DOCUMENT RESUME

ED 230 159 HE 016 235

AUTHOR Dede, Christopher
TITLE The Future of Higher Education.
PUB DATE Apr 83
NOTE 51p.; Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Canada, April 11-15, 1983).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Change Strategies; *College Planning; College Role; Economic Factors; Educational Change; *Educational Finance; *Enrollment Trends; *Futures (of Society); *Higher Education; Nontraditional Students; Political Influences; Social Change
IDENTIFIERS Strategic Planning

ABSTRACT

The likely alternative futures that higher education may face in the next decade are discussed, and suggestions for developing a strategic planning capability in response are offered. It is argued that major demographic, economic, and political disruptions are likely in the 1980s. Demographic trends that will have a major impact on higher education include changes in the numbers and age mix of students, the geographic distribution of educational demand, and students' special needs. Shifts in American workplaces and communities created by breakthroughs in information technology will also alter the goals of students. The financing of higher education and demand for its services are intricately interconnected to the health of the national economy. Since the range of economic future for the next decade is large, careful planning is needed to prepare colleges and universities to meet the spectrum of potential challenges they face. Probable changes in cultural beliefs and values, the political mood that these will engender, and the implications of higher education will also be important factors to consider. Research studies are suggested that may be helpful, particularly if these projects are integrated into an overall planning and monitoring system for higher education. Author/SW)

"The Future of Higher Education"

Dr. Christopher Dede
University of Houston at Clear Lake City
Houston, Texas

April, 1983

Contents

Author's Note

This paper is a revised, aggregated version of two papers I have previously published:

"Higher Education in Texas: Issues in the 1980s" Informing the Future. Austin, TX: Texas State Coordinating Board, 1981.

and

"The Reshaping of Adult, Career, and Vocational Education by the Emerging Communication Technologies" Communications Technologies; Their Effects on Adult, Career, and Vocational Education. Columbus, Ohio: National Center for Research in Vocational Education, 1983.

Introduction

Historically, higher education has been slow to change and relatively unaffected by major shifts in its societal context. Hence, policymakers have not used anticipatory long-range planning as a major tool in decisionmaking. The 1980s, however, appear to be a particularly unstable period for America, with changes coming that will have sweeping implications for colleges and universities. This paper outlines the likely alternative futures which higher education may face in the next decade and presents suggestions for development of a strategic planning capability in response.

The future resembles a tree: the trunk is unitary, as is the present; the many branches are the different alternative futures. As we walk up the trunk toward the branches (through the present into the future), each choice we make cuts off a branch (removes an alternative option). By the time we get to the location of the branches (by the time the present becomes the future), only one branch is left (the new present) and again a host of alternative futures stretches out before us.

The major demographic, technological, economic, and political branches of the future of higher education are discussed below. Some of these sectors are almost completely predetermined; here, potential responses are limited to different reactive options. Other prospective developments can be shaped if educational policymakers anticipate them, suggestions are presented for how higher education might accomplish this. Such an approach provides a method of planning for all probable contingencies, assigning resources on the basis of relative likelihood and desirability.

SHIFTS IN STUDENT POPULATION

Demographic trends will have a major impact on higher education in the 1980s. Change will occur in the number of students, the mix of different age groups in the student population, the geographic distribution of educational demand, and the special needs students bring to the learning environment. In turn, these shifts will have major implications for enrollment projections, the proportionate demand for different types of courses, and the management of growth and decline in postsecondary institutions.

Changes in the Age Structure of the Population

Between 1980 and 1990, the population aged 18-24 in the U.S. will decrease by 2.6 million, a decline of 15%.[1] This decrease follows a long period of growth caused by the "baby boom" after World War II. The "baby bust" generation of the 1960s is now beginning to enter colleges and universities. This will significantly affect attendance, since in 1975 48% of the total enrollment in higher education (and 64% of the undergraduate enrollment) came from this age cohort.

