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The Model For The Incorporation Of High Technology In The Community College Curriculum

Robin Ann Nelson
University of Nevada, Las Vegas

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University of Nevada, Las Vegas ED.D. 1985

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THE MODEL FOR THE INCORPORATION OF HIGH TECHNOLOGY IN THE COMMUNITY COLLEGE CURRICULUM

by

Robin Ann Nelson

A dissertation submitted in partial fulfillment
of the requirements for the degree of

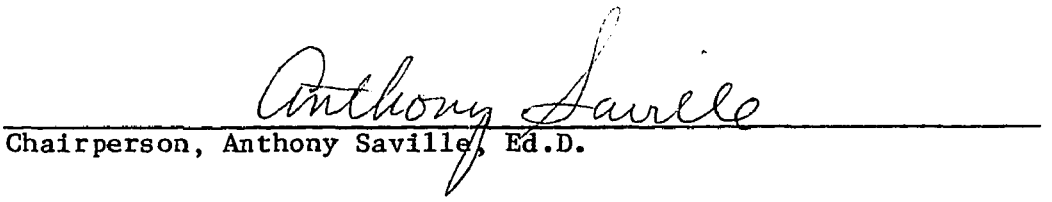
Doctor of Education

in

Educational Administration and Higher Education

Department of Education Administration and Higher Education
University of Nevada, Las Vegas
September, 1984

The thesis of Robin Ann Nelson for the degree of Doctor of Education is approved.



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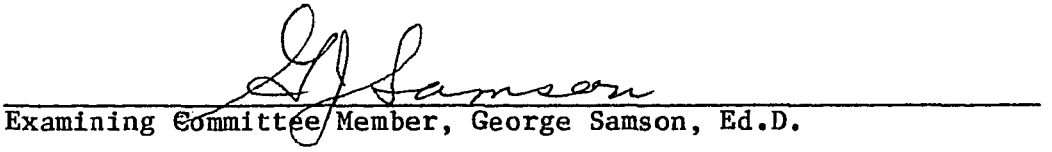

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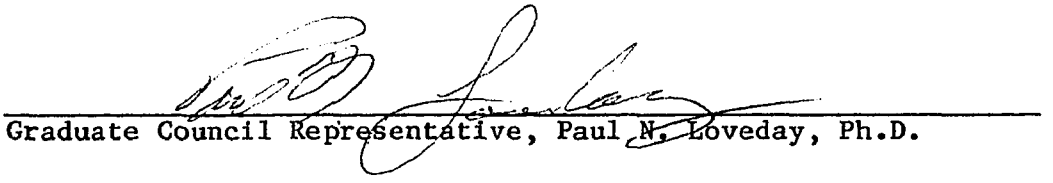

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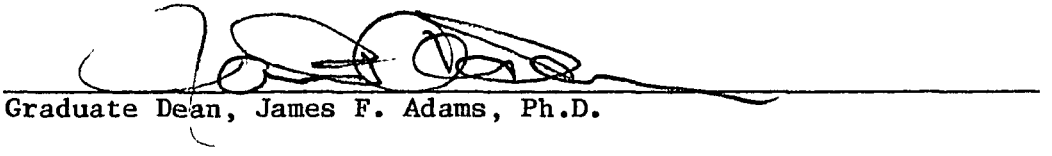

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September, 1984

ABSTRACT

THE MODEL FOR THE
INCORPORATION OF HIGH TECHNOLOGY
IN THE COMMUNITY COLLEGE
CURRICULUM

by

Robin Ann Nelson, Doctor of Education
University of Nevada, Las Vegas, 1984

Major Professor: Dr. Anthony Saville
Department: Educational Administration and Higher Education

The purpose of this study was to develop a model which might be used for the incorporation of high technology into the community college curriculum. The study design was a combination of descriptive research, face-to-face interviews, and program development.

The following procedure was utilized for the conduct of the study:

A. Review of the literature.

B. Consultation with computer-assisted instruction researchers and utilizers.

C. Visitations to selected community colleges in Arizona and California which had computerized instructional programs for two years or more.

Review of literature included: the computer in education, computer-based instruction, computer-assisted instruction, computer-managed instruction and administrative computer application.

The following curricular models were surveyed: Hilda Taba, Irwin Goldstein, Paul Dressel, William Berquist and Henry Kalani.

Through the review of the literature, the study of curricular models, and the visitations to the selected community colleges a curricular model was designed for the incorporation of high technology into the

community college curriculum.

The following conclusions were made from the study:

1. The incorporation of the computer must comply with the mission and goals of the institution, input from constituents, and careful planning by a group of representative faculty and administrators.

2. Strong consideration must be given to the budget and the capabilities of the physical plant.

3. Opportunities and incentives for training and staff development are needed to encourage faculty.

4. The development of evaluation criteria regarding the use of the computer must be ongoing.

5. Vendors and media staff must be consulted in regard to the selection of software and hardware and the utilization of each.

6. The greatest stumbling block to change is fear of the unknown. Many faculty will initially fear the computer because it is unknown to them.

7. Community college faculty and administration should consider the proven advantages of computer-assisted and computer-managed instruction.

TABLE OF CONTENTS

TABLES

CHAPTER I

THE PROBLEM

Introduction

During the past two decades, community colleges have vigorously pursued the expansion of mission and clientele. The events of these decades have left community colleges with more part-time students who require the the same services as full-time students, but who do not generate the same revenues; with a growing diversity of expensive services such as child care centers, financial aid offices, tutors and learning centers; and with greatly expanded delivery systems including colleges without walls, television media centers and other technological and human resource commitments (74, 1982, p. 1).

This lack of funds combined with the pace of technological development has created additional challenges for the community college. The community college appears at a historic crossroad in terms of mission. One route leads to the folk school organized around the needs of adults and focused on cultural and vocational interests not requiring degree attainment. The second and more historic route involves concentration on programs and services designed to assist students to attain the baccalaureate degree or entry to an occupation that could not have been attained without education beyond high school. The extent to which these two directions may be incompatible was evidenced by tensions which currently surround discussions of community college mission as described in the

recent Brookings Institute Study by Breneman and Nelson. Closely related to the issue of mission clarification was the problem of general education versus vocational education. In thinking about general education, the question arose, "Are the general education requirements the same today as they were twenty, fifty, or one-hundred years ago?" A recent issue of the Chronicle of Higher Education contained a review of a speech by Nannerl O. Keohane, President of Wellesley College, where she argued that the general education requirements in the 1980's will need to include a component she labeled "technological literacy." If the article reporting on the speech was accurate, Ms. Keohane was arguing for more technological information to be included as a requirement for a good solid education, liberal arts or otherwise. The support of "technological literacy" is not antagonistic to education that teaches "values" and the communication skills important to a liberal arts curriculum.

"As the damn breaks, the computers will pervade our lives in ways we are not yet capable of imagining." (52, 1982, p. 311)

"It is supposed to have been the atomic age, but it became the computer age." (94, 1982, p. 314)

"Sales of small computers are increasing at a rate of 50% to 60% a year. More than 1 million have already been bought, at prices ranging from $500 to $10,000. By 1985, small computers are expected to be a $9 billion-a-year business . . . ." (86, 1983, p. 68)

New information technologies -- computers, microprocessors, video recording devices, and inexpensive means of storing and transmitting information -- are creating a revolution as important as the invention of printing." (57, 1982, p. 310)

Community colleges, and higher education in general, in a time of

financial crisis, seem to be faced with a major crisis. Our society is accepting more quickly than expected the process of becoming computerized. The miracle "chip" has made it possible for industry to provide personal or microcomputers for several hundreds of dollars that exceed the power of huge room-sized computers just fifteen years ago. Businesses, large and small and individuals are buying these small computers by the thousands (61, 1982, p. 52).

How does the community college keep pace with these technological developments? Since the establishment of the computer at many community colleges in the last five years, the college's community has become increasingly absorbed in taking advantage of the many applications. Faculty are helping to manage their instruction by using the computer to keep track of student progress and compute student averages to assist in the assignment of final grades. Administrators are using the computer to help develop and maintain area and departmental budgets and to aid in the use of program cost models for long-range planning purposes. Secretaries are using the computer for word processing purposes which include information storage, maintaining current mailing lists, original typing and "personalization" of form letters and for help to ease the burden of correcting and redrafting written materials as they are developed and revised.

Many colleges are also in the process of installing a mini-computer system that will provide a complete management information system that will support the administrative functions of the college. But this is only a small part of the total applications of the computer at the community college. The advent of the computer gave the community college another opportunity for instructional innovation. A Washington State

report of the use of computers in instruction (39, 1978, p. 101) divided patterns of use into (1) computer-based instruction, the use of specialized computer programs, such as models and simulators, in the teaching of such subjects as economics, business and engineering; (2) computer-managed instruction, which supports teaching by maintaining student records, administering tests, generating progress reports and prescribing the most suitable types of instruction; and (3) computer-assisted instruction, the presentation of linear and branching instructional programs. In addition to use of the computer in teaching programming, computer languages and numerous other courses directly related to computing, it was being used in ancillary fashion in courses in around half the twenty-seven community colleges in the state.

Computer-assisted and computer-managed instruction was adopted in numerous community colleges, often in combination. Thompson (88, 1977, p. 44) described the Teaching Information Processing System as an elaborate and flexible computer program designed to amplify classroom instruction at Riverside City College (California). The system maintained information on student characteristics and achievement, prescribed remedial or enrichment work, and generated student progress reports in two macroeconomics classes. A Time-Shared Interactive Computer-Controlled Information by Television System, installed at Northern Virginia Community College in 1974, has been used to present the entire course material for college grammar, basic algebra, English composition and certain mathematics courses while scoring tests, teaching modules, and maintaining records of grades (80, 1977, p. 100). The computer at the Community College of the Air Force has been used to maintain a file of student characteristics, aptitude scores, indexes of reading ability and

educational background; select and present the best course material for each student, record student responses, and administer tests and supplemental training; predict students' completion dates; and evaluate and revise the course materials (10, 1977, p. 8). The Mathematics Learning Center at Miami-Dade Community College used a computer-assisted program that determined the students' preference for audio, tutorial, programmed, or slide/tape materials or workbooks and then presented the student with a series of learning units and tests (66, 1979, p 6).

Miami-Dade also combined computer-managed and computer-assisted instruction. Its Open College allowed students to work at their own pace without going to the campus except for examinations. Interaction between instructor and student was handled through the computer; information was transmitted through television (24, 1979, p. 6) (24, 1978, p. 12) (43, 1977, p. 10).

Several other instructional innovations have been introduced. Laboratories combined a kaleidoscopic variety of media and aids. The mathematics learning center at Tacoma Community College (Washington) included thirty mathematics course, from arithmetic to calculus, taught in various combinations of independent and tutorial study (83, 1978, p. 15). Hunter (40, 1977, 107pp) described innovative composition programs at six community colleges, including a grammar-oriented approach at Houston Community College (Texas), a classroom tutorial approach at Tarrant County Junior College (Texas), and an "applied alternative" at Meramec Community College (Missouri).

How the computer became a part of the community college curriculum has not been extensively researched. A computer search revealed few publications specifically addressing this topic. Although there is no spe-

cific research on how the computer got there, the first logical step would be an analysis of computer-assisted instruction and computer-managed instruction as it was integrated in the community college of today.

Statement of the Problem

The purpose of this study was to develop a model which might be used for the incorporation of high technology into the community college curriculum. Specifically, this study determined the following:

1. What theoretical models might be utilized in incorporating high tech in the curriculum?

2. What were the current practices being used at selected community colleges for the incorporation of the micro-computer into the instructional program?

3. What were the common curricular elements which apply to high tech programs?

Assumptions

The following assumptions have been made from the inception of the research:

1. The model developed as a result of this study would be helpful to administrators in the incorporation of high tech programs.
2. It was necessary to identify high tech needs as perceived by administration and faculty.
3. The incorporation of high technology would contribute to the achievement of the mission and goals of the community college.

Limitations

The limitations of this particular study were as follows:

1. The study design was a combination of descriptive research, face-to-face interviews, and program development.

2. The developed model was validated by a panel of administrators and full-time faculty of Clark County Community College.
3. The study concentrated on the incorporation of computer-assisted and computer-managed instruction in already established curricular areas such as social sciences, communications, business, and career education.
4. The schools selected for visitations had computerized instructional programs for two years or more.

Study Procedure

The following procedure was utilized for the conduct of the study:

I. Preliminary formal planning for the study.
   A. Review of the literature
      1. Reviewed and studied researched methodology appropriate to a study of the incorporation of high technology into the community college curriculum.
      2. Reviewed pertinent regional and national research studies.
      3. Review periodical, textual, and governmental publication information germane to the study.
      4. A variety of curricular models will be studied and an appropriate one selected generic to the community college curriculum and to the incorporation of high technology.
   B. Consultation with computer-assisted instruction researchers and utilizers.
      1. Consulted researchers in the field of high technology at the community college.

2. Consulted with local and state community college administrators regarding the implementation of high tech programs.
3. Visited the following community colleges: Maricopa Community College District, Phoeniz, AZ; El Camino Junior College, Torrance, CA; San Diego Community College District, San Diego, CA.

II. Preparation of research materials.

A. Collected pertinent data.

B. Conceptualized and developed model.

C. Presented finalized model.

Definition of terms

COMPUTER-ASSISTED INSTRUCTION

The concept of direct student-computer interaction, which requires the largest amount of computer-related equipment and computer time.

COMPUTER-MANAGED INSTRUCTION

Allows the computer to keep records, collate, and diagnose results performed away from the computer and prescribe additional study assignments, which requires less computer-related equipment and computer time.

COMPUTER EDUCATION

Acquaints the student with the applications of the computer, as well as its programming and operation.

PROBLEM SOLVING

Assumes the user has received prior preparation on the use of computers, and he is now using it purely as a tool to further his abilities and interests.

COMPUTER COUNSELING

An on-line system designed to help the student research and select vocations commensurate with his abilities and interests.

ADMINISTRATIVE OPERATIONS

Oriented toward increasing the speed, accuracy and general effectiveness of daily clerical operations.

MANAGEMENT INFORMATION SYSTEM

An attempt to collect data from operating departments under controlled conditions of time, accuracy, definition and procedure, and make them available for centralized storage, retrieval, and analysis.

MODEL

A conceptual framework and theoretical base around which a formalized activity or series of activities can be structured.

HIGH TECH

The influx of the computer into our work, schools, and home.

Organization of the Study

The study was divided into five chapters:

Chapter I outlined the general background of the problem under study. Included was a statement of the problem, purpose of the study, questions to be answered, limitations of the study, study procedure and definition of terms.

Chapter II contained a review of the literature germane to the study. Included in the review is research and writing dealing with the incorporation of the computer in the community college and in higher education. In addition, the affective, cognitive and psychomotor domains in Bloom's Taxonomy of Educational Objectives were studied in relation to

computer-assisted and computer-managed instruction.

Chapter III detailed the procedure used to investigate the problem under study. This chapter included a report on the visitations to the selected community colleges and a survey of curriculum models.

Chapter IV offered a presentation of the model for the incorporation of high technology into the community college curriculum.

Chapter V completed the formal study by including a brief restatement of the problem, a summary of the study, conclusion and final recommendations.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter was to review that body of literature which pertained to the incorporation of computer-managed and computer-assisted instruction at the community college. Unfortunately, prior to the 1970's very little research or writing could be found which dealt with this area of study. There was no accepted definition for the term "high tech" and the term does not appear on the list of key words which can be utilized in an ERIC computer search of the literature. Therefore, alternative words must be found which will provide a bibliography on this topic. Due to this limitation, the review included a computer search using the following key words: computer-assisted instruction, computer programs, microcomputers, teacher developed materials, college instruction, computer oriented programs, two-year colleges, educational technology, computer-managed instruction, management information systems, administrator attitudes, teacher attitudes, data processing, program development, individualized instruction, and higher education. The major categories of the review were: (1) computer-assisted instruction; (2) computer-managed instruction; (3) administrative use of the computers; and (4) curriculum theory and curriculum development modes.

The computer in education

The micro-processor is likely to encourage a number of desirable changes and innovations in the overall scope of the school.

Shane (82, 1982, p. 305) states that:

> The significant use of microcomputers will reside in the interactive relationship between learners and increasingly "smart machines" -- not in the use of microcomputers as "electronic flash cards." The microprocessor will also be used to facilitate work in traditional courses -- mathematics, English, social studies -- and a sprinkling of novel ideas will surface.

As the computer changes the work place, schools will find themselves pressured to modify vocational education and guidance programs to make them respond more rapidly to change. Lifelong education -- including vocational reeducation or "retrofitting: for those replaced by robots -- for mature (over 30) and senior (over 55 to 60) learners seems likely to open new, highly useful social roles for the school (82, 1982, p. 303).

The National Council of Teachers of Mathematics has said "Computer literacy is an essential outcome of contemporary education. Each student should acquire an understanding of the versatility and limitations of the computer through first-hand experience in a variety of fields." Harvard University now requires graduates to demonstrate the ability to write a simple computer program.

Although the cost of the computer was prohibitive for most school districts, computer use in schools is on the upswing for a variety of reasons. First, computers offer a cost-effective albeit capital-intensive way of individualizing education. Second, computers simplify the extensive recordkeeping required for individualized instruction. Third, familiarity with computers is now considered a strong vocational advantage, a salable skill. Finally, the computer is an enormously flexible tool that can and is being used in a wide variety of ways depending on local needs and available resources:

1. Students in the Alaskan bush study Alaskan history and English using microcomputers hooked up to television sets. The pilot project demonstrated the way to use the computer in the remote areas.

2. Harrisburg, Pennsylvania, students used computers for instruction and to learn programming. Most of the instruction materials were obtained free from the Asbury Park, New Jersey, School District.

3. Neighborhood centers in Wilmington, Delaware, offer after-school tutoring on computer terminals hooked up to a data bank at the University of Delaware.

4. The Houston Independent School System plans to have as many as 3,000 microcomputers in use by 1985.

5. Seven Arkansas high schools use a sophisticated guidance computer to help students select a career by programming likes and dislikes and strengths and weaknesses. It stores information on 875 jobs, nearly 5,000 colleges, and more than 300 scholarships.

6. Ninety-five percent of all students in Minnesota are believed to have access to instructional computing services through the Minnesota Educational Computing Consortium, which claims it is the biggest time-sharing network in the world (61, 1982, p. 34).

Naisbitt, in his book Megatrends, says:

> Although computer use in public education is still in its infancy, schools around the nation are beginning to realize that in the information society, the two required languages will be English and the computer.

We cannot improve our schools without first determining how to cope with the silicon age; we need to develop strategies -- both as professional educators and as private citizens — for living and learning in an electronic epoch, as well as future-oriented administrative policies, curriculum content, instructional practices, links with parents and

community and other educational agencies -- including the omnipresent TV set and its video-appendages (82, 1982, p. 303).

Computer-based instruction

Computer-based instruction (CBI) is generally defined as the use of specialized computer programs such as simulators, emulators, and models as tools to support the instruction of traditional disciplines such as economics, business, engineering, forestry, and health education (39, 1978, p. 92).

As a simulator of the "real world", the computer is used as a vehicle for processing a mathematical model of the environment which is the subject matter of the course. The course content is primarily based upon the simulated environment created in the mathematical model. According to Naylor, et. al. (15, 1982, p. 151):

> Simulation is a numerical technique for conducting experiments on a digital computer, which involves certain types of mathematical and logical models that describe the behavior of a business or economic system (or some component thereof) over extended periods of time.

In short, computer-based instructional applications consist of computer models that are important adjuncts to the instructional process in three ways. First, they provide a means for conveying to the students a body of substantive knowledge. Second, they enable the student to practice applying his theoretical knowledge in a realistic environment, closely resembling real-life situations. Third, they heighten the student's interest in the subject matter (39 1978, p. 6).

