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ABSTRACT

The best way to introduce computers into the instructional program of the small community college is to start with an inexpensive interactive system devoted primarily to campus instructional needs and financed by the college itself. This runs counter to the predominant idea that the optimum procedure is to begin with remote terminals connected to a large computer located elsewhere and to limit the initial effort to batch processing, but there is good evidence available to support violating the conventional wisdom. Analysis of data indicates that, contrary to general belief: 1) it is cheaper to operate a small on-site system than to pay for remote computing services; 2) the overhead and operating costs for a small system are not beyond the means of a small college; 3) cost is not the chief obstacle to the implementation of computer-assisted instruction (CAI); 4) government projects offer little help to the community colleges; 5) interactive capabilities are essential; and 6) CAI research and innovation can be done at the community college level, where resistance to change is often less than at the larger universities. (PB)

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COMPUTING IN THE COMMUNITY COLLEGES - FACT AND FANCY

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Abstract

A realistic look at the economics, hazards, and possibilities of the computer in the community college as viewed from a small, remote college actively involved with curriculum applications of the computer.

Introduction

Probably no other industry has changed more rapidly in the past few years than the computer industry. The economics of college financing have also undergone traumatic changes. It is important that these changes be kept in mind when assessing how the community college can best introduce the computer into the academic program. However, a number of myths have persisted in spite of the significant changes that should have lead to their demise. It is these myths that are the subject of this paper. Certainly some will be outraged at what appears to them to be a capricious attack upon well established fact. Of course, fact depends to a large extent on the point of view of the observer.

Over the past five years, Gavilan College has been involved with a wide range of computer activities. These include a small stand alone mini computer system, a terminal and leased telephone line into an extremely large computer center, and the use of a commercial data processing firm for administrative computing. The 'fact' in this paper is based upon the personal experience of the author, both at Gavilan College and over a wide range of contacts with computer activities throughout the country. In the opinion of the author there is an optimum way for the smaller community colleges, which account for the majority of the two year colleges in the United States, to introduce the computer into the curriculum which will optimize the chances for success. This point of view will be reflected in the "Fact and Fancy" which will follow.

Several documents were used for source data for the paper. The most important is *Computers In Higher Education*, a report of the President's Science Advisory Committee, February, 1967. Hereafter this document will be referred to as CIHE. It is recognized that conditions have changed drastically since this report was issued in

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1967. However, it is felt that the data which is used in this paper is still reasonably accurate.

Fact And Fancy

Fancy #1

The best way for a small community college to get started is to have several remote terminals via telephone lines into a large central computing facility.

Fact -

It is essential to understand just what size colleges are involved here. The 1972 Junior College Directory published by the American Association of Junior Colleges lists the following frequency distribution of colleges according to enrollment:

<u>Enrollment</u>	<u>Number of Colleges</u>
less than 1000	497
1000 - 2000	249
2000 - 3000	94
3000 - 4000	69
4000 - 5000	49
more than 5000	153
Total	1111

Thus, if we consider those colleges with 2000 students or less, we have included two thirds of the community colleges in the United States. It is this group of colleges that is the primary concern of this paper.

Fact -

CIHE indicates that the average cost per student for remote computing services would be about \$62 per year. Of this, transmission charges account for \$10. If we assume a typical college that is heavily involved with computer applications, and which has 1000 students, the total bill per year will be \$62,000 of which \$10,000 is for transmission charges alone. As will be pointed out below, for \$10,000 per year our typical college can acquire its own facilities on a lease purchase basis.

Fact -

Without question, access to a very large computer center makes available a wide range of languages and services that will not be available on a small locally operated system. It is highly

questionable though whether this wide range of services is necessary for effective educational utilization. At any rate, there is no point in becoming dependent upon services that cannot be supplied on an economically sound basis. Of the estimated \$62 per student per year used in CIHE, \$45 is for computing costs. For our typical college this is a fixed overhead of at least \$45,000 per year. This by itself is sufficient to kill the whole idea at most small colleges unless the cost is borne by the government. At the present time, the prospect of this happening seems vanishingly small.

Fact -

It is regrettable but necessary to question the motivation behind offers of access to central computer services with remote terminals over telephone lines. One possibility is that of genuine desire to assist community colleges. Another is the desire to help finance the existing computer center. It is interesting that many of the opportunities to tie into central computer facilities correlate well with the disappearance of easy federal funding.

Fancy #2

Computer systems have an inherently high overhead which makes them impracticable at small colleges.

Fact -

A large computer system can easily have an overhead equal to twice the rental costs of the computer and peripherals. This has been well documented by national surveys.

Fact -

A mini computer, or time sharing system built around a mini computer has an overhead of from 1/6 to 1/2 the rental costs of the computer and peripherals. This dramatic decrease in overhead is because such systems are essentially "turn key" operations. A staff of professionally qualified computer personnel is not necessary for educational use. In many colleges the only overhead is for maintenance and supplies with no personnel budgeted at all. In some instances a secretary is trained to operate the system under the direction of a faculty member who has part time supervisory responsibility for the computer.

Fact -

While other prices have been going up, computers and peripherals (especially large capacity random access memory devices) have been dropping.

Fancy #3

Regardless of how effective it might be, the cost of the computer in the curriculum is still too much for the small college.

Fact -

As indicated above, CIHE estimates the cost of adequate educational remote computing services to be \$62 per student per year. Of this, \$45 is for computing, \$10 is for transmission costs, and \$7 is for terminals or consoles. For a college with an enrollment of 1000 students the overall cost of \$62,000 per year is indeed formidable since this would be a fixed charge. However, other fixed charges of approximately the same size are routinely accepted at colleges as a necessary condition to accreditation. CIHE estimates that it costs on the average \$50 per student per year for library services, and that a chemistry laboratory costs \$100 per student per year.