During the 1980s, the number of adults age 35 and over will increase.[2] Moreover, the proportion of adults seeking higher education may grow. Because of economic change, needs for career mobility, and rapid technological developments affecting job skills, many adults will seek formal occupational retraining. (One Census sample found that one-third of American adults surveyed had changed occupations in the past five years.) There is also a growing demand for informal adult education, stemming in part from a desire for a balanced mix of education, work, and leisure throughout the lifespan.[3]

Ultimately, the impact of these two changes in population size on public higher education is uncertain. Since college attendance is not mandatory, a potential loss of enrollment can be counteracted if a larger percentage of adults is recruited as students. A recent American Council on Education study lists twelve ways to achieve such increases, including raising high school graduation rates, cutting attrition among current students, and enrolling students who now take courses from industrial employers.[4]

Geographic Distribution of Educational Demand

General figures on population size are less useful to colleges and universities than disaggregated data on demographic shifts in their own enrollment region. The deviations among different states from average U.S. population figures can be quite large. For example, the American Council on Education projects that, from 1975-1985, the 18 year old population will drop by 50% in Rhode Island and 44% in the District of Columbia, while rising 32% in Nevada and 26% in North Carolina. Even such statewide figures are too general for detailed planning; county by county net migration patterns would be more useful, especially in a rapidly growing state such as Texas.

Some overall trends in geographic distribution can be noted. Sun-belt states are experiencing net population in-migration. Central cities are declining in size, while suburban and non-metropolitan areas are growing.[5] In general, publically supported institutions located near large suburban areas, structured to accommodate part-time students, with healthy graduate enrollments and an environment attractive to foreign and non-white students will be relatively more prosperous than four-year private

colleges located in rural areas and totally dependent on full-time boarding students.

Special Needs of Students

Part-time students have different educational needs than the traditional postsecondary student population (and generally are more expensive for colleges and universities to service). Since 1970, part-time enrollment has increased from 32% to 40% of total enrollment and is expected to continue growing. Certainly, if higher education attracts more adults in the 35-and-over age cohort, the historical model of instruction geared to full-time, on-campus students will shift toward increasingly flexible, decentralized, and non-formal activities.

The number of foreign students seeking admission to colleges and universities may be substantial. In 1976-77, over 200,000 foreign non-immigrants attended American academic institutions (how much this will change as international tensions increase is uncertain). These students--usually men majoring in engineering, business management, and the sciences--have special language and cultural needs which pose extra burdens for higher education.

Two factors which have very great implications for elementary and secondary education in the 1980s may also affect colleges and universities. First, households are likely to become smaller and less traditional; by 1985, only about 40% of the population will be living in families of three or more persons. Many more young women will be childless, unmarried, working. Separation, divorce, and remarriage are all increasing. Use of childcare is becoming routine as a greater number of families have two wage-earners. Potentially, higher education could offer services to help

adults adjust to these changing cultural patterns.

Second, low income and minority students are increasingly becoming concentrated in the central cities. Projections show white populations in the core of large cities decreasing by up to 27% from 1970 to the year 2000, while non-white populations increase by up to 85%. Also, large numbers of non-English speaking Hispanic and Asian immigrants are migrating to urban areas. Legal immigrants have recently averaged 4 million per decade in the U.S., while illegal immigrants are today estimated at between 2 and 12 million people. It is likely that, by the end of the 1980s, Hispanics will be the largest minority group in the country.

Nationwide, the proportion of adults ages 18-24 who are from minority groups will increase from 15.3% in 1980 to 17.9% in 1990. To the extent that these students attend college, they will require special instructional services.

Summary

Demographic changes are relatively predictable events, yet educators have historically failed to plan for these shifts and have encountered major difficulties in consequence. The management of growth and decline will be a crucial area for higher education in the 1980s, and anticipatory planning is needed. For example, one strategy for campuses with failing enrollments would be to make a smooth transition to smaller budgets, decreased personnel, and a reduced physical plant. An alternative strategy might be to redirect the mission of the institution toward providing new client groups with additional services (such as university-industry "partnerships for productivity"). Policy analyses of the relative costs and benefits of such options need to be done far in advance of actual enrollment declines.

EMERGING DEVELOPMENTS IN EDUCATIONAL TECHNOLOGY

Recent and largely unanticipated breakthroughs in the information technologies seem likely to alter American workplaces and communities over the next several decades. Such a shift will change the needs of students in higher education in a dramatic fashion. Moreover, these new technologies offer the potential to expand greatly both the range of methods used to teach sophisticated cognitive skills and the size and diversity of the clientele who can be reached by educational delivery systems.