This paper will concentrate on computer-assisted instruction and computer-managed instruction.

Computer-Assisted Instruction

In recent months our entire system of education -- kindergarten

through college -- has come under harsh scrutiny. In part, this is because governments, institutions, and individuals are discovering that dynamic developments in electronic information technologies, in biotechnologies, and in complex global communications are rapidly changing what they do, how they do it, and how they relate to one another (82, 1982, p. 303).

But the onrushing silicon age is already changing the entire landscape of education. According to the Office of Technology Assessment:

> The so-called information revolution driven by rapid advances in communication and computer technology, is profoundly affecting American education. It is changing the nature of what needs to be learned, who needs to learn it, who will provide it, and how it will be provided and paid for (1982).

The report on Computer in Higher Education, prepared by the President's Science Advisory Committee, emphasizes the role of the computer in the following excerpts:

1. In all parts of education, government, or industry, digital computer use has come about because it was an effective tool.

2. In attempting to assess the educational need for computers in colleges and universities, we found ourselves compelled to believe that by 1978 essentially all university and college students will require some basic understanding of digital computation.

3. Every such institution will require on its staff enough faculty with computer experience to teach computer use and provide computer experience in various disciplines.

What can students learn or teachers teach using computers that they could not do, or could do only with difficulty, otherwise? This was the fundamental question. Decker F. Walker, in writing on the potential and

limitations of microcomputers in education says:

> My experience -- derived from three years of reading, thinking, and working with computers and computer-based education programs -- leads me to identify seven main ways that today's microcomputers can contribute to education. These are: 1) more active learning, 2) more varied sensory and conceptual modes, 3) less mental drudgery, 4) learning nearer the speed of thought, 5) learning better tailored to individuals, 6) more independent learning, and 7) better aids to abstraction.

Instruction in the community college will take into consideration everything that is known about learning and the different patterns of individuals. It will also include all known methods of instruction, and attempts will be made constantly to improve them and to discover additional methods (25, 1973, p. 132).

To provide for individual differences in learning patterns of students, opportunities will be provided for individuals to utilize their peculiar cognitive and emotional styles in the various learning experiences they elect to pursue. This may be accomplished in at least two ways. In his look into the future Cohen suggests the following pattern:

> In its attempt to resolve many such problems, the (new) college offers six distinctly different types of instructional sections in each course (though not for each unit). Each section has its own reason and style; and one is based on a specific instructional form--yet all sections lead to similar course goals.
>
> The six types of sections offered in each course are categorized by the different media employed. These varied lectures given by different people; each one is a distinct design for instruction that is built on a distinct rationale. Most units in each core course are offered in lecture, discussion, independent-study, tutorial, audio-tutorial, and computer-assisted sections. The sections run concurrently throughout the year in staggered time sequences.

The doors of community colleges are open wider than before to accommodate a new influx of students--underachievers, minority groups, and older adults--which makes heterogeneity a rule rather than an exception. A concurrent trend is the expansion of college services into the

community to reach segments of the population heretofore untouched. Because the talents and deficiencies of these students differ so dramatically, the faculty is finding the task of teaching increasingly difficult. Thus, individualization is no longer an intellectual proposition, but a dire necessity (68, 1980, p. 333).

Patricia Cross has convincingly indicated new directions for learning at the community college by promising successful treatment of non-traditional students. And, as a consequence of their extensive research, Rouech and Mink more particularly suggest that these "new learners" can enjoy a high rate of success in college experience when engaged with "caring" practitioners who employ mediated strategies in an appropriate learning environment. This trend in the humanistic use of technology may be seen in learning assistance centers.

Such centers have been defined as places "functioning primarily to enable students to learn more in less time with greater ease and confidence; offering tutorial help, study aids in the content areas and referrals to other helping agencies; serving as a test ground for innovative machines, materials, and programs; and acting as academic ombudsmen."

While the Center is equipped with media, software, programs, these are not prescribed perfunctorily for students or without the ready availability of human contact and consultation (78, 1976, p. 43).

Naisbitt says we must learn to balance the material wonders of technology with the spiritual demands of human nature. These learning assistance centers do just that.

Delta College, Michigan, has instituted independent study with variable credit offerings for advanced students specializing in certain academic areas (11, 1970, p. 23).

El Centro Junior College, Texas, established the mini-college. This is an instructional unit in which five instructors are responsible for teaching five courses (english, history, art, psychology, and mathematics) to a group of 180 students. The services of a counselor, reading specialist, media specialist, data-processing director, and curriculum coordinator are also available to the mini-college (37, 1970, p. 21).

Orange Coast Junior College, California, is using computer-assisted learning in management games, elementary surveying, and several mathematics and chemistry courses. The same institution has funds made available by the district to finance faculty fellowships in support of innovative and developmental work. Faculty members may work individually or in groups to develop improved learning experiences for students (93, 1970, p. 41).

The above were some of the first attempts to utilize computer-assisted instruction at the community college. We have come a long way since then.

Johnson (1979), who surveyed community colleges around the country, tabulated the incidence of cooperative work-study education, programmed instruction, audio-tutorial teaching, television, dial-access audio systems, instruction by telephone, multi-student response systems, the use of film and radio, gaming and simulation, computer-assisted instruction, and a host of other techniques ranging from electronic pianos to a classroom in the sky. Hardly an instructional medium could be identified that was not in place at some community college (15, 1982, p. 149).

Various types of computer hardware is utilized at community colleges. Currently, several types and pieces of computer hardware are used at Des Moines area community college for educational purposes. An IBM

Model 30 is used by the Career Education Data Processing instructional program. The college also has 15 cathode ray tube (CRT) terminals connected to an IBM 370 Model 158 located at Cedar Rapids and used by a number of other schools in the consortium. The college has a Hewlett-Packard mini-computer used mainly by the math department. This computer has a plotter attached to it and is used to prepare graphs and other data requiring plotting of points. The Electronics Technology program has a number of mini- and micro-processors used for instruction of electronic circuitry. The Data Processing and Accounting Departments have two Apple micro-processors which are to be used in educating students in the operation and programming of small computers (39, 1980, p. 32).

The community colleges in the State of Washington were among the first colleges in the Nation to develop educational programs in data processing technology. These programs were established in 1962 through the combined efforts of the Division of Vccational Education, the colleges (which were vocational-technical schools and junior colleges at the time), and interested vendors. A recommended curriculum was developed and unit record equipment and IBM 1620 computers were installed in these schools during 1962-63. Funding for these instructional programs came primarily from the local school districts with assistance from vendors, in the form of a 60 percent educational discount on hardware, and from supplemental federal vocational education funds (39, 1978, p. 92).

North Country Community College is a small, relatively new, community college that for various reasons did not have any computer resources, either through time-sharing or on-campus equipment, as late as the spring of 1980. The rapid movement to a computerized society was therefore particularly alarming to the college. In an effort to address the changing

needs of the marketplace with regards to computer literacy, the college therefore applied for and received in 1980 a grant to equip a laboratory with microcomputer hardware and software packages for business and secretarial applications. As a consequence, a microcomputer lab was equipped with 15 Commodore Pet 32K microcomputers, one Apple 48K microcomputer, and a considerable number of business and educational software packages (69, 1982, p. 8).

The University of California at San Francisco has used computers in instruction for over 12 years, initially utilizing a second generation computer dedicated to a CAI system called COMPTEST. In 1962, a new system called PILOT was implemented when a large, centralized time-sharing facility became available. Recent advances in computer technology in the form of dedicated stand-alone, programmable terminals off-line for special purpose CAI applications more efficiently and economically than on-line to the central computer, plus provides on-line capability for time-sharing on the central computer when necessary and appropriate (65, 1972, p. 3).

The developments in the technology of programmable terminals and mini-computers allows the University of Iowa and the University of California, San Francisco to deliver necessary and appropriate computer support in a distributive fashion via centralized and remote facilities in an economical and efficient manner (65, 1972, p. 3).

The Advanced Instructional System (AIS) utilized at Lowry AFB, Denver, Colorado. This system, is a prototype computer-based arrangement for the administration and management of individualized technical training. The system is computer-directed, based upon the following concepts:

1. Since students learn and respond at different rates and to different media, a self-paced, individualized approach to instruction was utilized.

2. That the best way to realize savings is through improved resource utilization such as student time, instructional staff and other training resources.

3. The system was designed to effectively manage the activities of thousands of self-paced students concurrently (10, 1977, p. 9).

The following seven problems seem to be the most severe limitations of today's microcomputers:

1. Microcomputers can supplement conventional education, but they cannot substitute for it.

2. Today's microcomputers are hard to use, and teachers prepared to use them are in short supply.

3. New products and systems are being created and marketed in such profusion, with such speed, and with so little standardization that systematic, long-term planning is nearly impossible.

4. Good programs are scarce because creating them for today's microcomputers is difficult, time-consuming, and expensive.

5. We are only beginning to understand how to use microcomputers in education; therefore, it is easy for a school or teacher to err, look foolish, or do harm.

6. Programs for teaching explicit, formal models can be created readily with known techniques, but it is more difficult to use computers to teach subject matter that involves judgment, intuition, improvisation, and creativity.

7. Microcomputers will not solve (and may aggravate) several of the

most serious current problems confronting education -- notably equity, school finance, and divergent public expectations (93, 1983, p. 103).

The principal findings in reviewing the literature with regard to computer-assisted instruction was that future research is warranted. The implications would appear to be strongest for research with different teaching techniques. The real outcome of computer-assisted instruction systems may not be better student performance, or the reduction of attrition to more comparable levels; however, the real advantage of such systems, may be less time needed in a particular course by students to generate a particular grade in the course.

According to Paden and others:

> The jury is still out in terms of deciding on the relative merits of computer-assisted instruction; however, many college departments consider computer-assisted instruction to be sufficiently effective to justify its continued use (65, 1977, p. 3).

According to Reed and others:

> There are several rewards which may accrue from the development of a computer-assisted instruction program. First, the teacher can redirect his efforts from routine teaching tasks, such as information-giving, to more personalized learning objectives. Second, the teacher may save time and effort in the long view, and third, the detailed discipline process required to create a computer-assisted instruction program may encourage the teacher to invest the art and science of teaching with greater meaning (72, 1974, p. 20).

As a final outcome of this investigation, additional studies can be generated; also the instructor will generate more concern for the students who are failing a particular course.

Nawaz summarized with the following quote:

> The wide array of approaches, techniques, and methods share evidence of a pragmatic response to the challenge of individualization. There is also increasing concern that the answer lies in diversity rather than uniformity; that there is no one best way of reaching students; and that any attempt at individualization should open up alternatives to the individual learner (62, 1977, p. 25).

Computer-managed instruction

A few years ago, highly intelligent, well-trained technicians were about the only persons able to communicate effectively with computers. Today, computer systems are designed for use by persons from all walks of life, from all levels of intelligence and training. The rate of this acceleration is having a significant effect on the way of life in society (66, 1979, p. 6).

By the year 1985, according to Martin and Norman (54, 1970, p. 8) in The Computerized Society, "there will be a sudden, massive spread of computer usage that will affect the lives of almost everyone." Attributing to this spread are four factors:

1. mass production of computer hardware at significantly lower cost
2. standardization of software and application systems
3. large data bases and rapid access storage devices
4. telecommunication network extensions and expansion.

Rapid changes in information technology open a wide range of possible futures for society.

Until recently, community colleges of the State of Washington responded to the increased demand for computing education much in the same manner that other colleges across the nation responded -- they sought to improve their condition on an individualized basis to the best of their abilities. The development and implementation of computer networks, however, have significantly expanded the alternatives facing the individual college in its search for methods to improve the quantity and quality of computing to its students at minimum cost. Technically feasible for several years, with attractive cost/benefit attributes, the network concept

is revolutionizing college computing, according to G.P. Weeg in an address to the Pacific Northwest Cooperative Computer Center Annual Symposium held April 13, 1973 at Washington State University. Weeg states that these networks exist in about twenty locations in the nation. They provide small institutions computing support of a kind more potent than any small college could in any other way achieve. These networks allowed the community colleges in Washington to develop computer-managed instruction without a great expenditure of funds (39, 1978, p. 63).

Computer-managed instructional (CMI) applications participated in the instructional process by affecting and organizing each step of the process. CMI provides information on the basis of which instructional-sequence decisions can be made. There were four characteristics of any computer-managed instructional system:

A. A file of student characteristics and performance;

B. A set of diagnostic examinations;

C. A set of instructional segments or modules; and,

D. A computing resource that used data on student characteristics and performance through diagnostic examinations to prescribe an appropriate instructional module (15, 1982, p. 150).

Computer-managed instruction differed from computer-assisted instruction in that CMI is adjunctive to the learning process, not the vehicle for presentation of course content as a CAI. CMI differs from CBI in that CMI manages and directs the sequence of learning events, and then records the progress of each student through the sequence. CBI does not include the management or recording of progress (39, 1978, p. 53).

Computer testing and evaluation, an offshoot of computer-managed instructional applications, was another technique which aids the class-

room teacher by helping him to develop tests. Before the system was used for a particular subject or class, a set of questions was developed and stored in the computer. This is a one-time process. The instructor can request the computer to generate a test by submitting the description of it--that is, the number of questions, the number of questions by degree of difficulty, the category, and the other optional attributes. Student answer sheets can be scored automatically by the system (69, 1982, p. 10).

Computer education and problem solving are two additional instructional techniques. Computer education acquaints the student with the applications of the computer as well as its programming and operation. Problem solving assumes the user has received prior preparation on the use of the computers and he is now using it purely as a tool to further his educational process (84, 1982, p. 316).

Another instructional application is computer simulation. An example would be management gaming. Various controllable aspects of a business enterprise, such as advertising budget, research budget, production volume, and product price may be determined within limits by the student. These decisions are fed into the computer, which then simulates the operation of the business and prints out reports indicating, for example, sales volume, current inventory, statement of profit and loss, and production capacity for another period (22, 1977, p. 63).

One of the newest applications of the computer is in counseling. This application is an on-line system designed to help the student research and select vocations commensurate with his abilities and interests. The computer data file contains detailed information on various occupations, job requirements, and job opportunities. It

contains similar data about colleges, universities, and specialized technical schools. Through the process of eliminating various options, the student plans his occupational and educational program (17, 1979, p. 41).

The benefits derived from computer-managed instruction are of several types. The most significant of these were: time saved from repetitive clerical tasks which can be reapplied to professional teaching tasks; improved record keeping which allows more timely professional attention to learning problems; and, students retained because of timely remedial or compensatory instruction (39, 1978, p. 13).

In a survey conducted at Lower Columbia Community College, of 158 students which has used computer-assisted or computer-managed instruction in a business course, 130 or 82 percent, found the use as "informative and enjoyable" while only 10 percent found it "confusing or difficult."

The Teaching Information Processing Systems (TIPS) was a project at Riverside City College which was funded by a grant from the Exxon Education Foundation. TIPS is nothing more than an elaborate and flexible computer program which, together with sound educational procedures, enables the teacher to individualize instruction with a large number of students. The TIPS program has the capabilities of keeping student characteristics and achievement data, of generating student progress reports and individual prescriptions for remedial or enrichment work, and numerous reports for the teacher pertaining to individual and collective student performance in specific content areas within the course (88, 1977, p. 15).

The following was a selected list of subject areas which use computer programs. The primary uses of the computer in classes other than

mathematics are for problem solving, simulation, and drill/tutorial.

1. Art: Computer animated films; computer-aided graphics as an art form; the microfilm plotter and computer art;

2. Biology: Heredity; photosynthesis; pest control; genetic modules; enzyme action; computing in animal physiology; testing program in audio-tutorial biology; data analysis;

3. Business: Inventory; depreciation; tax models; budget forecasting; bank statements; invoicing; mortgages; interest; economic models; population and economic growth;

4. Calculus: Newton's method; curve fitting; numerical integration; approximation of functions;

5. Chemistry: Data analysis; chemical equilibrium; testing of chemical names and formulas; aromatic organic synthesis; conversions; CAI and CBI in organic chemistry;

6. Education: CAI in early identification of handicapped children;

7. English: Simulation of poetry esplication; synonym drill; computer teaching of literary stylistics;

8. Foreign Language: Computer-generated video-tape for teaching French grammar; drilling Spanish verb forms; sentence generation through visual cues; computer-supplemented Latin instruction;

9. Game Theory: Dynamics of environmental system; urban planning; qualitative organic identification; economic policies;

10. Music: CAI in music theory; digital system for the instruction, composition and performance of music; an interactive computer music system;

11. Physics: Computer graphics; geometrical optics; wave motion;

12. Psychology: Simulation of psychotherapy results; computer

applications in experimental psychology;

13. Social Sciences: Population dynamics, election models and prediction; political simulation models; analysis of survey data; CAI in American history;

14. Statistics: Monte Carlo experiments; hypothesis testing; regression analysis; correlation; analysis of variance (18, 1975, p. 33).

Administrative application of the computer

The recent February issue of Phi Delta Kappan focused on the question "Will Technology Revolutionize Education?" Nineteen prominent educators commented on an address by William C. Norris entitled "Via Technology to a New Era in Education." Whether your personal philosophy leans to back to basics or toward there must be a better way, one must agree that the administrator will be the key instrument in any significant change (56, 1982, p. 69).

Microcomputers can serve as powerful tools for the school principal: keeping financial records; recording enrollment figures, absences, grades, providing ready access to information on present and past school progress for each student. Administrators can have all of this information at their fingertips merely by touching a button (94, 1982, p. 314).

A recent survey by the U.S. Department of Education (ED) found that about one school in four now has a computer available for student use, and there is good reason to expect this number to increase rapidly. But other ED sponsored research, examining the experiences of three urban school systems with microcomputers, demonstrates the difficulties of implementing large-scale computer use (84, 1982, p. 316).

Three conditions existed that could delay full use of computers in the classroom for perhaps as much as 20 years. They were:

1. The portion of the school budgets available for the purchase of instructional materials was probably too small to purchase enough computer units;

2. The current inventory of educational courseware available for student use was inadequate;

3. Current investment in developing new approaches to the student use of computers is inadequate (57, 1982, p. 310).

The administrator will lead the way in competing for public funds and in convincing policy-making bodies of the educational benefit of student use of the computer.

The second computer age--the micro-electronic age--is what education leaders at all levels have been waiting for. Small, cheap, easy-to-use, and portable, the microcomputer is powerful, versatile, and easy to program. It can be selected from a catalogue or from the shelf of a store. The cost starts at $600. It can serve as an endlessly patient tutor with a teaching style limited only by the imagination of its programmer; material can be taught by voice, pictures, or words on a screen or on paper. It can test the learner's progress and keep track of where the previous session ended (94, 1982, p. 315).

In higher education, courses in "computer literacy" are entering the curriculum everywhere, and some colleges now require computer courses for graduation ("In Brief", Chronicle of Higher Education, May 1981).

Versatility is a key reason for putting computers into schools. Teachers, students, and administrators will continually find new ways to use computer technology (95, 1982, p. 318).

The pace of technological development is never constant. Technology possesses a self-accelerating characteristic. Yet every technological

system if it is to be useful and effective, must accommodate to the human factor. In their social behavior and adaptability to changing work conditions, human beings change much more slowly than the mechanized or automated systems which support them. Still, it sometimes seems that a small number of technical experts or talented designers expect that hundreds, thousands or even millions of people will quickly adapt to innovative systems. This mismatch between the developmental pace of technology and the adaptability of people is the chief concern of managment and technology (56, 1982, p. 31).

