory sessions with the instructor present, with several additional turnarounds provided for open laboratory use. The report suggests an increased use of timesharing access, with experience in interactive programming provided. It recommends increased emphasis on concepts and usage of an operating system during coursework, increased emphasis on data and file structures, and increased use of pre-programmed packages and utilities.

The report offers a real challenge to those two-year institutions interested in maintaining an up-to-date, viable program. It will perhaps serve as an incentive to review and re-examine equipment, facilities, and programs.

EMPLOYMENT NEEDS

Students who complete the two-year Associate in Arts or Associate in Sciences degree program are generally capable of working as a junior computer programmer or programmer-trainee. Most graduates go into commercial applications work, into banks, insurance companies, small business, etc. Others go into statistical data centers, service bureaus, or local government data processing. Although most commu-
nity and junior colleges are required to perform student follow-up studies, most is done on a college-wide basis rather than for any particular curriculum. Therefore little has been documented on graduates of two year programs in computer education.

Most two-year educators feel that placement of graduates has been good. Many graduates have, within three years, moved up the promotion ladder into a variety of jobs, ranging from senior programmer, systems programmer, to management in a small company. Often, within five years of graduation, almost a third have not only been promoted on the job, but have acquired a baccalaureate degree, generally by continuing to an upper division institution on a part-time basis. Employment practices are, however, often criticized by these community and junior college program coordinators, to the extent that many local businesses and industries require that the entry level position be that of an operator, sometimes even a peripheral equipment operator. This mismatch of training to the job is usually “corrected” once the applicant has proven valuable.

More and more baccalaureate programs are becoming available in computer education, with the number of them recently passing the number of associate level programs. Many companies now show a definite preference for the four year graduate, as does the U.S. Government. Two year college graduates generally have their best opportunity, in their first job, with the small systems shop. Recently, several colleges have specifically attempted to outline a separate option within their program to fill that need.

OPPORTUNITIES AND CHALLENGES

Students interested in the computer field as a profession have opportunities at the community and junior college level to learn about the field, gain good technical skills in computer programming, and get a good general education. This initial investment is usually enough to give a talented person enough foundation to allow continuation in further learning while working in the field. Community colleges generally cost less, do not require students to move away from home while going to school, and in most cases provide a somewhat more personalized atmosphere than do the large state colleges and universities.

However, certain problems do exist. Many center around the problems arising from the lack of well-qualified faculty. It is difficult to find, and keep, faculty with good academic credentials, several years of experience doing computer work, and several years of teaching experience. With the declining enrollments forecast by professional educators, administrators are hesitant to hire new full-time faculty, and are, instead, promoting “cross-training” of those faculty in other departments whose enrollments have already declined. This can be done, and can be done well, but it requires more time than is generally given. Secondly, problems arise, and are increasing, from the lack of proper equipment, or lack of proper access to the equipment to be used, or lack of control over the types of activities to be done on the equipment. Thirdly, problems exist in the lack of commitment on the part of the institution to ensure a quality program. It is difficult for instructors teaching full-time to properly revise and maintain both a facility and a curriculum, without needed released time from course instruction. Fourthly, problems exist in the lack of understanding of the students about what the career field is, and the types of skills and talents that success in the field requires. The mystique of the “computer” has not been dispelled from entering students. Lastly, problems exist in the transition of the student from one level of schooling to another, commonly called the “articulation” problem. It occurs between secondary schools and community colleges as much as it does between community colleges and upper division institutions.

NEEDS FOR THE FUTURE

Developments in the computer field continue to occur at extremely fast rates. The boom in minicomputer and microprocessor technology is having a profound effect on business and industry. The growth in small diskette and cassette computers has led to an increased need for personnel who can serve as a combination of operator, analyst, data entry operator, and programmer. The effect of data base management inquiry systems and the creation of the position of data base administrator will change the way the conventional computer programmer performs work.

Educational institutions often react slowly to the need for change. Curricula established a decade ago are, in many instances, in need of attention in both the content area and in the physical facilities being used. Several rather urgent needs, given here in prioritized order, exist:

1. A return to the philosophy of attempting to do those things that are “academically” better, rather than doing merely those things that are the absolute minimum for retaining the program. We should be looking for the best teachers, the best in facilities and the best access to them, and strengthening of the content of the programs, both technically and otherwise. Getting this is NOT always a matter of increasing costs.

2. An emphasis on a well-qualified, kept-up-to-date faculty, given time for curriculum development as well as for teaching. There should be opportunities for “cross-trained” teachers to gain experience by working under the auspices of the college, perhaps, before being placed technically “over their heads” into a classroom. Special programs should be considered for community college instructors, perhaps on a state-wide or regional basis. Opportunity to interact with other teachers, as is possible in the ACM’s Special Interest Group for Computer Science Education, should be found. Access to recent computer literature should be planned, by means of journals, newsletters, etc.

3. More imaginative use of the monies spent on computer equipment. Recently decreased costs of equipment can make an older five-year lease very expensive. Alternative types of computers should be studied and con-
sidered for use in an entire curriculum, or in one course. Access to this equipment should be planned under the philosophy recommended in 1. above.

4. An increased emphasis on career education in the computer field, from the middle school level, at least. Better advising and counseling is needed in both secondary schools and community colleges. Encourage professional societies to revise career leaflets as they become dated, and urge students and counselors alike to use career books presently available. 15, 16

5. Availability of a "certification" examination suitable to the requirements of the entry-level computer programmer. Such an examination would give potential employers a reference point for the evaluation of the knowledge base of the entry-level applicant. It would provide a means for continuous professional over-view of what the entry-level person should know, as continuing re-evaluation of the examination occurs from year to year. It would provide the community and junior colleges with some statistical data on the scores of their graduates for continuous evaluation of their program.

OUR ALTERNATIVES

Community colleges have experienced explosive growth over the last few decades. Programs established during that period are in need of attention. Those that get it, and a rebirth of commitment, should survive, and will perform a service to society in the preparation of well-qualified persons for the use of computers in the future. Those programs that continue without changing to meet industry requirements will, in due time, slowly fade away. The needs will be met somewhere else, perhaps by a program at the four-year level, in the state colleges or universities. The decision, and the challenge, is ours.

REFERENCES


9. Correspondence from American Association of Community and Junior Colleges, December 1975.


14. For further information, write to Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

15. Perhaps the best of these was Facts on Computer Careers, American Federation of Information Processing Societies, Inc., 210 Summit Avenue, Montvale, New Jersey 07645.