The Emerging Knowledge-Based Society

As civilization becomes more complex, accurate and accessible information grows increasingly central to economic prosperity.[6] Daniel Bell has argued that the United States is entering a "post-industrial" period, in which:

--services supplant manufacturing as the major source of employment

--information serves as a resource, a production factor, and a commodity

--economic growth is largely predicated on scientific discovery and technological invention[7]

The new communications technologies are likely to play a major role in the emergence of this new economy, since information has certain unique characteristics as a commodity:

a. it is reproducible very cheaply compared to the cost of its original creation; such "theft" does not remove the information from its original owner.

b. it can be transported instantly and inexpensively anywhere in

the world over communication lines.

c. its lifetime, which can be very brief, is crucial in determining its value[8]

From these characteristics come problems with computer crime, copyright and patent laws, the flow of data among nations, property tax laws, and conflicts between the private value of information and the public interest in its free dissemination.

At least two major types of occupational shifts are being driven by the emerging information technologies. First, a new tier of industries is emerging to become the heart of the information-centered economy. Two sectors of these industries can be identified:

1. The primary sector deals with the producers of telecommunications hardware and the generation and sale of information. It includes diverse groups such as the computer and communications industries, typewriter manufacturers, newspaper publishers, and film producers.
2. The secondary sector is composed of internal information services and products within an organization. For example, internal accounting and production management and inventory control systems are included[9]

Second, the emergence of an "intelligent workplace" in traditional sectors of the economy--with microprocessors incorporated into tools and information management/telecommunications systems on the desk of every professional or technical employee--will create massive shifts in job roles. This "new industrial revolution" will eliminate many lower level skill jobs while simultaneously creating new occupations which demand intensive higher order cognitive functioning. Combined, these two sets

of shifts in the economic sector mean that few employees will have jobs at the end of this decade which are untouched by the new communications technologies.

America cannot afford to fall behind other countries in making these transformations to a new industrial base. Already, the U.S. position in the internal marketplace is threatened by the lead of West Germany and Japan in technology/human productivity. Between 1970 and 1977, the percentage increase in GNP per employee was 38% in Japan, 25% in West Germany, 23% in France, 14% in the U.K., 12% in Canada, 12% in Italy--but only 8% in the U.S.[10] In the past several years, the U.S. rate of increase has been very nearly zero.

While many factors have been cited as explanations for lowered American productivity,[11] increasing the amount and efficiency of worker-related education seems central to improving the national economic and defense situation. Otherwise, the transition to a knowledge-based society will not bring the return to affluence that Americans expect and hope.

Changes in the Workplace

The impact of information technology on occupational skills has been very large since the Second World War. From 1949 to 1965, about 8000 types of jobs disappeared from the U.S. labor market (due largely to the spread of automation); more than 6000 new types of jobs developed over the same period.[12] Since these figures were compiled, with the amount of information processing that can be done per unit time and cost doubling every two years, the processing capabilities of computers have increased by a factor of 256!

Many workers now must retrain three or four times during their

careers because of the swiftness of technological advance. For example, the electrical industry is experiencing such rapid change that about 10% of its technical knowledge becomes obsolete every year, and the electrical workers' union has fifty-seven full-time members constantly updating its textbooks.[13] With the new communications technologies driving an industrial transformation, for the next two decades many occupations may become so transient that complete retraining will be required every four to five years.

The advent of the microprocessor will increase the already fast pace of technological change to a frenzied pitch. Microcircuitry can replace hundreds of moving parts, redefining and reducing the number of jobs in industries such as cash register production and watchmaking. Robots will alter the environment of the assembly line, changing industries such as energy equipment manufacturing and weapons production. Printing, textiles, metal and plastic fabrication, instrument engineering, electronics, shipbuilding, and aircraft fabrication are illustrative of the range of companies likely to be affected. Communications, chemical/petrological, geological, and medical industries will undergo sweeping alterations.[14]

The manufacturing industries are not alone in the coming tide of new information technology applications. Insurance and banking, stock handling and mail delivery, librarians, draftsmen, programmers, accountants, secretaries, cashiers, and sales clerks are examples of the lower level jobs in the service industries which may change. The skill shifts at upper managerial and administrative levels will be even more profound, as new communications channels and information synthesis systems redefine professional roles. The "half life" of advanced degrees--already

only five or six years for many areas of engineering--will dwindle for the whole spectrum of business and technical personnel.