At Amarillo College, as at other colleges across the country, the first computer applications were instruction in data processing, and administrative support, usually in selected areas of student registration and academic records. The current administrative applications at Amarillo College may be viewed in three levels: administrative operations, administrative reports, and planning and management systems. Administrative operations are oriented toward increasing the speed, accuracy, and general effectiveness of daily clerical operations. Adminsitrative reports result from operations centered in each department and is designed to effect transactions and provide information of unique use to that department. A planning and management system is an attempt to collect data from operating departments under controlled conditions of time, accuracy, definition and procedure, and make them available for centralized storage retrieval, and analysis. This information system emphasizes the capability to integrate and display data from various files, both current and historical, for numerous management purposes (A Report of the Information System Task Force, Amarillo College, Texas, March, 1980).

The relevance and cost justification of the computer on a sizable community college campus may not be validated until the planning process on campus has matured to a point where administrators and faculties are aware of the need to simulate, choose alternatives, and implement computer-assisted instruction on a cost effectiveness basis. Additionally, it will take a sizable campus with ample resources to implement the cost of a developmental staff for creating software packages that are already on the market. Of course, the institution that chooses to modify software packages might suffer from loss of "pride of authorship" or lack of programs perfectly designed to meet their needs. College management will perhaps feel better when comparing the cost of a full developmental staff with that of a smaller core operational staff. The community college president must take a hard look at the cost of computer hardware he has on campus, the cost benefits accruing to the organization, and the status of possessing its own computer (48, 1973, p. 6).

Lahti also said that, "Managing the rapid change in technology and utilizing behavioral science research to elicit maximum human effort are two great challenges of organizational leadership today."

The implementation of the computer means curriculum change. Kurt Lewin (51, 1948, p. 301), one of the theorists who has developed and expounded a theory of change, has pointed to three basic steps in achieving change: unfreezing the field; carrying out activities which induce change; and refreezing at the new or different level.

McCorkle and Archibald in their book, Management and Leadership in Higher Education, stated that: "A false sense of security has come from implicitly assuming that computers produce information that is better than that obtained elsewhere. The numbers that appear on cathode-ray

tubes and computer printouts appear to be "objective" data, containing facts and constituting revealed truth on which hard choices can be soundly based. That was simply not true. Most administrators have gained the wisdom--sometimes by sad experience--to recognize the limitations as well as the power of computers. Computers can organize data quickly and (one hopes) inexpensively return them in any specified format, once the rules for organizing them are determined. Managers--not technical staff nor systems analysts--have to provide rules and define formats to generate useful information for monitoring and controlling. Only then can operating systems, reporting systems, and analytical systems be developed to support management activities." (56, 1982, p. 63)

Many managers have learned that building comprehensive, fully integrated computerized information systems is not always the best solution to information needs (1, 1963, p. 10).

Curriculum Theory and Curriculum Development Modes

While most people will assert that change in our lives is constant, while the concept of future shock has already taught the American public that change occurs more rapidly than had been thought, while the evidence of change is seen in almost every phase of our daily lives, it is also true that change in an institution of higher education comes painfully and slowly. Changing a curriculum, changing the course content, changing the strategies for teaching -- all of this is recognized by faculty and administrators alike as difficult if not impossible. The acceptance of the status quo or of tradition is pervasive. College faculties do things a certain way because they have always done them that way (Wattanbarger, Scaggs, New Directions for Community College, 25, 1979).

As Hefferlin (35, 1969, p. 92) observed: "The curriculum remains

the central means to an educational institution's end; and if the curriculum is irrelevant, it must be changed."

Who decides what the curriculum shall be? Several of the reports refer to curriculum management. But who develops curriculum in the community college? To say, "The college decided to offer a program," is not enough; people stand behind all decisions. Some reports suggest that the administration plans curriculum, while others give responsibility to the faculty. Categorizing in this fashion fails to fully describe the process, because curriculum leadership may come from any person or group within the college. In the college he studied, O'Hara (1977) found the governing board to be the prime agent in the curriculum development (17, 1979, p. 91).

Most of the literature on curriculum was concentrated on program planning and development. Any type of program planning has to begin with a definition of program goals or institutional mission. Lenning and Micek (49, 1976, p. 16) delineate procedures for goal-setting, and describe how the needs of community colleges differ from other types of postsecondary institutions. They emphasized the need for concrete guidelines and alternative strategies in developing a set of goals.

Wayne County Community College (Michigan) has developed a "Management Organization Systems Technique" (1976) which is used to determine the goals and objectives of the college and to assist management in their attainment and evaluation. Of particular interest is the use of measurable objectives for each department so that programs and courses can develop a clear relationship to departmental objectives.

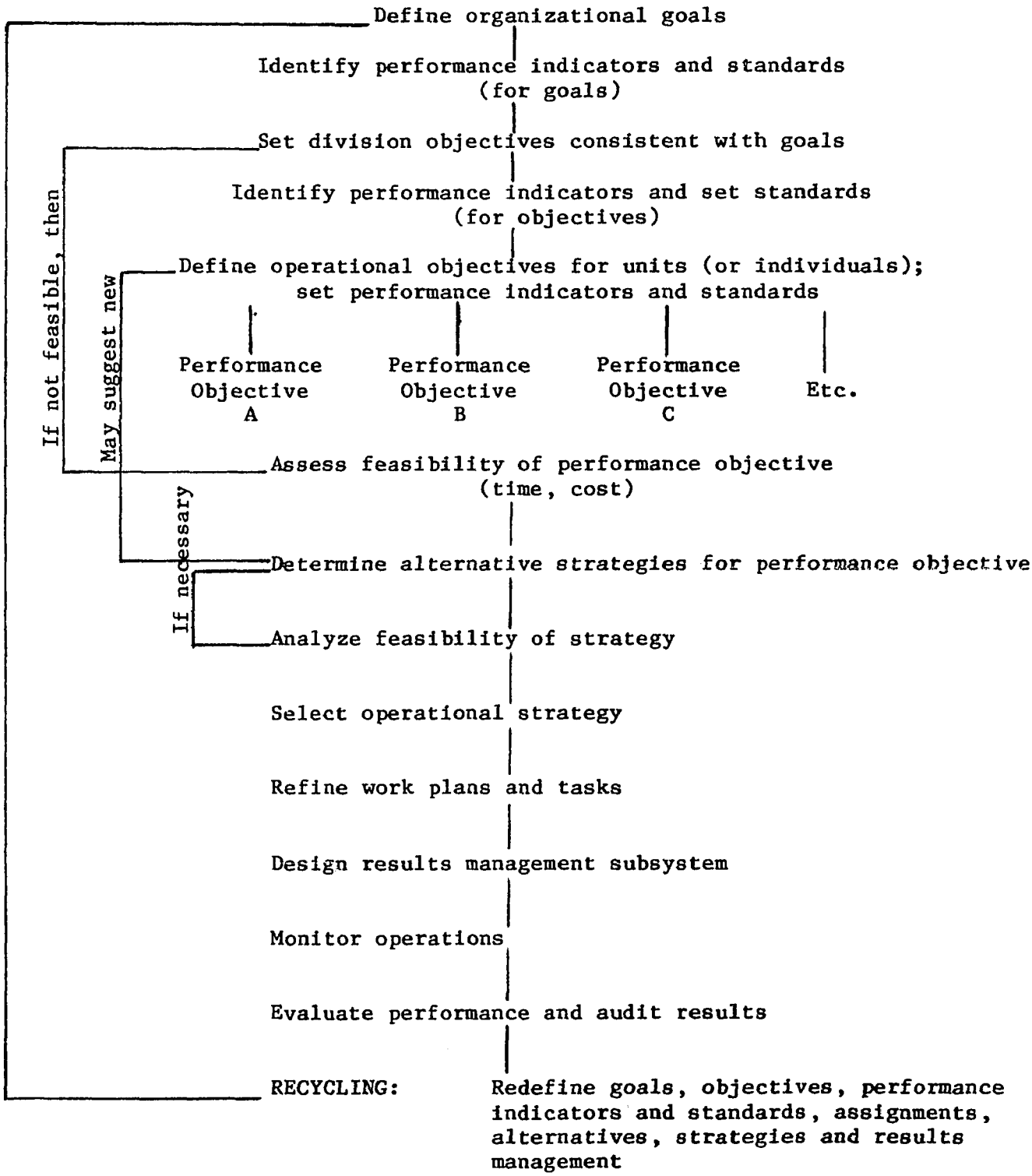
Without setting goals and objectives for the educational institution, Hostrop maintained negative outcomes occurred. Results could not

be assessed without clear expectations. Personnel could not function at maximum effectiveness since no one could succeed in the absence of directed purpose. MBO (Management by Objectives) provided a means for professionals to measure their true contributions, improved problem solving, eliminated evaluation based on personality, determined span of control, and provided a basis for promotion and merit pay (38, 1975, p. 179).

Raia reported an MBO implementation in a Southern California school district where overall productivity and communication increased by involving staff with identification of district goals. Sophisticated program assessment was realized as more orderly priorities were established and communicated (70, 1974, p. 164 - 165).

Measurable objectives developed along MBO guidelines or established models might be utilized in curricular development and evaluation. One such model which might be adopted would be the General MBO Model developed by Knezevich in his 1974 book, Management by Objectives and Results -- A Guide for Today's School Executive, which was theoretical in nature. The Knezevich model is illustrated in graphic form on the following page.

Figure 1. Knezevich MBO Model



Halyard and Murphy (31, 1978, p. 16) described studies that use competency development as the basis for curricular planning and evaluation. The instructional delivery system is also discussed in relation to expected competencies.

Many curriculum planning guides are developed for vocational, technical, and occupational programs. One of the most utilized guides available was by Holcomb and others (31, 1978, p. 5). They particularly focus on the modification and termination, two areas of curriculum shaping that are often the most difficult to implement.

Program evaluation also tended to have a heavy impact on curriculum. Kirby (45, 1978, p. 15) described evaluation techniques employed at Oakton Community College (Illinois), which are expected to not only evaluate programs, but also make external funding reports easier and provide internal information on reliability and validity of the evaluation process. The use of a business-industry survey as a tool in curriculum planning was spelled out by Melville and Roesler (58, 1975, p. 16). Using needs assessment as a tool so that curriculum planning can be based on future needs of the community is covered by Phillips and Tucker (67, 1975, 24pp.).

Although little was available that used the concept of high technology as a curricular core subject, the literature showed that curriculum design was not simply a function of subject matter. Hilda Taba of San Francisco State College stated that:

> Generally speaking, a conceptual system for curriculum or theory of curriculum is a way of organizing thinking about all matters that are important to curriculum development: what the curriculum consists of, what its important elements are, how these are chosen and organized, what the sources of curriculum decisions are, and how the information and criteria from these sources are translated into curriculum decisions.

Further Taba asserted:

> A design needs to be supported with and to make explicit a curriculum theory which establishes the sources to consider and the principles to apply. Both are needed in consistent decisions about the curriculum. (85, 1962, p. 88)

Organizing thinking into learning experiences, coupled with a good theory of curriculum and good teaching to put the curriculum into place appear to be basic key elements in learning.

Observers of the community college have reported unanimously that teaching was its "raison d'etre." Koos pointed to the "superiority of teaching skill" found among two-year college instructors because most of them came from the ranks of high school teachers and had their training in pedagogy, unlike their counterparts at the universities. Eells called the junior college "a teaching institution par excellence." Thornton proclaimed instruction the prime function, saying that it had to be better in the two-year college than in the university because the students covered a broader range of abilities, and their prior academic records tended to be undistinguished: "It is fair to say that most community college students are able to learn but are relatively unpracticed. Under good instruction they can succeed admirably, whereas pedestrian teaching is more likely to discourage and defeat them than it would the more highly motivated freshmen and sophomores in the universities" (15, 1982, p. 22).

Community colleges that desire to remain new will be experimenting and innovating continuously with their curriculum offerings. New courses will be born regularly and others will die when they are no longer relevant. Even more important than the variety of learning experiences offered will be the increased emphasis on the achievement of objectives set up for each learning unit. Regardless of the length of the learning

unit, behavioral objectives will be written for each one and students will be held accountable for achieving them to a reasonable degree (25, 1973, p. 115).

Curriculum change typically involves four stages--recognition of need, planning and formulation of a solution, implementation and initiation of the plan, and institutionalization of the change (50, 1978, p. 35).

Unfortunately, these processes cannot, in all cases, take place in an orderly fashion. Those who perceive the need may not be the same as those who initiate a plan or formulate a solution. The outcome ultimately depends on how well a change fits the institutions in which it is attempted. When the change offers significant advantages, it will be incorporated into a college either through diffusion or through the efforts of a formally recognized academic or administrative unit. In general, quiet, continual, orderly change is usually more effective than highly publicized extensive change attempted all at once (13, 1977, p. 103).

The Carnegie Foundation gave acknowledgment to the concept of program uniqueness in higher education, particularly for community colleges. Their findings were that:

> The two-year colleges are easily the most diverse of all colleges in the country. Not only are they distinctive as compared to one another, but they also pride themselves in encouraging diversity of programs within each college. The result is a spectrum of institutions in which colleges with narrowly defined technical or vocational are at one end and multi-unit community colleges are at the other (13, 1977, p. 43).

Hilda Taba, in her book Curriculum Development, Theory, and Practice, writes about an effective strategy of curriculum change. Taba states this change strategy must proceed on a double agenda, working

simultaneously to change ideas about curricula and to change human dynamics. To achieve both the strategy of curriculum change requires a methodology, which may be summarized as follows:

1. Curriculum change required a systematic sequence of work which deals with all aspects of the curriculum ranging from goals to means.

2. A strategy for curriculum change involved creating conditions for productive work.

3. Effecting curriculum change involved a large amount of training. New skills need to be learned, new cognitive perspective must be acquired, new modes of thinking need to be initiated.

4. Change always involved human and emotional factors. To change thinking about curriculum one also needs to change people's attitudes toward what is significant and perceptions about role, purposes, and motivation.

5. Since curriculum development is extremely complex, it required many kinds of competencies in different combinations at different points of work. These competencies need to be organized into effective working teams so that all resources are made available.

6. Managing curriculum change required skilled leadership. It also requires distributed leadership (85, 1962, p. 85).

James W. Reynolds pointed out that the instructional staff should hold primary responsibility for curriculum development, but to be effective in doing so, they must have:

1. Knowledge of student traits and how the individual student learns.

2. Knowledge of the subject matter with which the students will be concerned.

3. Knowledge of what constitutes efficient instruction (73, 1962, p. 35).

Reynolds further believed that the administrator-instructor relationship was the key to the success or failure of junior college curriculum development. He felt that on an administrative style continuum of democratic to authoritarian, the authoritarian style would produce mediocre curriculum due mainly to the fact that instructional staff has little to do with decision-making, they ultimately feel no professional pride in supporting or carrying out resultant programs. Conversely, at the democratic extreme, curricular resolutions are slowed due to an increased sharing of opinions and decision-making. The outcomes, however, should be more favorable except where reaching a consensus requires settling for less than the best because of compromise (73, 1969, p. 105).

Bloom's taxonomy of educational objectives was developed as an all-encompassing plan for classifying and correlating objectives which utilized three principal categories or domains.

The cognitive domain includes those objectives which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills.

The affective domain includes those objectives which describe changes in interest, attitudes, and values, and the development of appreciations and adequate adjustment.

The psychomotor domain consisted of outcomes that constitute muscular/motor skill and manipulation/neuromuscular coordination (6, 1972, p. 35).

Since the taxonomy was intended to assist various educational prac-

tioners in solving problems of curriculum and evaluation (7, 1956, p. 63), its components seem most applicable to the incorporation of the computer at the community college. All three components provided a basis for more accurately identifying curricular issues relevant to the use of the computer.

Under the cognitive domain the computer will allow us "to keep students actively engaged in learning for sustained periods, adjust teaching to the rate and learning style appropriate to the individual student, and provide a wide variety of direct problem-solving experiences through simulations and modeling" (57, 1982, p. 310).

Before computers can be used by educators, certain attitudes must be changed. Hennings states that "educators who have no previous experience with microcomputers may be wary of attempting to use one." The affective domain focuses on a change of interests, values, and attitudes toward computer use by the student, teacher, and administrator.

Once the fear of the computer is overcome, certain motor skills and neuromuscular coordination is required to use the computer. These skills, which fall under the psychomotor domain, are defined under the five categories of the psychomotor domain which are: auditory, visual, tactile, mechanism, and complex overt response (6, 1976, p. 23).

CHAPTER III

DESIGN OF THE STUDY

The purpose of this study was to develop a model to be used for the incorporation of the computer (especially the micro-computer) into the community and junior college curriculum. This study was conducted by using personal interviews through visits to selected community colleges presently utilizing the computer for instructional purposes and extensive literary research. The purpose of the visitations was to search for common facilitators and barriers to the use of the computer for instructional purposes. Common elements were identified to answer the questions of the study.

A descriptive research approach was utilized throughout the study to systematically examine curricular models with some relationship to the use of the computer in the instructional program at the community college. Curriculum models were selected which had particular relevance to the mission of the community college. Five curriculum models were selected for study with the goal of identifying one model germane to the incorporation of high technology into the curriculum at the community college.

Evolution and Current Status of Computers in Colleges

In 1963 there was a total of 400 computer systems in colleges and universities nationwide primarily in large universities, and used for research with some records processing. The number of systems, appli-

cations, and options available grew rapidly, but primarily at larger institutions. By 1970, virtually all universities and colleges with over 5,000 students had a computer center. The general tone of the literature of that era, even through the early 1970's, was that use of computers in community colleges, especially for administrative applications, was impractical (19, 1983, p. 6).

However, by 1973-74 hardware manufacturers began to target smaller colleges in their advertising and national publications for two-year colleges like The Community and Junior College Journal began to include articles such as the one by Meyer in 1973 which discussed administrative access to on-line student data at a college of 3,000 students. Authors such as Mosmann (1973) began to define areas of computing applicable to the small college. These views of the needs of the small college were still fragmented, stressing either financial or student records, rarely more.

In less than ten years, both the Epsilon 1980 survey and the results of the national survey reported in the Bender and Conrad monograph document small colleges of less than 2,000 students now utilize computers extensively, especially for information systems. Both studies found about 65 percent of these colleges have computer support for student records processing and over 80 percent have a computerized instructional program and some administrative applications.

Twenty-four percent of college and university faculty use instruction by computer. It was most common among faculty at two year colleges (34 percent) and least common among faculty at selective liberal arts colleges (18 percent) and the most research-oriented universities (17 percent) (12, 1970, p. 5). Such instruction came in two forms--computer

-assisted instruction (CAI) and computer-managed instruction (CMI).

Teaching about computers came in three forms--specialist courses, service courses, and survey courses (50, 1978, p. 49).

Specialist courses are programs for the training of computer experts--people whose job it is to work with computers.

Service courses are classes designed to teach students how to use a computer for their work in other areas, such as architecture, chemistry, and sociology.

Survey courses are classes in the genre of "computers and society," which are intended to help students gain an understanding of computers. Such courses are generally single-term classes and deal with topics such as the history, strengths, weaknesses, issues, and future of the computer.

Instruction of all three types about computers was becoming increasingly popular. Twenty-seven percent of undergraduates say they have used their campus computer facility for analyzing data or learning to program (13, 1977, p. 71).

Community colleges have a briefer history in the use of the computer--only about ten years as compared to the twenty years of experience of the largest colleges and universities. This is reflected in a lesser number of applications, in less sophisticated development, and a lesser degree of overall development of computing on campus. This can be seen in a number of studies in the literature.

Robbins, Dorn, and Skelton (76, 1976, p. 14) studied thirty different institutions and agencies using the case study method. They identified four stages of computing development typical of institutions studied--initial, basic, operational, and extended. Briefly, the Initial

stage has little or no use of knowledge of computers; the Basic stage has access to a computer but few administrative applications of knowledge. The Operational stage has computing used extensively for administrative operations and educational training, and a computer system managed by a separate center or department. In the Extended stage, the computer impacts throughout the institution, multiple service types are available, and advanced administrative information systems are in use or under development. Using the classification described, experiences of the investigators of this national study would place most community colleges in the Basic stage of development, with a large number now struggling to move from the Initial stage to Basic. As Robbins, Dorn, and Skelton found, the direction is toward the Operational stage, but only a few small two-year community colleges have yet reached this plateau.