Fact -

Quite adequate computing services can be supplied locally for much less than \$62 per year. First, it is necessary to estimate how many terminals are required. CIHE estimates that roughly one third of the courses could make very effective use of computing. If our typical college with 1000 students is used, and if each student is taking four courses at any given time, the result is 4000 student course units. Of this, one third or 1333 student course units will involve the computer. A very good estimate of the computer time required is one half hour of terminal time per student per week in each course utilizing the computer. Thus, a total of about 650 terminal hours will be required each week for the college. If we assume 40 hours per terminal per week (this can be achieved by operating in evening hours and on weekends) a total of 16 terminals are required. A 16 terminal time sharing computer with adequate disk storage can be obtained on a lease purchase basis for about \$10,000 per year for five years. If we allow \$10,000 per year for terminal rental and maintenance, and \$10,000 per year for an operator, the cost of the system is \$30,000 per year during the lease purchase period, and \$20,000 per year thereafter. Thus the comparison cost per student per year is \$30 during the lease purchase period, and \$20 thereafter. This looks much better than the CIHE figure of \$62. The cost per terminal hour (based on a 36 week year) is \$1.28 during the lease period, and \$.85 thereafter.

Fancy #4

The primary barrier to utilization of computers in the curriculum is one of cost.

Fact -

The cost figures developed above indicate that computing services of some type are within the reach of any college. A determined faculty working together can produce dramatic results in the acquisition of a computer system.

Fact -

One of the fundamental problems rests with the faculty itself. The computer can be a very disruptive device when unleashed on the campus. Traditional attitudes and patterns undergo changes which can produce a severe psychological threat to a significant fraction of the faculty.

Fact -

A traditional pattern has been to use the computer to do faster that which was already being done. A much more effective (and also much more difficult) method is to determine what one would really like to do in a course given the presence of the computer. Such a course should be significantly different when compared to the traditional approach if the computer is being used effectively.

Fact -

With very few exceptions, there are no texts or text material which routinely utilize the computer. There is a critical need for material which the faculty member who is a computer novice can use in his classes.

Fancy #5

Government projects offer the best possibility for the small college to acquire computer services.

Fact -

CIHE called for massive federal funding to tie community colleges into large regional computing centers to provide the computing services already discussed. This report was issued in 1967. Six years later there has been no meaningful change with the exception of the CONDUIT project which involves five regional networks, the PLATO project, and the MITRE project. At the present time, while much has been promised and may eventually be delivered, both PLATO and MITRE are of no functional value to the average community college.

Fact -

Sound educational use of the computer cannot depend upon the vagaries of federal funding. If community colleges wait until

massive federal funding is made available for support of educational computing, the wait will be long.

Fancy #6

Batch processing computer facilities are the most effective from the educational point of view.

Fact -

If meaningful educational use is to be made of the computer it is absolutely necessary that contact with the computer be interactive. Generally, this means a time sharing system using an interactive language such as BASIC or APL.

Fact -

Batch processing of programs can be used effectively but only if the turn around time is one hour or less. Long turn around times (days or even weeks) not only don't help but can be counterproductive and completely demoralize the student.

Fact -

A very alarming statistic which is often associated with batch processing facilities is the number of programs run during a course. Such data suggests a measured number of encounters with the computer that is more important to the computer center rather than the use of the computer whenever it is felt important to the student.

Fancy #7

Administrative and educational computing easily coexist on a campus using the same large computer.

Fact -

If a computer system is acquired for data processing purposes, this tends to dominate the useage. Many community colleges have rather large computers but no educational use. Quite different stories emerge depending upon whether one talks to the director of computing activities who supplies the services or to faculty members who want to use them.

Fact -

For colleges with existing data processing computers, it may prove much cheaper to acquire new and separate computing facilities for educational use than to expand existing facilities.

Fact -

If an interactive computer system is installed to primarily support educational use it can be used (with proper software) to accomplish administrative data processing utilizing untrained personnel and a data base which can be accessed from time sharing terminals.

Fancy #8

Computer curriculum research can best be done at large universities and colleges.

Fact -

Resistance to curriculum change is probably greater at the large college and university than anywhere else. There is a built in inertia in large organizations that frustrates change no matter how well motivated.

Fact -

Of the several curriculum projects funded at large institutions almost nothing has emerged to date which is routinely available and of use to the small community college. Many reasons exist for this, but the fact remains.

Fact -

The small community college has a flexibility which can be used to advantage in investigating new approaches to curricula. The community colleges may well be the only place at which meaningful changes in pedagogy can be produced.

Conclusions

The prospects of widespread changes in patterns of computer utilization at the typical community college which arise from the concept of someone else (the large central computer facility on a remote university campus) solving your problems do not seem particularly bright. However, to seize this as an excuse to do nothing is the worst folly of all. Ultimately, it is those changes which originate within the community college that are likely to be the most effective.

In the opinion of the author there is a very effective path that can be taken by the small college into academic computing. Start with an inexpensive system - possibly even a stand alone single terminal system. However, the system must be carefully chosen to

permit expansion. The purpose of the small system at the start is to permit the most valuable commodities of experience and confidence to be developed. Once the program starts to succeed, students will spread success throughout the campus by contagion. The system can be gradually expanded in both size and capability to a full time sharing system capable of handling both the educational and administrative computer needs of the full campus simultaneously on an interactive basis. At each stage of the process, an upper bound on the risk can be established. Each step in the expansion process is predicated on the success of the previous step.

There is no reason, either technological or financial, why community colleges cannot move into a position of leadership in the academic world with regard to the educational applications of the computer. The possibilities for useful change in the educational process through the computer are unlimited. Whether or not this bright vision is brought to reality remains to be seen.