The overall magnitude of occupational transformation--between the incorporation of microprocessors into tools and the emergence of new tiers of information industries--will be comparable to the industrial or agricultural revolutions. The immediate effects on society will be greater and more disruptive than even these two historical shifts because the time scale will be compressed; the transition to a new economic base will take not centuries or generations, but decades. Societal resistance to such sudden change will be overpowered by desires for economic resurgence and global preeminance.

Fully half the jobs in the Yellow Pages will have begun to alter by 1990--and then the oncoming revolution in biological technologies (e.g.) recombinant DNA applications) will begin to impact occupational roles! Higher education must change swiftly and proactively to meet these emerging needs.

Altered Occupational Skills

Some questions exist as to the specific ways in which the new communications technologies will change job roles. For example, some argue that "intelligent" tools will allow workers to be quite stupid (and hence will obviate the necessity for much occupational training). One example of such a situation is McDonalds: the personnel need only find and punch the pictures of hamburgers, fries, shakes, etc. on the electronic cash register; and the machine calculates the total bill and dispenses change. Since the food is preboxed and colorcoded, no higher order cognitive skills whatsoever are required in such a job!

However, for each occupation like McDonalds, a multitude of job roles will emerge similar to word processing/text editing/information management positions. One such professional, properly trained, can do the work of five clerk/typists. The employer can pay this information synthesis specialist three times what a secretary makes, purchase the machine involved, pay for training, maintenance, etc. and still save money--hence, the "new industrial revolution." However, a great many higher order cognitive and professional/affective skills are required of the employee, nor can the machine simply be used as a typewriter with an electronically correcting screen!

A second issue concerns what types of complex skills workers will need to use "intelligent" tools. A naive conception is that universal technical literacy will be required, with each employee fluent in computer languages, engineering jargon, and mathematical constructs. While such abilities will be in demand during the "new industrial revolution," most jobs will not necessitate these types of knowledge.

In actuality, the workplace will become a set of human/machine partnerships, in which the device will accomplish what it can and the person will supplement what microprocessors can't cost-effectively be programmed to do. Information-based tools can be constructed to do technical things well, but are not skilled at being flexible, creative, or making decisions given incomplete information (all of which humans do adeptly, if trained). Communications devices' capabilities for complex pattern recognition, evaluation, and synthesis are also quite limited. Hence, the "new basics" required of workers--and, in a broader sense, the emerging altered definition of human intelligence--will center on

largely non-technical skills which in many ways resemble those taught in a "liberal arts, general education" curriculum.

Third, changes in the attitudinal and institutional structure of the workplace will inevitably accompany the incorporation of communications technologies into job roles. Not all stagnation in productivity can be attributed to inadequate training or to outmoded capital equipment; a predominant "hate work" mentality and poor worker management approaches also are significant problems.

Attitudes of dislike for work and indifference to quality of performance often stem either from not feeling challenged and interested by the job or from a sense of unnecessary stratification and exploitation by the employer. "Intelligent" tools, by removing the routine and boring aspects of many occupations, will aid in combating worker ennui, but may increase employee alienation if sufficient interaction with co-workers is not retained or if increases in salary and stature are not concommitant with new skills acquired. In Europe, and through a different variant in Japan, more technically sophisticated work forces often have demanded increased "economic democracy."

Economic democracy is a movement committed to increasing the involvement and commitment of the worker to his/her employer through enhancing the worker's participation in decision-making.[15] Traditional rewards of wages, possibilities of promotion, and steady employment (all currently becoming difficult for employers to offer) seem to be less important when workers have an increased level of satisfaction and motivation from shared control over the work environment. Such joint decision-making can take the form of work teams or autonomous work groups, co-determination

on governing boards by representatives of both management and labor, and even worker self-management via elected councils which make all major policy decisions for the firm.

As with the communications technologies, an implementation of some form of economic democracy in the American workplace would require changes in the skills of the labor force. These would include enhanced abilities to participate in group decisions, the capacity for increased individual decision-making, cooperative skills, and the ability to give and receive training. Such skills will require increased work-related education to achieve. In turn, workers with augmented responsibilities in decision-making might well choose to increase the amount of job-related training available, as education may be perceived as an essential component in maintaining an economic democracy environment.