One major aspect of computing services for small community and junior colleges was the state systems for computing that are being provided more and more frequently. Many states (including Texas, Virginia, West Virginia, Florida, Georgia, Illinois, Kentucky, North Carolina, South Carolina, in the fourteen state southern region) provide some degree of computing support to all colleges within their systems. This service ranges from rudimentary accounting systems to full access to information systems available through large state universities.

The effect of these systems on the individual institutions is interesting. Due to the lack of expertise on campus, some colleges were still at the Initial to entering Basic stage of development in their use of services though software at the Operational stage is available. In other instances, where an individual of high expertise is affiliated with a small institution, the inadequacies of state support have prevented

progress.

Curriculum Models Surveyed

Curriculum models reported in the literature appeared both in narrative form and schematic configuration. Models used in the study were limited to those with some degree of relevance to the incorporation of high technology and/or the computer into the curriculum.

Taba, cited in Chapter II, developed a basic model for curriculum design. Her model, shown in Figure 2, had certain components useful in specialized programs like computer-assisted instruction such as:

1. Learning Experiences
2. Staff Utilization
3. Curricular Scope
4. Course Sequence
5. Learning Accountability
6. Course Content (85, 1962, p. 438).

Irwin Goldstein's model was a systems approach schematic emphasizing specific instruction objectives, criteria for performance, and evaluation.

This model, shown in Figure 3, involved three phases: assessment, training and development, and evaluation. The most important aspect of the model was that it represented a total system, incorporating the important instructional processes that should be a part of a well-conceived educational and/or training program (30, 1974, p. 18).

This model had several advantages when applied to the incorporation of the computer into the curriculum. First, it provided a frame of reference for planning and evaluation. It emphasized that evaluation was an important part of the total system and not an activity undertaken only

FIGURE 2. A MODEL FOR CURRICULUM DESIGN (TABA)

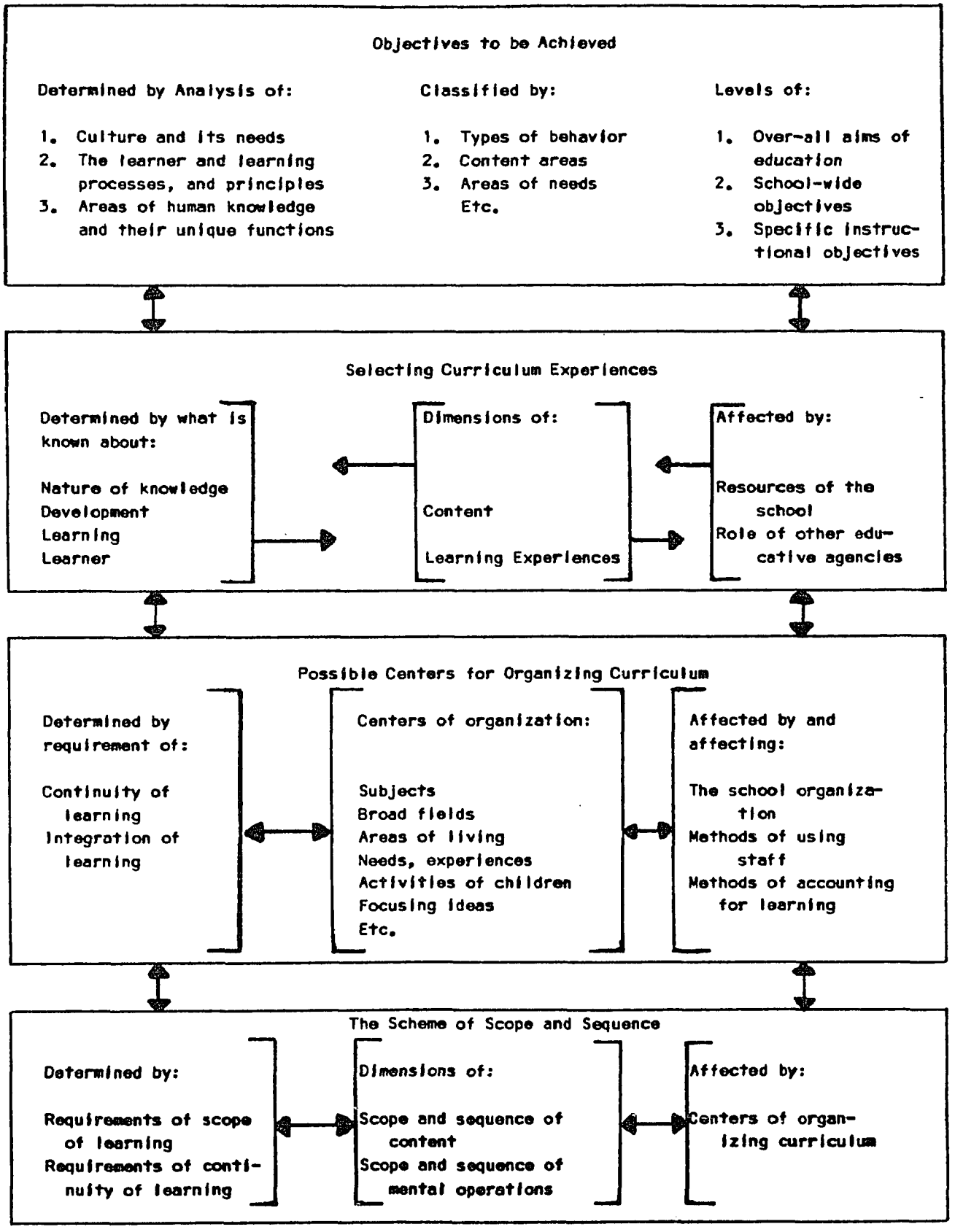
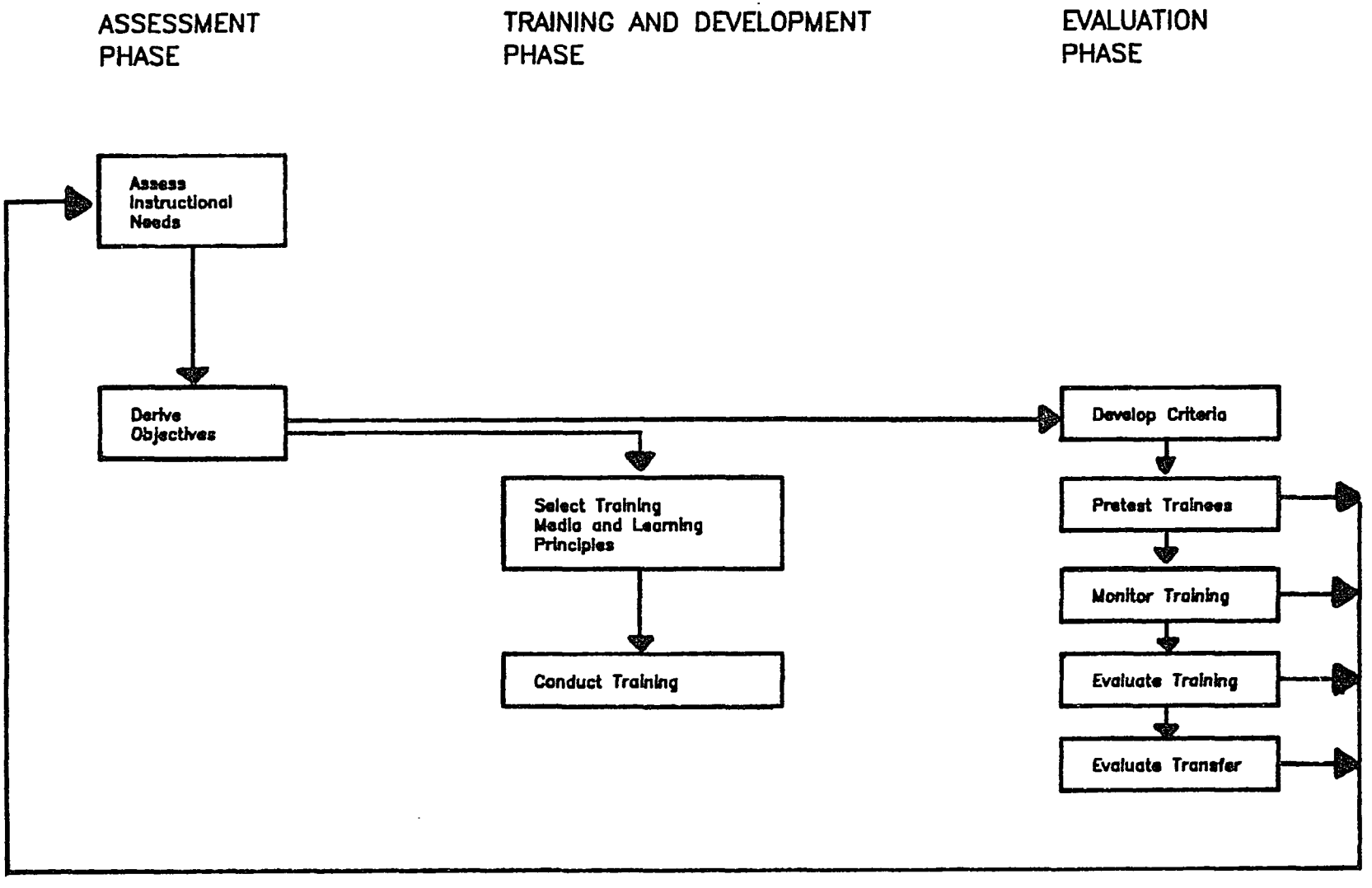


Figure 3. The Goldstein Model of an Instructional System



when something was wrong. Second, use of the model gave impetus to the establishment of education and/or training objectives and the development of evaluation procedures. It directed attention to the agreement that should exist between industry goals and overall educational objectives and added the necessary emphasis to evaluation planning. This model also represented a closed-loop system that used feedback to modify the program continually. The greatest benefit to be derived from the model's use, as far as the computer is concerned, was its flexibility. Programs were viewed as unfinished products; they could be continually modified by information indicating whether the program objectives were being met. They can be modified, in addition, to fit the different types of instructional programs utilizing the computer.

Paul Dressel identified four continua when discussing the basic elements of curriculum development. The first continuum contrasted concern for the individual student with concern for the discipline, while the second contrasted a primary concern for problems, policies, and actions ("practical" education) with a primary concern for abstraction, ideas and theories ("ivory tower" education). Highly flexible and adaptable programs are contrasted with rigid, uniformly-imposed patterns (continuum three). The fourth continuum set off programs that are compartmentalized, inconsistent, and discordant. Dressel believed that these four continua are essentially independent and implies that in each instance the second of the two extremes is more frequently descriptive of the traditional liberal arts curriculum than is the first. Non-traditional curricular designs can be described as: 1) student-oriented (first continuum), 2) problem-oriented (second continuum), 3) individualized (third continuum), and/or 4) integrated (fourth continuum).

Dressel specifically described eleven different curricular models. A "dewey-eyed" program is individualized, problem-based, and life-oriented. A "saintly" conception emphasized heritage, scholarship, and intellectual elitism. Dressel describes the "pedantic" pattern as discipline-oriented, specialized, and oriented toward the academic profession. A narrowly vocational model was skills-oriented, specialized, and job-related. Each of these four models, according to Dressel, was weak because it represented an extreme position on one or more of the four continua.

Dressel offered seven other models that are less traditional and more responsive to both ends of each continuum. The first model, entitled "outreach" encouraged the student to integrate "real life" and academic experiences through a series of off-campus, service-oriented placements. The second model ("single module plan") related to the scheduling of courses rather than the substance of an educational experience. The student concentrated on one area of study at a time rather than simultaneously taking several courses. The "theme college" was Dressel's third non-traditional model. A major social issue or problem was identified. Students and faculty relied on several disciplines and various practical experiences to work toward resolution of the issue or problem.

The remaining four models were innovative and certainly uncommon in American higher education, yet relied on accepted modes of instruction: tutorials, independent studies, workshops, and off-campus field experiences. Each student fashioned a study program that is specifically related to his/her own interests and needs. These four models provided flexibility in the scheduling of courses. Students gain increased

freedom as they progress through their college experiences. Though there were some differences between these final four models--labeled by Dressel as Individual Tutorials, Integrated, Elective, and Flexibly Rigid--they were closely interrelated and clearly represented Dressel's own personal preference for a college curriculum (4, 1981, p. 41).

William Berquist identified a list of eight curricular models that included most of the current curricular innovations in this country. These eight models, described below, are shown in graphic form in Figure 4.

1. Heritage-Based. The curriculum was primarily designed to provide students with a clear and meaningful sense of their own cultural and historical background(s), thereby providing them with the knowledge and skills to deal with current and future problems associated with this heritage.

2. Thematic-Based. A specific, pressing problem or issue of our contemporary society was identified that encompasses a wide variety of academic disciplines; an education program that will provide students with resources needed to solve and/or cope with this problem or issue is then designed.

3. Competency-Based. A set of specific competencies which a student was to acquire and/or demonstrate prior to graduation was identified; educational resources (including course work) were developed, assembled, or identified in order for the student to diagnose current levels and achieve desired levels of competence.

4. Career-Based. Programs were specifically designed to prepare students for a certain vocation, admissions to a professional training program, or a vocational decision-making process.

5. Experience-Based. On-and-off campus experiences that were in some sense educational were created or provided; the college takes some responsibility for controlling the quality of the experiences, sequencing the experiences, and relating the learnings from these experiences to principles that have been conveyed through more traditional modes (lecture, discussions, seminars).

6. Student-Based. Students were allowed a significant role in determining: a) the nature of the formal educational experiences they were to receive, b) the ways in which these experiences were to be interpreted, and c) the criteria and means by which they were to be evaluated.

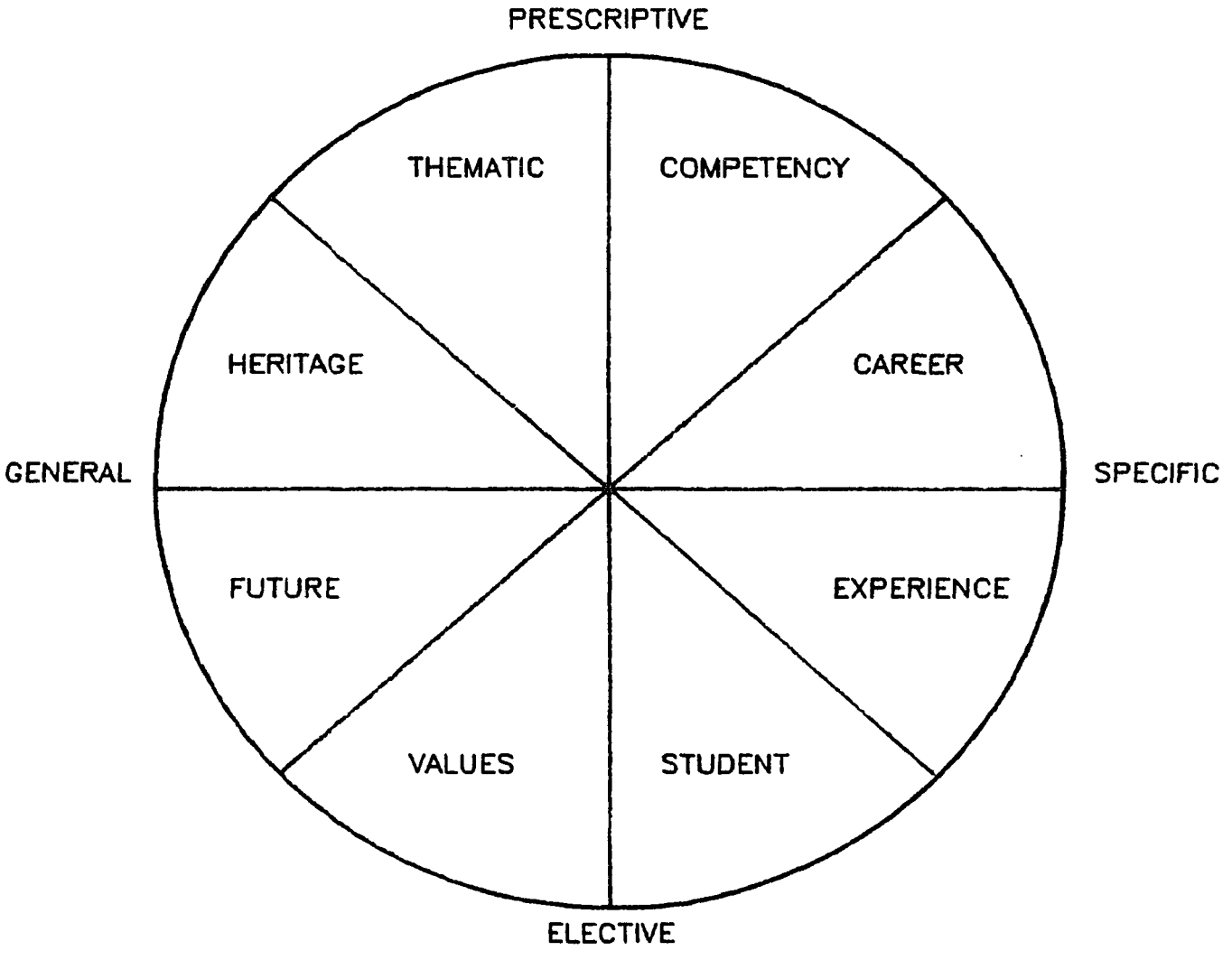
7. Values-Based. Students were provided with the educational resources and experiences to clarify or expand on their current values or to acquire new values; these values were related to current social, political, or religious issues or to the student's life and career plans.

8. Future-Based. Conditions were created for students to acquire knowledge, skills, and attitudes that were appropriate to the creation of a desirable future or that were adaptive to a predictable future society (14, 1977, p. 83).

Competency-based, Career-based, Experience-based, and possibly Student-based curricular models would seem to lend themselves to the incorporation of the computer into the curriculum.

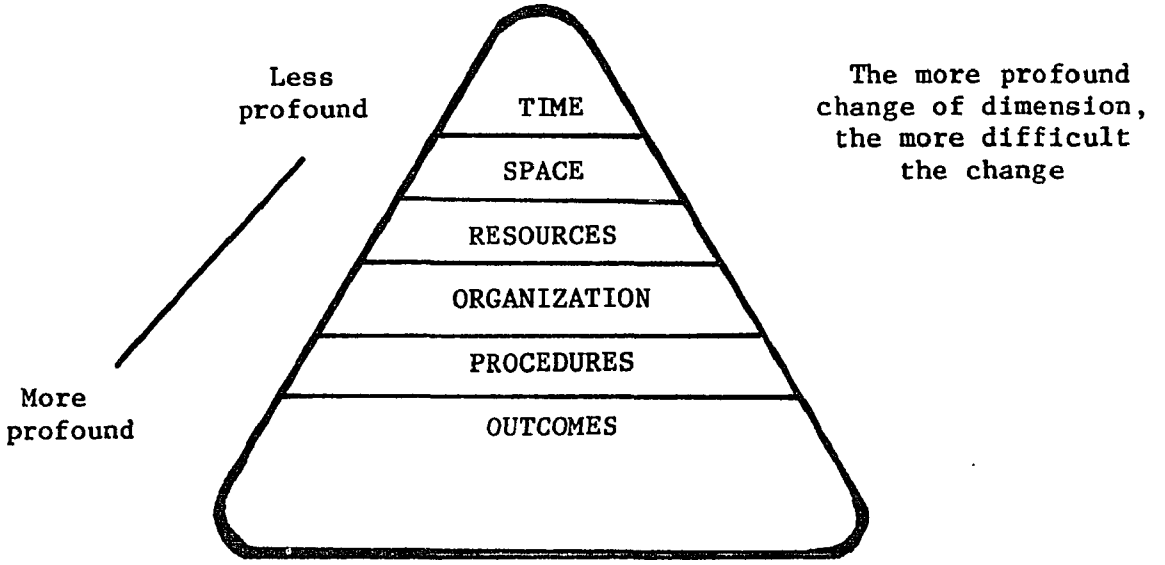
Berquist, Gold, and Greenberg in their book, Designing the Undergraduate Education, described a college curriculum in terms of a series of decisions that the college has made with reference to each of these six dimensions. Furthermore, there was a hierarchy of the six dimensions with reference to the profundity of change required when a decision is made to alter existing curricular structures within one or another dimen-

Figure 4. The Curricular Circle



sion. For example, changes in curricular time and space are less profound than changes in resources or organization, these latter changes being, in turn, less profound than changes in either procedures or outcomes. Whereas changes in time and space primarily require only structural change, changes in procedures and outcomes tend to require changes in processes and attitudes as well as structure. Furthermore, changes in the procedural or outcome dimension almost inevitably require changes in each of the other dimensions as well. Curricular changes, therefore, would be easiest to bring about, as a rule, if they involve lower-order (time, space) rather than higher-order (procedures, outcomes) (4, 1981, p. 6).

Figure 5. Hierarchy of the Six Curricular Dimensions



Henry Kalani, whose Curriculum Guide for Hospitality Education was designed specifically as a model for the development of new programs in community colleges. This model was described in the following narrative outline:

The Program Model

First: Established employment demand from high to low

Second: Selected high and medium occupational classifications

Third: Reviewed skills and knowledge of selected occupational classifications; and

Fourth: Decided on major curriculums.

Figure 6 shows Kalani's curriculum design model schematic, as specifically applied to the community colleges in Hawaii, while Figure 7 is a schematic of the model in simplified general application form (42, 1975, p. 2).

Kalani justified the design in the following:

The Core Learnings

There are certain basic skills and knowledge that a person must possess to be qualified for job placement in the hospitality industry and also to find personal satisfaction. These are the core learnings or courses important to all industry personnel:

Communication Skills
Computation Skills
Culinary Terms
Human Relations Skills
Industry Orientation
Information on Hawaii

These core learnings or courses were developed for the three degree curriculums: Cooperative Education and Hospitality Management.

The Specialized Learnings

Each occupation in the industry carries with it requirements for

certain skills needed to get the job done. It is significant that in today's job market two areas, food and beverage, and hotel and travel services command total employment in Hawaii's hospitality industry. In general, jobs in food and beverage are dining room attendants, food preparation and kitchen personnel, supervisory personnel; and in hotel and travel services they are those who work in hotels and in tour and travel. These specialized learnings or courses were developed to meet the special needs of this segment of industry's personnel:

Food and Beverage Service Skills
Food Preparation Skills
Hotel Service Skills
Travel Service Skills
Salesmanship
Business Machines
Computer Science

THE CURRICULUM DESIGN

The two sectors of learnings form the framework for the curriculum design. Within this structure, students will find their area of study, from basic to advanced, from entry-level jobs to management positions. Each major curriculum employed the same structural design.

1. Each curriculum will include selected core learnings or courses; and,
2. Each curriculum will offer training in specific skills for targeted job positions.

EXPLICATION ON SELECTION OF CORE AND SPECIALIZED COURSES

Once the curriculum design was established, the task at hand was to develop core and specialized courses that would best prepare students to enter the job market as qualified persons well able to find a place for themselves in the hospitality industry. As plotted in the curriculum design, every student, whatever curriculum he is enrolled in, will receive corresponding parallel learnings in general skills and knowledge.

In the structure of special training courses, however, attention was given primarily to particular job demand and needs.

FIGURE 6. HOSPITALITY EDUCATION CURRICULUM DESIGN (SPECIFIC)

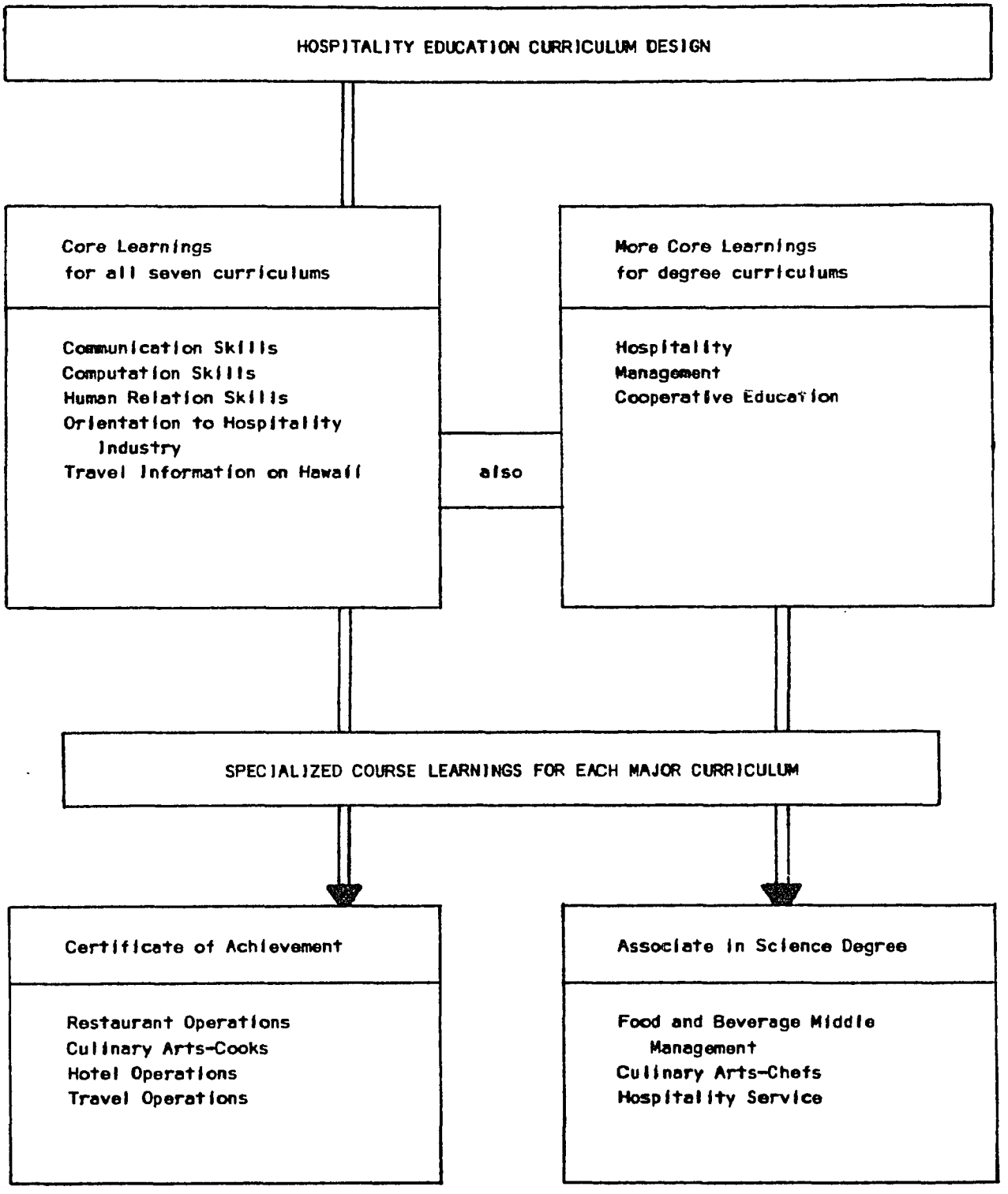
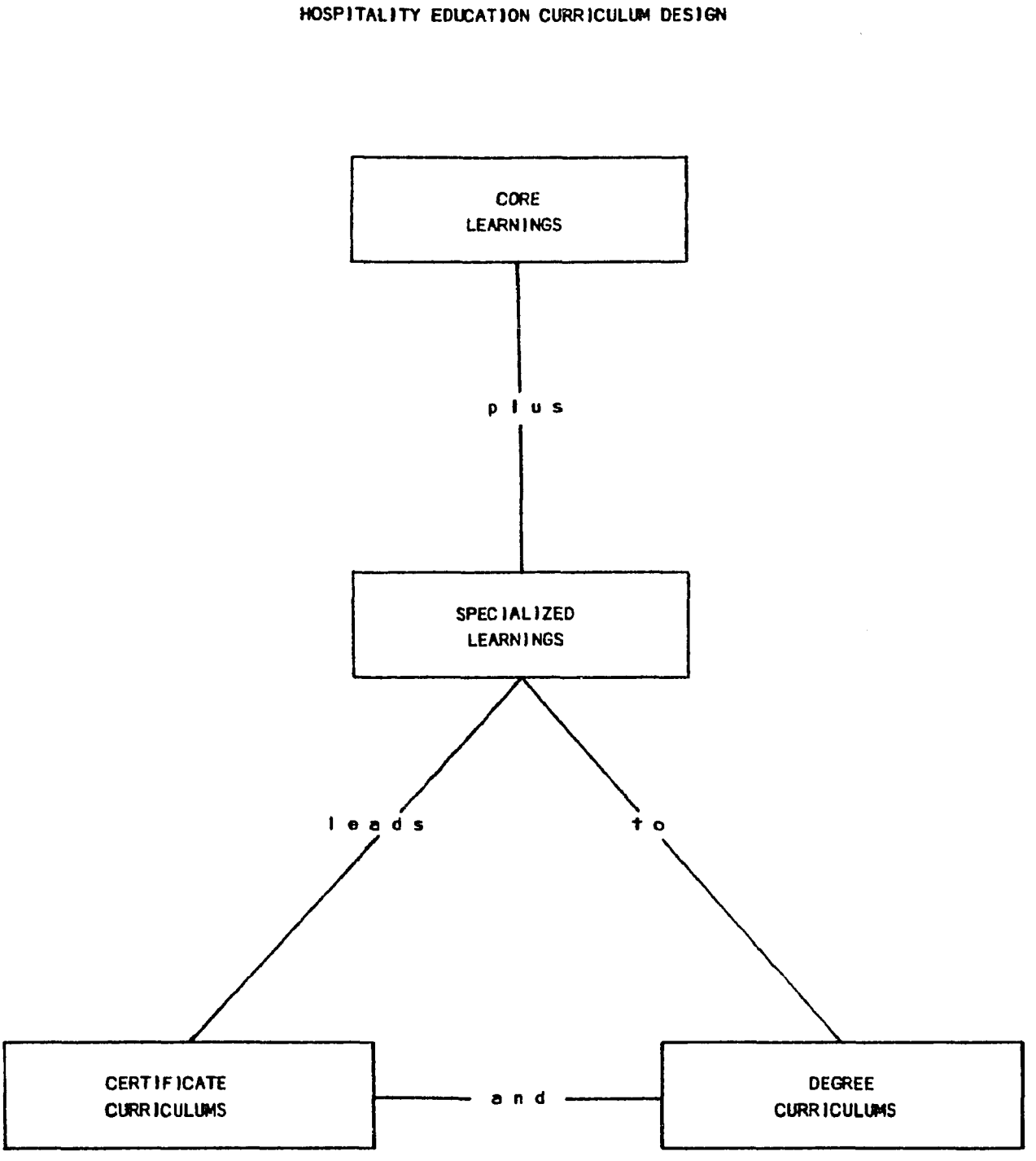


FIGURE 7. HOSPITALITY EDUCATION CURRICULUM DESIGN (GENERAL)



Current Models in Practice

Meaningful curriculum development was not likely to occur unless a significant number of faculty, administration, and external supports sense a real need to change. Yet colleges and universities have very poor sensing mechanisms when it comes to curriculum. There usually are few resources for gaining the necessary information educating those who have influence over curriculum, and conducting the development process.

Several strategies can strengthen institutional or program ability to assess curriculum development needs. One aid was activities to help leaders of various campus sub-groups learn more about educational philosophy and learning theory, then to clarify their own beliefs in concert with other colleagues. Another would be systematic data-gathering and feedback regarding the nature of students, programs, learning outcomes and related costs. A third contribution would be systematic exposure to the latest thinking and practice in college curriculum around the country, exposure for everyone who has a say over curriculum (14, 1977, p. 139).

As innovative researchers find, a first-hand look is worth a lot of pages in convincing skeptical faculty that apparently respectable faculty at other institutions may be doing curriculum differently. This was the purpose for the visits to the community colleges currently utilizing the computer for instructional purposes. The institutions visited were doing it differently and had been doing it longer than Clark County Community College.

Community colleges surveyed for the purposes of this study were:

1. Maricopa Community College District, Phoenix, Arizona (Glendale Community College)
2. San Diego Community College District, San Diego, California

(San Diego Community College)

3. Los Angeles Community College District, Los Angeles, California (Torrance Junior College)

The following questions were asked of the community college faculty and administrators which were using the micro-computer in the instructional program:

1. Name the disciplines which use the computer for instruction and place them in rank order.

2. List some of the ways the computer is used in instruction.

3. Does your district have a computer center and how is it used?

4. Name some advantages of computer-assisted instruction.

5. Name some disadvantages of computer-assisted instruction.

6. List your computing priorities for the future.

7. What is the major source of difficulty in implementing the use of the computer?

8. What are some of the problems facing the community college in establishing computer centers and computer-assisted instruction?

Visitations to Community Colleges

The colleges visited for the purpose of this study began shifting from manual to computer based instructional systems only a few years ago. School catalogs indicate courses being offered for the study of data processing, but the micro-computer was being used in many other program areas.

Figure 8

Computer-Assisted Instruction
Applied in the following disciplines (rank order)

1. Math
2. Business
3. Computer Instruction
4. Social Science
5. English
6. Physics
7. Electronics or Engineering technology

Instructional applications included:

--computer information systems or data processing curricula

--computer literacy instruction, or teaching non-majors how to use and apply the computer

--computer-assisted instruction (CAI) where the student uses the computer to learn other subjects

--computer-managed instruction (CMI) where the instructor uses the computer to assist with material preparation and/or records

--word processing instruction, which might also be considered a form of CAI.

Computer services to support any or all of these areas would be considered instructional by the colleges.

The colleges indicated that their computer centers utilize on an average of 35 percent of their time for various instructional applications.

In all cases, the college district had a computer center with a smaller facility located at each campus. Each campus had a micro-computer lab for student and faculty use. All colleges used the district-wide computer system for both administrative and instructional purposes.

The faculty members interviewed at each of the colleges were asked

their opinion of computer-assisted instruction as utilized at their institutions. A consensus of their responses are listed below:

Advantages of computer-assisted instruction:

1. they felt that students learn at least as well using computer-assisted instruction as any other method of learning,

2. students performed better using computer-assisted instruction alone rather than by combining it with traditional methods,

3. most of the faculty interviewed felt that learning by computer-assisted instruction is faster than other methods,

4. computer-assisted instruction seems to reduce student attrition,

5. students study at their own pace with very little sense of relative standards of speed or slowness,

6. students receive more personal attention and instructional content time than in a traditional classroom,

7. student reaction has been good to enthusiastic,

8. fewer students perform unsatisfactorily at completion of a course,

9. in general, students who have not responded well to traditional instruction react positively to computer-assisted instruction,

10. the cost of computer-assisted instruction for the district is dropping quickly,

11. computers do not scold or embarrass students in public or show personal biases or prejudices.

Disadvantages of computer-assisted instruction:

1. It is a new method of instruction about which little is known; furthermore many are ignorant about what is known,

2. it can be impersonal,

3. student excitement associated with it may be short-lived,

4. it is generally expensive,

5. currently prepared programs cannot be readily shared because of the wide variety of computer languages in use,

6. faculty have frequently resisted it.

These opinions seem to respond closely with the literature, especially the writing of Arthur Levine in his 1978 book, Handbook on Undergraduate Curriculum.

Although instructional support is important to these community and junior college districts, they listed their computing priorities in the following order:

Figure 9
Computing Priorities

Priority	Applications
1	Student Information Systems
2	Instruction in Computer Information Systems or Data Processing
3	Financial Information Systems
4	Other Administrative Support Systems
5	Instructional Support, including Computer-Assisted Instruction and Computer-Managed Instruction
6	Library Information Systems

Although the interviews and reported results were non-scientific, they pointed out some important data regarding computer use at these community colleges.

Personnel problems were identified as the major source of difficulty

in implementing either management information systems or computerized instructional systems. These personnel problems in computing were classified as problems with personnel already at the college, problems with new data processing personnel, and problems with communications between the two groups.

One of the most basic problems identified were problems involving personnel already at the college who resisted the change. Resistance to change has a long history from Luddites who destroyed labor-saving textile machines to those who thought the automobile would never last; resistance to computing technology is only one of the most recent. Resistance to change seems to be an emotional attitude accompanied by fear and uncertainty--fear of loss of status because new skills must be learned and uncertainty of ones ability to master the new skills--these feelings cannot be overcome by logic nor debate. An administrator at Glendale Community College spoke of these feelings and stated that they required a sophisticated plan of action that combines knowledge of both the human and organizational factors. He indicated that the data processing personnel are the 'change agents' in this process trained to proceed logically but perhaps lacking human understanding. The systems analysts often find the slowness of acceptance or lack of cooperation by faculty frustrating and tend to return to their own department, thereby reducing communication. This perception is consistent with the research of Couger and associates (20, 1979, p. 3) who assessed university computer managers as high in a factor known as 'growth need strength' but in 'social need' (the need to interact with others).

Problems of the same type arose between faculty and computer specialists when introducing computers into the classroom. The faculty view

themselves and their world from the perspective of an educational system which has changed very little in centuries, where the techniques used and wisdom of teachers that lived over 2,000 years ago are still valued for what they can offer today. The computer specialists, however, view themselves and their world from the perspective of computing technology which spans only twenty-five years. Almost total change every few years is a way of life to the computer specialist (19, 1983, p. 16).

Between such different groups, reflecting the systems in which they developed and the personality traits that drew them to those separate systems, the resulting communications problems are no surprise. However, community college administrators and faculty who were interviewed, indicated a high degree of communication between the user (faculty member and student) and the implementer of information systems and between faculty member and computer specialist is essential for successful systems.

Administrators interviewed also reported on a variety of problems facing the community college in establishing computer centers and computer-assisted instructional systems. They were as follows:

1. Obtaining and then keeping qualified technical personnel,

2. Financing computer acquisitions,

3. An 'information glut' which can arise which makes acceptance and use of an information system by management more difficult.

Shortly after Dr. Paul Elsner became Chancellor of the Maricopa County Community College District in Phoenix, Arizona, he wrote a paper raising current social and educational issues which indicated directions for change within the District. One of these changes was the incorporation of the computer into the instructional system. He created the Joint Council for Educational Planning (JCEP) whose membership is broadly

representative of administration and faculty throughout the District. The JCEP recommended that occupational education be a top priority for planning in the District. The first report stated a tentative goal for program development in occupations to meet market demands. Of top priority were programs using the computer both for data processing curriculum and for computer-assisted instruction in other areas. A Labor Market Review of the Phoenix area undertaken by the city indicated that jobs can be found in electronics, computer specialists, programmers, systems analysts, clerical, word processing and service occupations. Based on the job market in the Phoenix area, the district established capital equipment priorities for the 1983-84 school year. These priorities can be found in Figure 10.

In order to facilitate program development, the District created a College Task Force and a District Task Force with the responsibilities of program assessment and master planning, respectively.