Broader Societal Shifts

The family and community lives of workers will also be dramatically affected by the new information technologies (Wise 1980). The demarcation between job and personal life will be weakened as communications devices enable occupational roles to be performed at home--and vice versa.[16] Interpersonal relationships will be affected by an increase in communication via machines and a lessening of direct experience. The effective size of families and communities will grow as interaction at a distance becomes cheaper and easier. The strains of continual retraining will reduce the time and energy workers have for the rest of their lives, until increased affluence allows a reduction in working hours. These--and many, many other probable shifts--cannot be covered in the space available, but illustrate the multiplicity of challenges

which higher education will confront.

Moreover, the ways in which the new communications technologies affect post-secondary education will be shaped by all the other societal forces interacting in the 1980s. Demographic, economic, and political developments will be influential in determining how and when these devices are implemented. It does seem likely, however, that economic pressures will compel a rapid and massive adoption of information-based rules despite the traditional inertia of the workplace, although the array of potential policies which could affect these decisions is large. Even in higher education, traditionally very resistant to new approaches, these communications devices will reshape job roles.

Breakthroughs in Information Utilization

Education has always been constrained by the cost of information:[17]

--A printed page has about 10,000 bits of information and costs about 3¢.

--A colored slide has about 250,000 bits of information and costs about 50¢.

--A half hour color motion picture has about 10,000,000,000 bits of information and costs about $700.

--Organized real world environments such as technical labs and field trips are even richer in the amount of information available, but also much more expensive. Many types of job-related education are limited by the costs of such experiences.

The emerging communications technologies offer a means of dramatically reducing the cost of information in the curriculum, while simultaneously enhancing interaction and convenience.

The power of the emerging information technologies makes major cost reductions possible. The personal computers purchasable today for less than one thousand dollars are twenty times faster and cost two hundred times less than "state of the art" computer systems in 1958 (Licklider 1979). The videodisks now being marketed for about twenty dollars each contain about fifty thousand images of video information. The digital videodisk, which will be operational by the mid-1980s, can use these images to store about ten billion "bits" of information (equivalent to one thousand books).

An electron beam device, "writing" on a small wafer of semiconductor material, can store about one hundred billion bits--roughly ten thousand books. Magnetic bubble memories are expected to condense even larger amounts of information; perhaps the entire Library of Congress will be stored in a volume-sized container.

Optical fibers the diameter of a human hair can carry more than one hundred million bits per second (ten books per second). Laser printers, controlled by computers, can produce several pages of high quality text and graphics per second. Satellite telecommunications advances allow the capability of delivering this volume of information rapidly and cheaply to individual households, in either text or video form.

By the early 1990s, computers will be approximately thirty times more powerful than at present. A complete microcomputer system the volume of a display case will have the capacity for a library at least the size of twenty-five major reference works.[18] The top part of the case can be a full-color screen which displays text, high-resolution

graphics, and pictures; a complete keyboard and speech synthesizer can be stored in the bottom. The computer core of the device can have the memory and the program needed for sophisticated processing of student work (answer checking, search for error patterns, tutoring, coaching, mapping student knowledge, speech recognition, branching based on errors, etc.).

Two-way, interactive transmission of information via cable systems linked to home television sets will be almost universal. This allows for "narrow-casting" capabilities; using "packet switching," forty households simultaneously tuned to the same channel could recieve, at their individual discretions, forty different programs. A single large computer could interact with hundreds of homes all at the same time via timesharing strategies.

How will these advances enhance the instructional process in higher education? Briefly, the computer, the videodisk, and communications networks have the potential to:

1. improve instruction in conventional vocational, career, and adult education subjects,
2. allow the efficient teaching of types of knowledge and skills previously too expensive to include in the occupational curriculum (e.g. sophisticated laboratory procedures and instrumentation),

   and
3. improve the quality of research into the teaching/learning process.

Moreover, unlike direct human instruction, the size of groups taught

by telecommunications can be very large without increasing costs or adversely affecting quality.

The Promise of Information Technology in Education

Historically, technological devices have been of little aid in higher education because they were capable of only a few, very basic teaching functions (such as drill-and-practice) compared to the wide range of instructional skills used in teaching the adult, vocational and career education curriculum. Between now and the end of the eighties, developments in the power, cost, speed, and memory of the information technologies will create a wide range of new educational functionalities, which are listed below:

Hand-Held Computers

--drill and practice
--presentation of simple material, with questions to test assimilation
--response to student-initiated questions on a specific topic
--simple games which build basic remedial skills (such as spelling)

Microcomputers

--complex games to build higher order skills (such as advanced math)
--simple interactive simulations (such as modeling lab equipment)
--simple "microworlds" (e.g. what would happen if gravity behaved differently)
--voice input and output
--computer art and music
--word processing and spelling/grammatical correction
--authoring programs (enabling faculty to create instructional packages)
--computer-managed instruction
--information management, data-retrieval, and recordkeeping

Mainframe Computers

--complex simulations and microworlds
--complex presentation of databases (e.g. a 3-D tour through an architectural structure)
--sophisticated electronic library

Computer Networks

--electronic mail
--computer conferencing
--transfer of large data bases

Mass Telecommunications

--instructional delivery to multiple extra-school settings (one-way or interactive)
--dramatic, vicarious experience (with corresponding affective overlay)
--simple models of skilled performance (e.g. titration, word processor usage)

Interactive Videodisk

--complex models of skilled performance (e.g. electronics diagnosis and repair, surgery)
--surrogate travel (such as a trip through an art museum or a factory with the student controlling speed and angle of view)

This list is incomplete, and many of the labels are too narrow to convey the full spectrum of capabilities possible.[19] It will take a long time for educators to master completely how best to use this range (four hundred years after its development, instructional usage of the book is still being refined). Nonetheless, these sample functionalities illustrate how certain instructional properties and attributes of these devices can be matched to the learning process, thereby enhancing the efficiency and effectiveness of occupational education.

For example, as a result of these new functionalities, types of knowledge and skills previously too expensive to be included in job-related education can be taught on a cost-effective basis. Words, symbols, and line drawings are cheap and powerful (in both information and monetary terms); historically, the vocational curriculum has tended to emphasize subjects which can be taught primarily in this manner. A difficulty which such an approach poses is that words and symbols are good for

teaching complex procedural such as laboratory procedures, medical skills, advanced writing, equipment troubleshooting, and instrumentation usage. Occupation-related education has tended to teach "what" rather than "how," but changes in America's industrial base and emerging predominance of professional and technical jobs are forcing an emphasis on "how."

The functionalities listed under "Microcomputers," "Mainframe Computers," and Interactive Videodisk" indicate an incipient capability to teach complex, higher order procedural skills cheaply via technological simulation. In fact, these types of knowledge (which are characterized by a limited range of "right answers") are particularly well suited to being taught by instructional devices. As a result, students will become better able to communicate, to organize information, to formulate strategies when presented with complex real world phenomena, and to emulate expert performance. Such skills will make graduates very desirable in the occupational marketplace.

Also, hand-held computers (with hardware costing about twenty dollars total and replacable memory chips available for less than a dollar apiece) can replace or supplement textbooks, reference works, and handouts. Speech input and output can be added to these devices without greatly increasing their cost. Using such technologies, students can interactively learn basic material at their convenience, tailoring the delivery system to their learning style and reducing both individual and institutional investments in unalterable printed materials. Costly contact with human instructors can then be targeted to advanced questions and sophisticated cognitive skills.

Finally, the quality of research into the teaching/learning process can be greatly improved by using communications technologies for instructional delivery. All these devices can unobtrusively and cheaply measure key variables such as student time on task, response time to questions, percentage of errors in answering items, pattern of mistakes made, and tutoring sequences chosen. As a result, information previously unobtainable about individual performance can be garnered as a byproduct of instruction without elaborate human recordkeeping. Further, as teaching devices are tailored to learner response and alternative instructional modalities tested, the success or failure of different approaches will provide invaluable insight into the basic nature of higher order human learning.