The planning model selected by the Task Force incorporates directions for change from the environment and from assessment of current offerings. It linked planning to the setting of priorities and the allocation of resources. It provided for staff and program development based on human and fiscal resources within a five-year time frame. Completing the cycle are implementation and evaluation. Figure 11 is a representation of the Maricopa Cycle Plan for Educational Development.

The purpose of the District Master Plan was to provide an overall point of view, a District-wide consensus and a direction which can be readily understood. The plan charts the development of occupational education in Maricopa Community Colleges over a given period of time.

The Master Plan was also a tool for decision-making, for allocating

scarce resources and for articulating to the public what are the aims and goals of occupational education in the Maricopa Community College District (64, 1981, p. 33).

MARICOPA COMMUNITY COLLEGE DISTRICT

REVISED ESTIMATES OF CAPITAL NEED

Figure 10

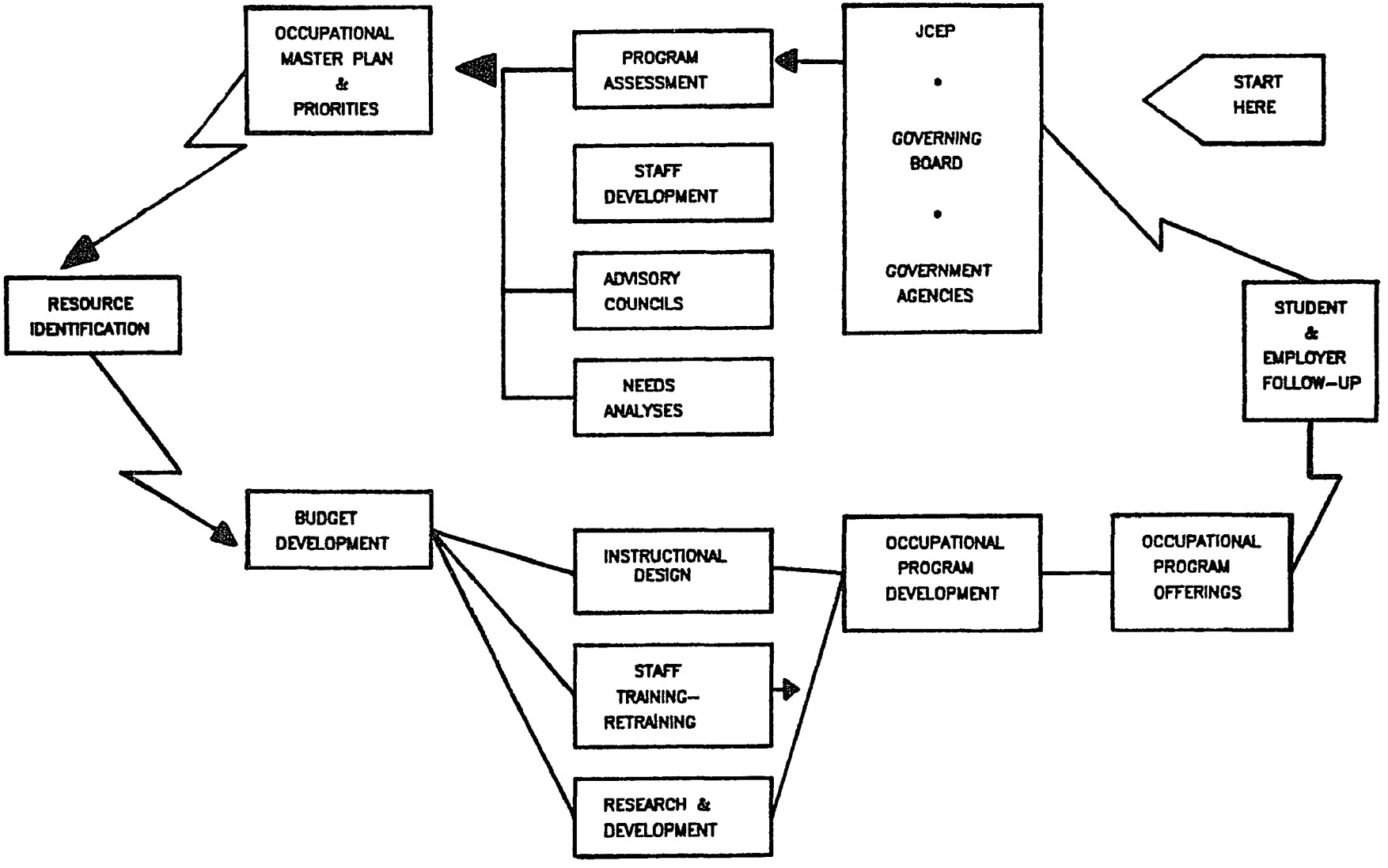
Occupational Program Capital Equipment Priorities 1983-84

College & Program		Amount
GCC	1-Automotives	$80,000
	2-Electronics	75,000
	3-Data Processing	60,000
	4-Drafting-Mechanical	70,000
	5-Word Processing	30,000
	6-Welding	30,000
	7-Construction Drafting	25,000
	8-Industrial Television	25,000
College Subtotal		$395,000
MTC	1-Office Education/Data Processing	43,200
	2-Electronics	18,000
	3-Radiation Tech/Resp Care	29,000
	4-Welding	7,000
	5-Solar/AC/Refrigeration	16,000
	6-Service Coordinator	12,500
	7-Advertising Art	5,000
	8-Diesel Mechanics	4,000
College Subtotal		$134,700
RSCC	1-Electronics	256,000
	2-Apprentice Programs	35,000
	3-Management	115,500
	4-General Business	45,000
	5-Office Education	40,000
	6-Machinist	30,000
College Subtotal		$521,500
SMCC	1-Drafting	70,000
	2-Office Education	37,500
	3-Business	25,000
	4-Nursing	5,000
College Subtotal		$137,500
College Totals		$2,004,710

College & Program		Amount
PC	1-Electronics	$46,000
	2-Data Processing	51,500
	3-Emergency Medical Tech	20,000
	4-Word Processing	10,000
	5-Medical Lab Tech	8,950
	6-Drafting/Machine Shop	9,200
	7-Dental Hygiene	6,410
	8-Nursing	2,100
College Subtotal		$154,160
MCC	1-Data Processing	30,000
	2-Automotives	25,000
	3-Electronics	24,000
	4-Word Processing	30,000
	5-Machinist	30,000
	6-Agriculture	48,000
	7-Welding	11,850
	8-Drafting	50,000
College Subtotal		$248,850
SCC	1-Electronics	150,000
	2-Bus/Office Education	65,000
	3-Commercial Photography	30,000
	4-Hospitality/Management	50,000
	5-Nursing	10,000
	6-Data Processing	60,000
	7-Equine Science	28,000
	8-Tribal Management	20,000
College Subtotal		$413,000

MARICOPA COMMUNITY COLLEGE DISTRICT

FIGURE 11 -- CYCLE PLAN FOR EDUCATIONAL DEVELOPMENT



Chapter Summary

This chapter identified the research approach, surveyed various curriculum models, and reported on the community college visitations.

Figure 12 identifies the common elements from both theory and practice. These elements were utilized in the development of the model for the incorporation of the micro-computer.

Figure 12 - COMMON ELEMENTS IDENTIFIED FROM THEORY AND PRACTICE

(in order)

1. Develop a plan and establish priorities
2. Assess program modes
3. Train and retrain staff
4. Develop criteria
5. Design instruction
6. Continually modify
7. Evaluate

The curriculum models surveyed provided several components which were used in selecting the components for the final model including:

1. The Taba model contained methods for selecting curricular experiences and organizing curriculum.

2. The Goldstein model contained three phases: assessment, training and development, and evaluation. This model also viewed programs as unfinished products; they could be continually modified.

3. The Dressel model which is in reality eleven different curricular models, contained a vocational model which was skill-oriented, specialized and job-related. This model, combined with non-traditional curricular designs such as problem-oriented and individualized, could be

integrated to design a model for computerized instruction.

4. The Berquist model was a list of eight curricular models that includes most of the current curricular innovations in this country. Three of these models, career-based, competency-based, and future-based, could be combined for the development of a computerized instructional model.

5. The Kalani model was designed specifically as a model for the development of new programs and combined core learnings with specialized learnings for specific jobs. The goal was to prepare students to enter the job market as qualified persons.

None of the five models surveyed contained the exact components for the development of a curricular model for the incorporation of the computer into the instructional program. As a result, components were selected from Goldstein, Berquist, and Kalani for the development of the new curricular model.

CHAPTER IV

COMPUTER CURRICULAR MODEL

Background

American colleges have never claimed to teach everything that could be known. The early colleges sought only to provide the tools of learning--logic, mathematical skills, languages that cultivated a facility in communication and disciplined thought and reason; and a familiarity with the elementary facts, major ideas, and basic principles that could be drawn from what was known about man and nature. The need to master a subject for its own sake was not recognized, except in professional schools, until well into the nineteenth century (13, 1977, p. 2).

During the past 341 years, colleges have extended their reach to include increasing numbers of students and to cover a rapidly expanding knowledge base. There has also been experimentation with new structures and procedures to accommodate new functions and the new interests, goals, and abilities of students. Not all of these efforts are compatible with one another, and there has been no attempt to integrate them into any single type of undergraduate curriculum. Instead, a diverse effort has emerged that involves many kinds of institutions and many programs within institutions.

This diversity has advantages. It enabled many colleges to accommodate heterogeneous student bodies and serve a broader, more diversified portion of society. It enabled colleges and universities to pursue self-determined missions and to conduct themselves in accordance with self-

determined philosophies.

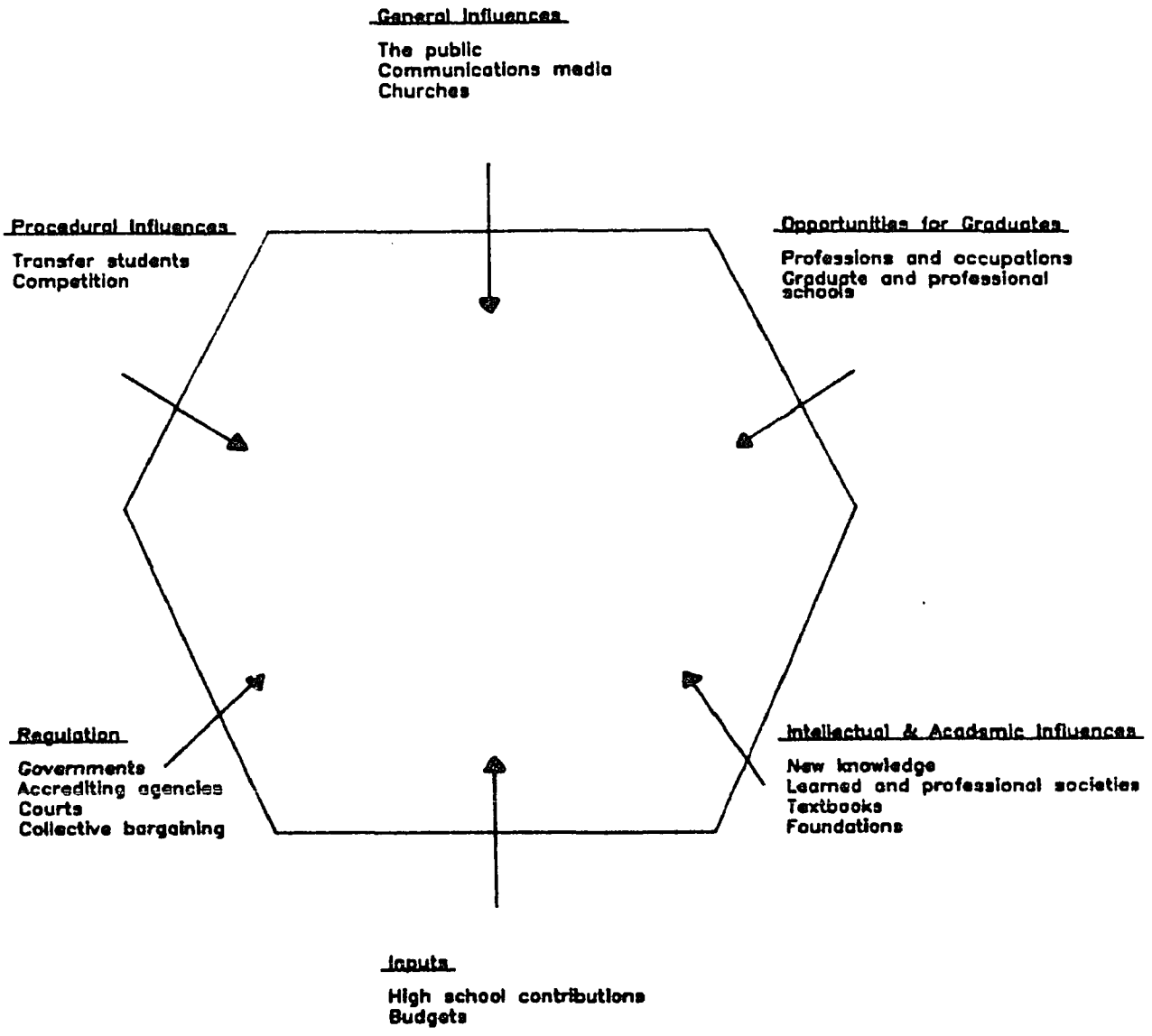
But such diversity also has shortcomings. It obscured the question of whether or not there should be some common characteristics of the education all colleges offer to their students. It also leaves colleges without generally recognized reference points in the quest for quality. Under such conditions, the undergraduate curriculum becomes governed mostly by market forces. What is offered is what is desired--or can be sold.

External Forces that Shape the Curriculum

Colleges have enormous potential for altering people's lives and contributing to changes in our society, so they are the concerns of many externally based public and private interests. (Figure 13). Some of these interests are more obvious and important than others, but most of them can make a difference in the scope and kind of education that college students receive. (13, 1977, p. 65)

Of the six external forces that influence the college curriculum, professions and occupations and new knowledge probably have had the greatest effect on the influx of the computer into the curriculum. During the current decade, the American people have assigned particularly high priority to career preparation as a function of higher education. Their concern is generated in large part by the disappointment of many young men and women whose college educations failed in recent years to give them entry to the level of jobs that might have been readily open to them a decade ago. This situation followed two decades marked by expansion in national research and development activities, including the rapid development of the computer and aerospace industries. Students respond to these developments by seeking out courses that specifically prepare

Figure 13. External Influences on the College Curriculum



them for the new situations that develop.

The second most critical force that has resulted in the way the computer was utilized in higher education is new knowledge. Totally beyond the control of the colleges was the growth of knowledge itself. In the seventeenth and eighteenth centuries, when our colleges were beginning, both the presumed limits of human understanding and the methods of acquiring knowledge of humans and their world were being redefined. The time was over when informed men could believe that anything it was possible to know was already revealed and available through the work of recognized authorities.

Currently, powerful tools have been developed to improve our vision, our memories, our communication, and our abilities to process information rapidly. The result has been a spiraling rate of knowledge growth.

For the colleges, the growth of knowledge presented difficult administrative and planning problems. The capacity of faculty members to keep up with developments was severely taxed, and there are limits to any college's ability to maintain a faculty that was even superficially representative of all of the important academic disciplines and subfields. In the final analysis, such practical considerations may determine the most important dimension of the curriculum--its scope at any college.

Internal Influences on the Curriculum

Although many external factors influence the undergraduate curriculum, it continues to be shaped in its specifics mostly by internal forces (13, 1977, p. 29). The basic responsibility for deciding what particular subjects will be taught, what instructional format will be used, how long the instruction in a subject will take, and whether it will be offered at an introductory or advanced level belongs to faculty

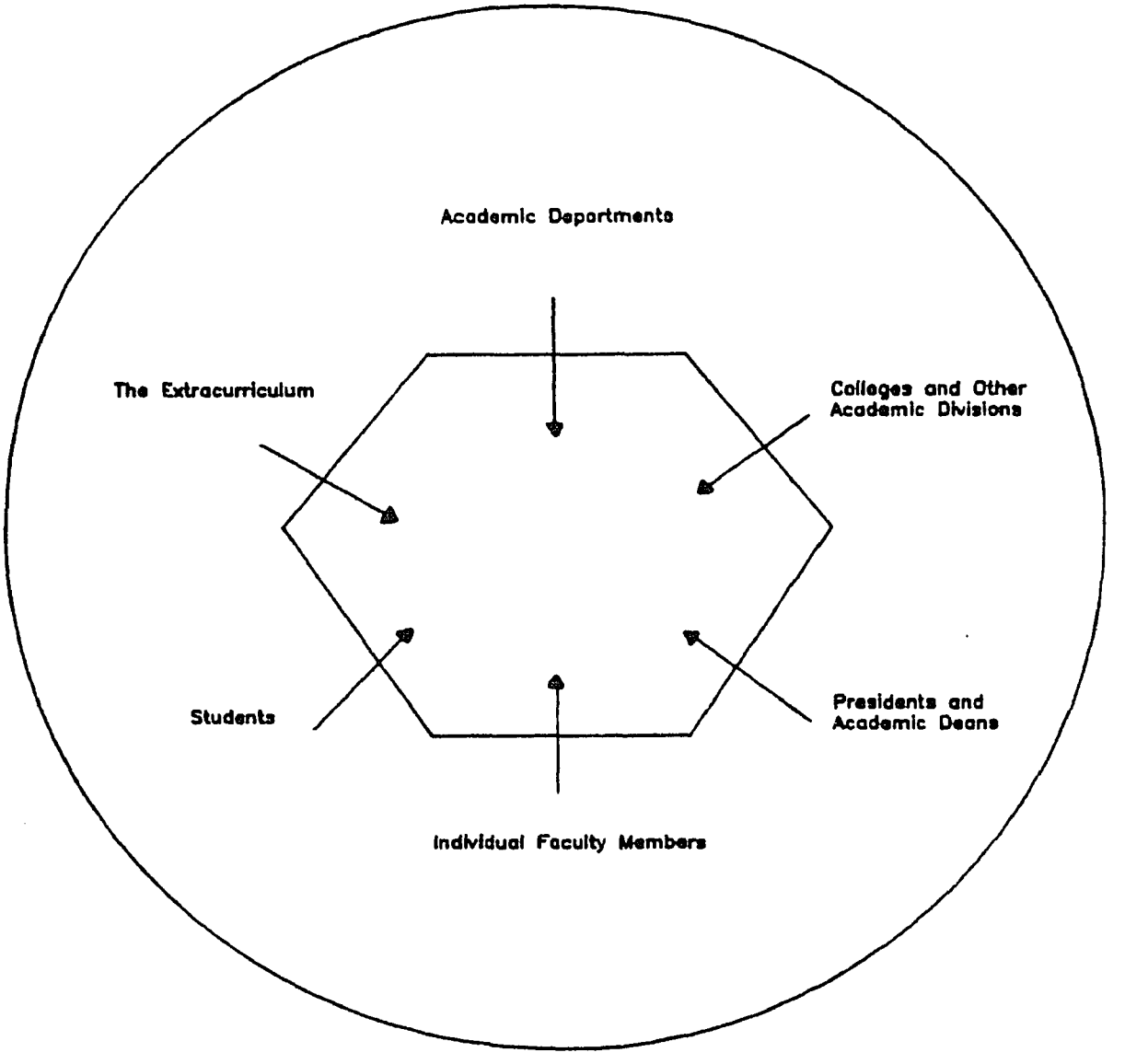
members, students, and others on the campuses who have professional interests in the intellectual and personal development of undergraduates. (Figure 14).

Martin Trow (89, 1976, p. 11; and in McHenry, 1977, p. 13) describes the academic department as the "central link between the university and the disciplines . . . between an organized body of learning--a body of knowledge and characteristic ways of extending knowledge--and the institution in which teaching and learning are carried on." In most community colleges, the departments are the basic units of curricular administration and give particular attention to the design of sequences of courses for majors, to the development of courses and programs that meet college-wide graduation requirements and to organizing programs.

Colleges should periodically review and evaluate the scope and quality of departmental programs in the context of both their own institutional missions and the department's educational objectives. To administer such programs fairly, the college must, in advance, develop and announce the criteria to be utilized. Adequate use of resources may be measured, for example, by such indicators as instructional costs per student, enrollments and student retention, and the extent to which departmental programs contribute to the outcomes implicit in the institution's mission and the departments' own objectives.

Presidents do not always play a strong role in curriculum planning or policy making, but they are in a position to do much more. They can, for example, arouse interest in the curriculum throughout the institution, encourage departmental participation designed to improve general education and impart skills to part-time students; and offset pressures on the curriculum from organized faculty, students, and departments

Figure 14. Internal Influences on the Curriculum



seeking special advantages.

Governing boards typically regarded curriculum matters as a domain that belongs to professional educators. They were slow to initiate curriculum changes on their own. They should maintain an interest in the curriculum at all times and should be prepared to support presidents and other principal academic officers in any initiative designed to overcome deficiencies that were not adequately dealt with in the routine channels of academic administration and policy making.

The two-year community colleges are easily the most diverse of all colleges in the country. Not only are they distinctive as compared to one another, but they also pride themselves in encouraging diversity of programs within each college. The result is a spectrum of institutions in which colleges with narrowly defined technical or vocational programs are at one end and multi-unit community colleges are at the other. In between are colleges with basic transfer curriculum and variations of structure and offerings that move in both directions along the spectrum. In addition, there are two-year branch campuses of colleges and universities, proprietary institutions that have similar missions, and other specialized institutions, such as the Community College of the Air Force.

The curricula of these colleges were basically related to their training functions and the degrees and certificates they award, but an increasing focus of comprehensive two-year colleges on community services and human-development activities has produced programs that often go far beyond those defined by their degree and certificate programs.

CURRICULAR MODELS

The Goldstein, Berquist, and Kalani models, as described in Chapter III, need to be examined more closely to discover common elements from

the three models.

Futures-Based Curricula - Berquist

Most college catalogs at some point state that the institution is firmly committed to preparing students for the future. Furthermore, most college administrators and faculty members would readily agree that a college education should prepare a student for conditions and problems of the future, rather than those that exist in the present. Since the computer is the wave of the future, this curricular model must include the computer.

What would an effective curricular reform look like if it were to be responsive to some images of the future? First of all, such a curriculum cannot itself solve the problems of the future. An institution that wishes to be future-responsive can only provide training in the skills that will be needed by a student who will live in that particular future. Second, the curriculum must be comprehensive with respect to a specific image of the future. It should neither be too specialized, nor too diffuse. Thirdly, a future-responsive curriculum, like all curricular reforms, must be based on sound rationale that integrates the specific image of the future that the institution wishes to embrace, the unique and specific mission and goals of the institution, and the educational needs of the clientele being served by the institution. Furthermore, the curricular design must clearly and consistently reflect the rationale that has been established. The reform must be derived from and disseminated through campus governance mechanisms that adequately incorporate input from all constituents that will be effected by the reform.

Such a program would probably involve one or two years of work by a curricular planning group that would attempt to identify or create its

own unique image of the future. In a recent study of curricular programs at many colleges and universities in the United States, very few could be found that could be called "future-responsive," though a number of isolated, future-oriented courses can be found. As a result, it is difficult to utilize the Berquist model as a basis for the incorporation of the computer into the curriculum. Some similarities can be found between Berquist and Goldstein in their approach to curricular reform.

Berquist also says that:

> "Viable models of curriculum development make allowance for answers to at least the following questions:
>
> 1. Why am I teaching this?
> 2. Why am I teaching this in this particular way?
> 3. How should I organize the content of my courses?
> 4. What technology is appropriate?
> 5. What do I expect students to be able to do, or to know, or to believe as a result of my course?
> 6. How do I know how successful I have been?" (4, 1981, p. 77)

This is similar in concept to the Goldstein Model.

The Goldstein Model of an Instructional System

Irwin Goldstein's model was a systems approach schematic emphasizing specific instructional objectives, controlled learning experiences to achieve the objectives, criteria for performance, and evaluation. This model involved three phases: assessment, training and development, and evaluation. The most important aspect of the model, in relation to the incorporation of the computer, was that it represented a total system, incorporating the important instructional processes that should be part of a well-conceived educational and/or training program.

The Goldstein model begins with an assessment of instructional needs, determining objectives, selecting training media and learning principles, conducting training, developing criteria for evaluation, pretesting trainees, monitoring training, and evaluating training and

transfer. Programs were viewed as unfinished products and could be continually modified by information indicating whether the program objectives were being met.

Goldstein's model seemed to lend itself to the introduction of the computer. Each department must assess its instructional needs to determine if the computer should be used, develop the program objectives and then select the proper software. While the training was conducted, criteria for evaluation must be developed and the instructional use of the computer must be closely monitored. Training with the computer must be evaluated and continuing use of the computer must be determined. The most significant part of this model is the assessment of instructional needs.

Curriculum Guide for Hospitality Education - Kalani

Kalani's model, in the simplified general application form, was closely related to Goldstein's model. Kalani's model was originally designed for hospitality education so his curriculum schematic is designed for that specific program area. But his general design, which can be used by any program in a vocational or skill area, could be adapted to the introduction of the computer in any curricular area. Kalani's design begins with a set of core learnings which are defined as a set of certain basic skills and knowledge that a person must possess to be qualified for job placement in any industry. From the core learnings we proceed to specialized learnings which are the specific requirements for certain skills to get the job done. The use of the computer could assist the student in obtaining these skills whether basic or specialized. These core and specialized learnings lead to certificate curriculums and degree curriculums. The utilization of the computer would assist the student in

obtaining his goal--which might be job placement and/or a degree.

Curricular Model for the Incorporation of the Micro-Computer

The Goldstein model was used as a basis for the incorporation of the computer into the curriculum at the community college. (Figure 15). Common elements from other curricular models examined in Chapters III and IV will be utilized as well.

Through an extensive review of the literature, it appeared that the majority of the community colleges that introduce the computer into the curriculum begin with computer-managed instruction which was defined as the method by which the computer keeps records, collates, and diagnoses results performed away from the computer and prescribes additional study assignments, which require less computer-related equipment and computer time. The student did not directly interact with the computer. In computer-assisted instruction, the student interacted with the computer. CAI required more equipment and computer time.

Assessment Phase

Step 1 - Assess Instructional Needs

An assessment of instructional needs must include:

1. The development of needs that comply with the mission and goals of the institution.

2. Examination of the instructional needs of the clientele.

3. Formulation of a curriculum committee composed of a representative group of faculty, administrators, and students. Input from constituents is a key consideration.

4. Consideration of the budget and whether money is available for purchase of the micro-computers and the necessary software.

5. Consideration of the capabilities of the physical plant to house

a computer facility.

Step 2 - Derive Objectives

A Computer-Based Instructional System or a Computer-Assisted Instructional System must include the following objectives:

1. To enhance and extend program and course offerings both on and off campus.

2. To design a system that would be compatible and complementary with other facets of the college.

3. To improve instructional experiences for students.

4. To use the computer as an alternate mode of delivery.

5. To provide tools for educational analysis.

6. To provide staff development for faculty in the use and development of CMI and CAI.

7. To achieve computer literacy among staff and students.

8. To design a system characterized by quality, efficiency, consistency, and transportability.

9. To recommend subsequent areas of study.

Training and Development Phase

Step 1 - Select Training Media and Learning Principles

Selection of training media must include:

1. The selection of all materials and equipment for purchase should be based on predetermined specifications formulated by media staff, with input from the instructional staff.

2. Examination of hardware to select the micro-computer which would best suit the instructional needs of the college and fit into the budget. This would include consultation with other community colleges with CAI and with vendors.

3. Selection of software by each instructional area to meet the needs of the students and faculty.

Selection of learning principles must include:

1. Learning principles must be identified for each instructional area.

2. Learning principles must be described using Bloom's taxonomy as affective, cognitive, or psychomotor as defined in Chapter II.

3. Learning outcomes must be defined for each instructional area which will utilize the computer.

4. Learning principles must correspond to the objectives previously outlined.

Step 2 - Conduct Training

1. Faculty and administration must be constantly involved in the monitoring of student progress.

2. Vendors must be involved in the training of faculty and staff and the monitoring of the equipment.

3. Faculty must be available to assist students so that the personal touch remains.

4. Training must allow the computer to replicate the excellent teacher and provide accurate information for student feedback.

5. Continuing training for all instructional staff members.

6. Opportunities and incentives for training are needed to encourage faculty.

Evaluation Phase

Step 1 - Develop Criteria

1. The development of evaluation criteria must be ongoing.

2. Criteria must be developed for each instructional area.

3. Students must be involved in the evaluation process.

4. Faculty must be involved in the evaluation of software and equipment as well as the evaluation of student progress.

Step 2 - Pretest Trainees

This phase of Goldstein's model may or may not be desirable for computer-assisted instruction. It would depend on the program area and the learning goals that have been outlined. Faculty would have to determine the use of a pretest and post-test for students. Results would determine student placement in the instructional program area.

Step 3 - Monitoring Training

The monitoring of training would have to include:

1. Instructional materials be such that students can learn from them without constant help from an instructor and can make steady progress in the mastery of defined learning outcomes.

2. Conditions which permit each student to progress through a learning sequence at a pace determined by his/her own work habits and by his/her ability to master the designated instructional objectives.

3. Provisions for having the student actually carry out and practice the behavior which he/she is to learn.

4. Provisions for having the student receive immediate feedback concerning the correctness of their efforts in attempting to approximate a desired behavior.

Step 4 - Evaluate Training

The evaluation process would include:

1. Evaluation based on the original learning outcomes and objectives.

2. Evaluation that would include the judging of an instructional

sequence based on its effectiveness in producing changes in students, and feedback concerning student performance.

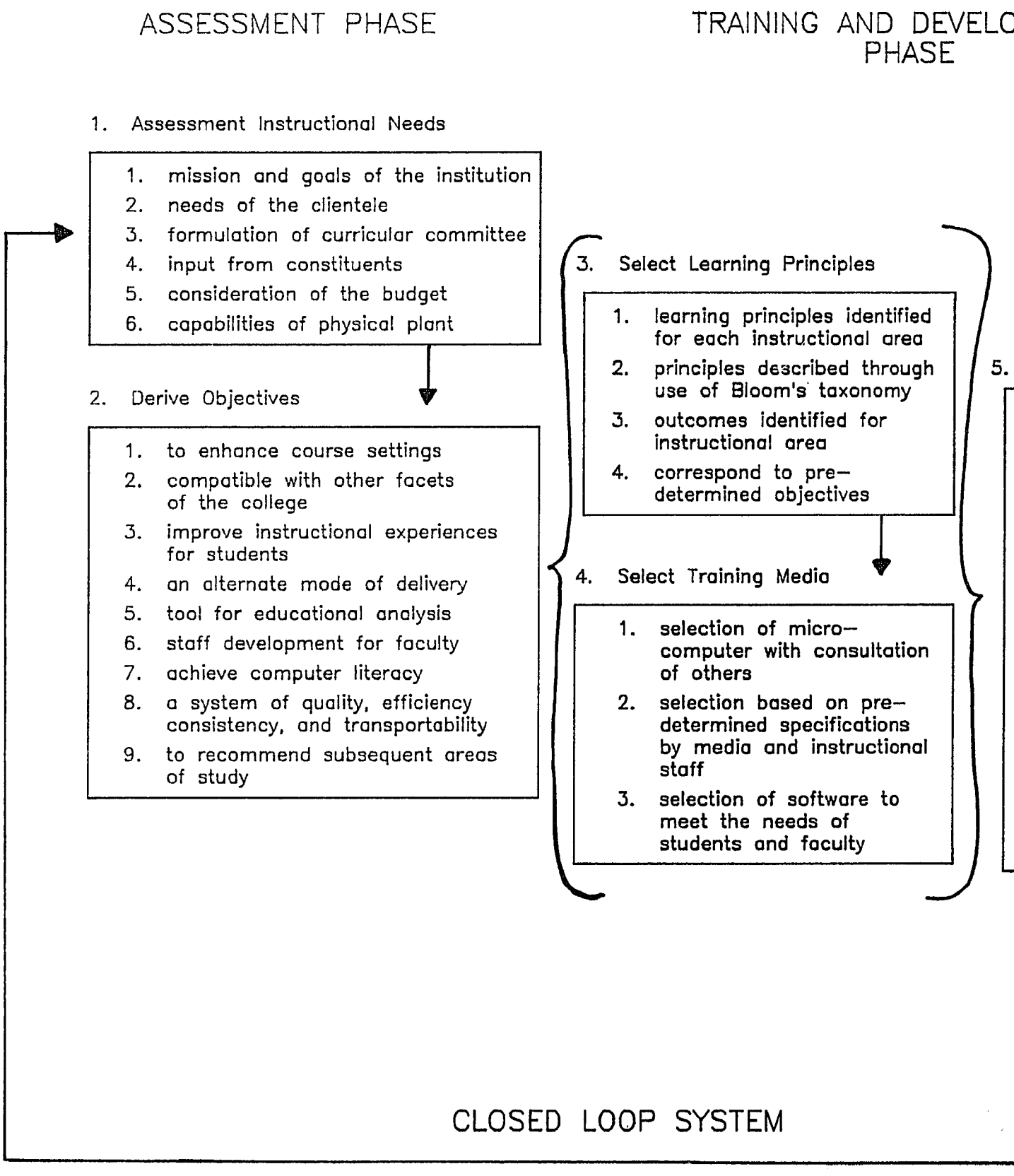
3. Feedback from student performance should be used in the continued modification and improvement of materials and procedures.

4. Follow-up studies which would compare the test results of students who learned with the computer and students who learned by the traditional method.

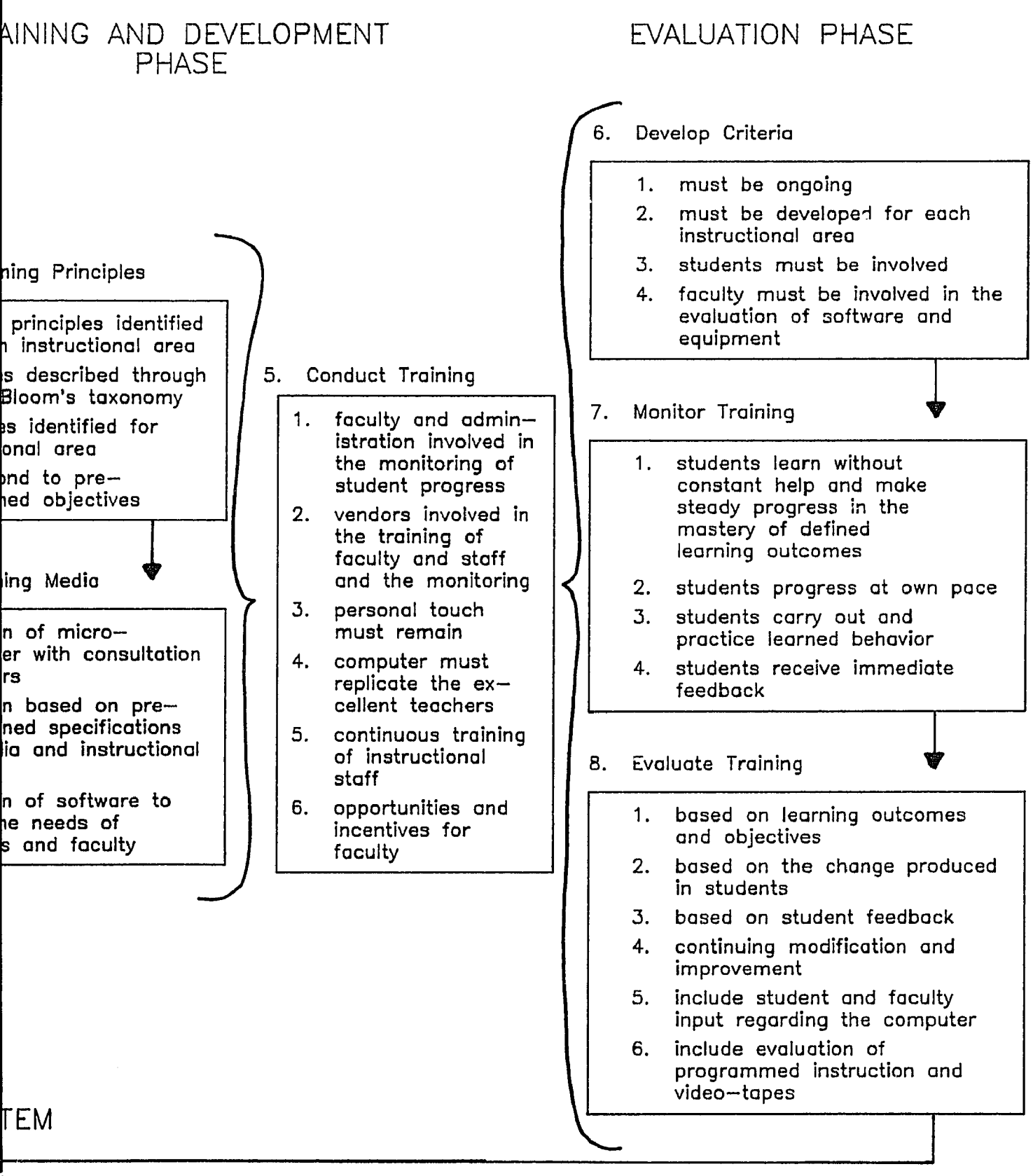
5. Student and faculty evaluations of the instructional process utilizing the computer.

6. The evaluation of video-taped and programmed instruction course usage.

FIGURE 15. COMPUTER CU



COMPUTER CURRICULAR MODEL



Chapter Summary

This chapter reviewed the external and internal forces which effect the curricular offerings at the community college. Three curricular models were outlined and comparisons made. The curricular model for the development of computer-managed and computer-assisted instruction was described based on Goldstein's original model for an instructional system and utilizing concepts from other curricular models discussed in Chapter III.

CHAPTER V

SUMMARY AND CONCLUSION

The conclusions and recommendations presented in Chapter V were recognized to be subject to continual adaptation, change, and evolution. It was impossible to predict what affect future computer advances would have on education in general, and on the community college curriculum in particular.

Summary of the findings

Review of the literature indicated that the pace of technological development is never constant. Technology possesses a self-accelerating characteristic. Yet every technological system, if it is to be useful and effective, must accommodate to the human factor. In their social behavior and adaptability to changing work conditions, human beings change much more slowly than the mechanized or automated systems which support them. Still, it sometimes seems that a small number of technical experts or talented designers expect that hundreds, thousands or even millions of people will quickly adapt to innovative systems. This mismatch between the developmental pace of technology and the adaptability of people is the chief concern of management and technology. For every one person who is an enthusiast, eager for change, there can be found ten or a hundred persons who prefer things as they are or were. And no matter what the social or political structure of a country may be, it was impractical to impose systems on people. The best functioning systems

are those in which the actual users have participated in the development and planning work. The community college administrator must keep this concept in mind when introducing technology into the curriculum. Probably the least well functioning systems are those whose features have been designed by an all knowing expert (which some college administrators presume to be) or a committee of persons who are far removed from the actual workplace. Curricular innovations must be brought forward through a mutual effort of an administrator who is a curricular leader and enthusiastic faculty willing and anxious for a change. One of the administrators most important and vital jobs is to control the enthusiasm of the persons who seek change and to convince the remaining ten or hundred persons that change will help rather than harm them. And these people must be convinced, for the vital element in any system is people, not machines or computers. People can make or break a system, because people are adaptable and flexible; few machines have much flexibility or tolerance for error. Even the "smart" computer which "learns" to play chess only learns to manage moves within a predefined set of possible or likely moves. Such a computer cannot deal with the unknown or the unknowable. Even a small community college is characterized by a large number of unknown or unknowable factors. Decisions about this type of organization, its missions, goals, objectives, policies, and procedures are still matters for human intellectual analysis and judgment, perhaps even for human intuition. A basic assumption of this paper was that human beings are always in charge of and responsible for instructional systems utilizing the computer. Machines, computers, and computer models are merely technical tools, extensions of mind and muscle. They are not substitutes for the mind. Those who succeed in applying technical tools

should take the credit to themselves for any successes; those who fail should blame themselves, not the computers.

Research of the literature provided the following summary information:

1. Computer-assisted and computer-managed instruction is relatively new to higher education.

2. Twenty-four percent of college and university faculty use instruction by computer.

3. Computer-assisted instruction is not for everyone. In general, people will probably be happier and more productive if they are studying or teaching via a method compatible with their style.

4. No one teaching method should be regarded as a panacea for all students in all subjects.

5. Community college faculty have the basic responsibility for deciding what particular subjects will be taught, what instructional format will be used and how long the instruction will take.

6. A future-responsible curriculum, such as one utilizing the computer, must be based on sound rationale that integrates the specific image of the future that the institution wishes to embrace, the unique and specific mission and goals of the institution, and the educational needs of the clientele.

7. Both the advantages and disadvantages of computer-assisted instruction must be considered prior to implementation.

8. In working with computers, the CAI student is becoming acquainted with a tool that may be of significant value in future vocational activities.

9. Computers are now being used in instructional settings in at

least four ways: (1) to convey, and to test for comprehension of, new instructional material, (2) to simulate complex physical or social systems, (3) to assist the instructor in recordkeeping and grading of objective tests, and (4) as a topic of study and a vehicle for the student's acquisition of knowledge about computer systems programming.

10. The rapid growth of computer use in all areas of life and their decreasing size and cost clearly demonstrate that the use of computers is fast becoming a prerequisite for study in other fields as well as a necessary skill for all educated persons.

11. The process of curriculum change involves four stages--recognition of need, planning and formulation of a solution, initiation and implementation of the plan, and institutionalization of the change.

Conclusions

Conclusions concerning the incorporation of the computer into the curriculum at the community college resulted from: a review of the literature, visitations to other community colleges, and an analysis of the final curricular model.

The following conclusions were made:

1. The incorporation of the computer must comply with the mission and goals of the institution, input from constituents, and careful planning by a group of representative faculty and administrators.

2. Strong consideration must be given to the budget and the capabilities of the physical plant.

3. Opportunities and incentives for training and staff development are needed to encourage faculty.

4. All three components of Bloom's taxonomy of educational objectives cognitive, affective and psychomotor domains provided a basis for

more accurately identifying curricular issues relevant to the use of the computer.

5. The development of evaluation criteria regarding the use of the computer must be ongoing.

6. Vendors and media staff must be consulted in regard to the selection of software and hardware and the utilization of each.

7. The greatest stumbling block to change is fear of the unknown. Many faculty will initially fear the computer because it is unknown to them.

8. Community college faculty and administration should consider the proven advantages of computer-assisted and computer-managed instruction which might be summarized as follows: improved quality of instruction, improved recordkeeping, better use of professionals' time, reduced student attrition, increased student retention and increased productivity.

According to Evans and Neagley in their book, Planning and Developing Innovative Community Colleges, community college officials can check how up-to-date their curriculum and instructional programs are by responding to the following questions:

1. Have any students in the service area been turned down because the course or program they needed was not available?

2. Are the technical and vocational education programs offered by business and industry planned cooperatively with the college?

3. Are a number of short-term courses being offered?

4. Has a curriculum committee been organized and granted the proper authority to act and make recommendations?

5. Is curriculum revision and study a continuous process, with re-

leased time or extra compensation in the summer provided for staff members to participate?

6. Are behavioral objectives formulated for most courses and standards of competency set?

7. Are experimentation and innovation in the curriculum and instruction encouraged?

8. Is the instructional program based on a thorough knowledge of the learning process and an understanding of different cognitive, affective, and emotional styles of learning?

9. Are a variety of forms of instruction utilized and are they constantly being improved?

10. Are adequate equipment, learning materials, and spaces available at all times?

11. Is the computer being utilized for computer-assisted instruction (CAI) and for individually prescribed instruction?

12. Is theory being utilized in curriculum and instruction? (25, 1973, pp. 134 - 135)

Neagley and Evans' suggestions have been included in the model developed for the incorporation of the computer into the community college curriculum.

Recommendations

Considering the results and limitations of this study, the following recommendations for future study have been made:

1. Expand the study to include community colleges using computer-assisted instruction throughout the United States.

2. Conduct a follow-up study of the community colleges visited in

Arizona and California including an evaluation of the results of computer-assisted instruction.

3. Conduct a study examining administrative uses of the computer.

REFERENCES

1. Arrow, K. J. Control in Large Organizations. Technical Report No. 123. Stanford, Calif.: Institute for Mathematical Studies in Social Sciences, Stanford, University, 1963.

2. Auvil, Mary S. The Impact of Vocational Education Special Projects in California Community Colleges: Issues and Implications. Department of Education, Washington, D. C., August, 1982.

3. Averill, Donald F. Vocational Education Administration and National Priorities. Paper presented to the California Community College Forum, May 1982.

4. Berquist, William H.; Gould, Ronald A.; Greenberg, Elinor Miller. Designing Undergraduate Education, San Francisco: Jossey-Bass Publishers, 1981.

5. Blocker, Clyde E.; Plummer, Robert H.; and Richardson, Richard C. The Two-Year College: A Social Synthesis. Prentice-Hall, Inc. Englewood Cliffs, N.J., 1965.

6. Bloom, Bemjamin S. Taxonomy of Educational Objectives. New York: David McKay Company, Inc., 1956.

7. Benjamin S. Bloom, editor. Taxonomy of Educational Objectives Handbook I: Cognitive Domain. David McKay Company, Inc., New York, 1956.

8. Blumenthal. S. S. Management Information Systems: A Framework For Planning and Development. Englewood Cliffs, N.J.: Prentice-Hall, 1969.

9. Brown, S.; Carhahan, W.; Houston, D.; Kerstiens, G; and Maddaford, H. "Technology with Humanism Supports Learning." Community and Junior College Journal, 47 (8), 1977, p. 8 - 9.

10. Campbell, Dale. New Roles for Occupational Instructors. Paper presented at Texas Post-Secondary Office Occupations Workshop, May 26, 1977, 12pp.

11. Carlyon, Don and Wolfe, Martin. "Delta College." Junior College Journal, 40, No. 4 (1970), p. 23.

12. Carnegie Committee on Higher Education. The Open-Door Colleges: Policy for Community Colleges. New York: McGraw Hill, 1970.

13. Carnegie Foundation for the Advancement of Teaching. Missions of the College Curriculum. San Francisco: Jossey-Bass Publishers, 1977.

14. Chickering, Arthur W., and others. Developing the College Curriculum A Handbook for Faculty and Administrators. Washington, D.C.: Council for the Advancement of Small Colleges, 1977.

15. Cohen, Arthur M. and Brawer, Florence B. The American Community College. San Francisco: Jossey-Bass, 1982.

16. Cohen, Arthur M. Dateline '79: Heretical Concepts for the Community College. Beverly Hills, Calif: Glencoe Press, 1969.

17. Cohen, Arthur M., ed. New Directions for Community Colleges: Shaping the Curriculum. San Francisco: Jossey-Bass, 1979.

18. Cohen, A. M. and Associates. College Responses to Community Demands. San Francisco: Jossey-Bass, 1975.

19. Conrad, Lora P. and Bender, Louis W. Computers and Information Systems in the Two-Year College. A monograph publication for the Institute of Higher Education, Florida State University, 1983.

20. Couger, J. Daniel; Robert A. Zaroack; and Edward B. Opperman. "Motivation Levels for Directors of University Computer Centers vs those of their Employees." EDUCOM Bulletin. 12 (4): 2-8, Winter, 1979.

21. Cross, Patricia K. "New Roles for College Teachers." Community College Frontiers, 5.2 (Winter, 1977), p. 8 - 12.

22. Cross, Patricia. Accent on Learning. San Francisco: Jossey-Bass, 1976.

23. Dressel, Paul. College and University Curriculum, Berkeley, California: McCutchan Publishing Co., 1971.

24. Emerson, S. RSVP Basic Math Lab: MAT 1992. Unpublished paper, Miami-Dade Community College, 1978. 22pp.

25. Evans, N. D. and Neagley, R. L. Planning and Developing Innovative Community Colleges. 1973.

26. Farley, George T. Increasing the Cognitive Level of Classroom Questions: An Application of Bloom's Taxonomy of Educational Objectives. A dissertation submitted to the Graduate School of the University of Massachusetts, May 1968.

27. Fitzgerald, Daniel F. and Francis, Robert M. The Development of a Diagnostic Tool to Limit Student Attrition through Programmed Instruction in Large Accounting Classes. Ed.D. Practicum, Nova University, May 1981.

28. Gleazer, E. J., Jr. This is the Community College. Boston: Houghton Mifflin, 1968.

29. Gold, Charlie L. Contracting with Business and Industry: Use Your Community Resources. Bay de Noc Community College, Escanaba, Michigan, 1982. 30pp.

30. Goldstein, Irwin I. Training: Program Development and Evaluation. Monterey, California: Brooks/Cole, 1974.

31. Halyard, R. A. and Murphy, N. Using Competency Based Techniques in Curriculum Development. Papers presented at the 58th Annual Convention of the American Association of Community and Junior Colleges, Atlanta, GA, April 9-12, 1978. 22pp.

32. Harris, N. C. and Grede, J. F. Career Education in Colleges. San Francisco: Jossey-Bass, 1977.

33. Harris, N. C. Technical Education in the Junior College: New Programs for New Jobs. Washington, D.C.: American Association of Junior Colleges, 1964.

34. Hass, Glenn; Bondi, Joseph; and Wiles, John, eds. Curriculum Planning: A New Approach. Boston: Allyn and Bacon, Inc., 1974.

35. Hefferlin, J. L. Dynamics of Academic Reform. San Francisco: Jossey-Bass, 1969.

36. Hennings, Dorothy Frant. "Words Processed Here -- Write with Your Computer." Phi Delta Kappan, Vol. 65, No. 2, (Oct. 1983), p. 122.

37. Holt, Deon H. "Dallas County Junior College District." Junior College Journal, 40, No. 4 (1970), p. 21.

38. Hostrop, R. W.; Mechlenburger, J. A.; and Wilson, J. A., Editors. Accountability for Educational Results. Linnet Books, Hamden, Connecticut, 1973.

39. Howard, Alan and others. "Instructional Computing in the Community Colleges of Washington State." Washington State Board for Community College Education, Olympia, Washington, June, 1978, 148pp.

40. Hunter, P. L. Composition in the Open-Door College. Unpublished paper, Gainesville, Fla., 1977. 107pp.

41. Jenkins, Joe. "Future Funding Trend." Community and Junior College Journal, Vol. 54, No. 5 (Feb., 1984), p. 24.

42. Kalani, Henry. Curriculum Guide for Hospitality Education, Part I. U.S., Educational Resources Information Center, ERIC Document ED 150 333, 1976.

43. Kelly, J. T. and Anandam, K. Instruction for Distant Learners through Technology. Paper presented at 3rd International Conference on Improving University Teaching, Newcastle-Type, England, June, 1977. 16pp.

44. Kiefer, Jerry. "Real World." Community and Junior College Journal, Vol. 54, No. 5 (Feb., 1984), p. 33.

45. Kirby, E. B. Locally Directed Evaluation: A Progress Report on Vocational/Technical Curriculum Evaluation at Oakton Community College. Morton Grove, Ill.: Oakton Community College, 1978. 17pp.

46. Knezevich, S. J. MBO: Its Meaning and Application to Educational Administration Education, 93: 12-21, September, 1972.

47. Krathwohl, David R.; Benjamin S. Bloom; and Masia, Bertram B. Taxonomy of Educational Objectives, Handbook II: Affective Domain. New York: David McKay Company, Inc., 1956.

48. Lahti, Robert E. Innovative College Management. San Francisco: Jossey-Bass, 1973.

49. Lenning, O. T. and Micek, S. S. Defining and Communicating Institutional Mission/Role/Scope and Priorities: The Needs of Different Types of Postsecondary Institutions. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, Calif., April 19-23, 1976. 77pp.

50. Levine, Arthur. Handbook on Undergraduate Curriculum. San Francisco: Jossey-Bass Publishers, 1978.

51. Lewin, K. Resolving Social Conflicts: Selected Papers on Group Dynamics. New York: Harper, 1948.

52. Long, Sandra M. "The Dawning of the Computer Age: An Interview with Ronald Palemara." Phi Delta Kappan, (Jan., 1982), pp. 311 - 313.

53. Martin, James Thomas and Norman, Adrian. The Computerized Society. Englewood Cliffs, N.J.: Prentice-Hall, 1970.

54. Marty, Myron A. New Directions for Community Colleges: Responding to New Missions. San Francisco: Jossey-Bass, 1978.

55. Mattews, Walter M., ed. Monster or Messiah? The Computer's Impact on Society. Jackson University Press of Mississippi, 1980.

56. McCorkle, Chester O. and Archibald, Sandra Orr. Management and Leadership in Higher Education. San Francisco: Jossey-Bass, 1982.

57. Melmed, Arthur S. "Information Technology for U.S. Schools," Phi Delta Kappan, (Jan., 1982), pp. 309 - 311.

58. Melville, G. and Roesler, E. The Business-Industry Survey: Its Use in Institutional Planning. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, D. C., April, 1975. 46pp.

59. Mitchell, Maurice and others. The Design of a Computer Based Education System, Volume I. Des Moines Area Community College, Ankeny, Iowa, June, 1980, 52pp.

60. Monroe, C. R. Profile of the Community College. San Francisco: Jossey-Bass, 1972.

61. Naisbitt, John. Megatrends. New York: Warner Books, Inc., 1982.

62. Nawaz, M. and Tanveer, S. A. "Individual Instruction: The Promise, Requisites and Alternatives." Educational Technology, Vol. XVII (March 1977), p. 25.

63. Noeth, R. J. and Hanson, G. "Occupational Programs Do the Job." Community and Junior College Journal, 47 (3), (1976), p. 28 - 30.

64. Occupational Education Master Plan 1981 - 1986. District Task Force on Occupational Education, Maricopa Community Colleges, May 1981.

65. Paden, Donald W. and others. "A Decade of Computer-Assisted Instruction." The Journal of Economic Education. (Fall, 1977), Vol. 9, No. 1, p. 3.

66. Palow, W. P. Technology in Teaching Mathematics: A Computer Managed, Multi Media Mathematics Learning Center. Paper presented at 57th annual meeting of the National Council of Teachers of Mathematics, Boston, (April 1979), 8 pp.

67. Phillips, H. E. and Tucker, K. Needs Assessment: Importance in Planning, Present Status (and) Needs Assessment and Long-Range Planning. Papers presented at the Convention of the Southern Association of Community and Junior Colleges, Atlanta, GA., (Dec., 1975), 24pp.

68. Pincus, Fred L. "The False Promises of Community Colleges: Class Conflict and Vocational Education." Harvard Educational Review, Vol. 50, (August 1980), p. 332 - 361.

69. Poole, Lawrence H. and others. Computer Literacy: The New Mandate for General Education in the 80's. North Country Community College, (March, 1982), 12pp.

70. Raia, Anthony P. Managing By Objectives. Scott, Foresman Co., Glenview, Illinois, 1974.

71. Railsback, Charles E. "Microcomputers: Solutions in Search of Problems?" Phi Delta Kappan, Vol. 65, No. 2, (Oct. 1983), p. 118.

72. Reed, Fay Carol and Others. "A Model for the Development of Computer-Assisted Instructional Programs." Educational Technology, Vol. IV (March, 1974), p. 20.

73. Reynolds, James W. The Comprehensive Junior College Curriculum. Berkeley, Calif.: McCutchan Publishing Corp., 1969.

74. Richardson, Richard C. The Community College in the Eighties: Time for Reformation. Paper presented at the 62nd Annual Convention of the American Association of Community and Junior Colleges; St. Louis, MO, April 4-7, 1982.

75. Richardson, Richard C., Jr. and Leslie, Larry L. The Impossible Dream? Financing Community College's Evolving Mission. American Association of Community and Junior Colleges. "Horizons Issues" Monograph Series, 1980.

76. Robbins, Martin D.; William S. Dorn; and John E. Skelton. Who Runs the Computer? Strategies for the Management of Computers in Higher Education. Boulder, CO: Westview Press, 1975.

77. Rockart, John Fralick and Scott, Michael S. Computers and the Learning Process in Higher Education. New York: McGraw-Hill, 1975.

78. Roueche, J. and Mink, O. "Helping the Unmotivated Student: Toward Personhood Development." Community College Review, 3, (Sept., 1976), p. 40 - 50.

79. Samojeden, Elizabeth and Rauch, Margaret. The Use of Computers in the Classroom. Paper presented at the Annual Meeting of the Minnesota Reading Association, Ossen, Minn., Nov. 5-6, 1982.

80. Sasscer, M.F. 1976-77 TICCIT Project. Final Report. Annandale: Northern Virginia Community College, 1977. 150pp.

81. Scott, Robert W. "Clear Signals Needed." Community and Junior College Journal, Vol. 54, No. 5 (February, 1984), p. 19.

82. Shane, Harold O. "The Silicon Age and Education." Phi Delta Kappan, (Jan., 1982), p. 303.

83. Spangler, R. Mathematics, K-14: A Learning Center Approach at Tacoma Community College. Paper presented at annual meeting of the American Mathematical Association in Two-Year Colleges, Houston, Texas, Oct., 1978. 29pp.

84. Sturdevant, Rosemary. "Microcomputers and Copyright in Education." Phi Delta Kappan, Vol. 63, No. 5 (January, 1982), p. 316.

85. Taba, Hilda. Curriculum Development: Theory and Practice. San Francisco: Harcourt, Brace and World, Inc., 1962.

86. Taylor, Alexander. "Small-Computer Shootout." Time, (March 2, 1983), pp. 68 - 69.

87. Thomas, Wanda E. and Barker, Stephen C. Developing a Workload Formula for High Technology Faculty. Paper presented at the annual convention of the American Association of Community and Junior Colleges, April, 1983.

88. Thompson, F. A. TIPS. Final Report, Riverside, Calif: Riverside City College, 1977. 44pp.

89. Trow, Martin. "The American Academic Department as a Context for Learning." Studies in Higher Education, 1976, 1(1), 11-22.

90. Tyler, Ralph W. Basic Principles of Curriculum and Instruction. Chicago: The University of Chicago Press, 1949.

91. Vaughn, George B. Questionning the Community College Role. Jossey-Bass, Publishers, Inc., San Francisco, Calif., 1980.

92. Walker, Decker F. "Reflections on the Educational Potential and Limitation of Microcomputers." Phi Delta Kappan, Vol. 65, No. 2 (October, 1983), p. 103.

93. Watson, Norman E. and Luskin, Bernard J. "Orange Coast Junior College District." Junior College Journal, 40, No. 4 (1970), p. 41 - 42.

94. Winkle, Linda Wyrick and Mathews, Walter M. "Computer Equity Comes of Age." Phi Delta Kappan, (Jan., 1982), pp. 314 - 315.

95. Zucker, Andrew A. "The Computer in the School: A Case Study." Phi Delta Kappan, (Jan., 1982), pp. 317-319.