From such research, an "applied educational science" can emerge. Cognitive psychology, ergonomics (studies of human-machine partnership), and educational research all would benefit greatly from the fundamental knowledge thus gained. In turn, the applications of these new insights could be used in industrial training and adult education. Comparable gains in educational theory using data collected solely from human instruction would be prohibitively expensive; thus, the emerging information technologies offer the promise of a fundamental breakthrough in understanding the workings of the mind.

Altered teaching and research strategies are by no means the only impact of the information technologies on higher education. Many more shifts in instructional practice are likely as a result of the new communications devices than can be detailed here.[20] One important issue which merits discussion is the increased numbers of students who will

need job-related education in the 1980s. Previous sections have indicated that most workers will require some form of retraining; how, given current realities, can this large group of potential clients be reached?

New Delivery Systems--New Markets

Mass telecommunications and computer networking have the capability of greatly expanding the number of students served by post-secondary educators. Demand for job-related training has always been limited by constraints on the lives of older, working students. Historically, to allow even part of the working population to attend instruction, institutions have had to provide classes at night or on weekends at locations other than the campus; altered admissions requirements and formal entry standards; and special services such as lower fees, special counselors, financial aid, business and job placement, expanded office hours, and child care. While expanding occupation-related education has been seen as an important priority in America's economic productivity, the difficulties of providing increased training using conventional instructional methods have been formidable.

As indicated in the list of functionalities earlier, the new communications technologies offer capabilities which may ameliorate some of these problems for adults and workers. Interactive delivery of highly specialized instruction to home or workplace settings will be easy and cheap by the late 1980s. The more basic aspects of training can be communicated by devices (either hand-held or home-based) from which students can learn individually at their convenience. Computer networking offers the potential for better "cooperation at a distance" strategies than

education/industry partnerships have been able to achieve with more traditional forms of communication. Students can transact necessary business with different sectors of the institution without having to appear physically on the campus. Limitations on time, location and individualization will be greatly lessened.

How many new clients will be able to avail themselves of educational services as these historic constraints are removed is not certain, but--given the magnitude of change in job roles America is facing in the next decade--it seems very probable that a high percentage of all workers will wish to receive job-related training if it is reasonably convenient. How large a potential demand could develop?

Estimates of enrollment in non-collegiate post-secondary schools in 1976 range from 1,399,000[21] to 3,066,000,[22] so the uncertainty in such figures is high. Over sixty percent of the women and over eighty percent of the men enrolled were employed full-time (many also attending school full-time). A greater percentage of the working population might well choose to receive training from these vocational/technical institutes, technical schools, business/office schools, cosmetology/barber schools, flight schools, trade schools, arts design institutes, hospital schools, allied health schools, and the like if alternative technologically-based delivery systems were available.

On the collegiate level in 1976, community colleges enrolled between 243,000 and 352,000 students around age twenty in occupational curricula (about 70% of all Associate of Arts degrees that year). Significant numbers of the non-collegiate post-secondary students in vocational schools might be lured to community colleges if more flexible forms of

instructional delivery were utilized, so both competition and the total size of this market may grow as the new communications devices become more prevalent.

Continuing work-related education (employer-provided) encompasses a less formal and less understood market. Quantitative data in this area is generally sparse, and estimates vary widely. It appears that formal training is currently provided by less than half of all firms, but by more than 80% of large firms. The number of workers involved in formal training in any year is about one in five in big firms and a lesser proportion in smaller enterprises. Cost estimates have ranged from 100 billion dollars per year (formal and informal training, direct and indirect costs)--which was 12 percent of all wages and salary payments in that year--to as small as three billion dollars per year; the majority of researchers give figures of ten to twenty-five billion dollars per year. Continuing professional education and labor-sponsored training would add to the size of these estimates.

This is a market likely to expand considerably with the advent of the "new industrial revolution," and most employers will be seeking methods of retraining without causing major inconvenience for either firm or employee. Corporations have been reluctant historically to implement extensive in-house education programs, preferring to contract out for these services, but in recent years this trend has begun to change. Whether the new communications devices intensify the movement away from services delivered by educational institutions will probably depend on the speed with which college and university educators adopt instructional technologies tailored to worker needs and constraints. Certainly, the

be the overall costs and benefits of deliberately moving higher education in this direction?

First, even with the large initial outlays of capital involved, college and university instruction would become less expensive. The first few years of such an effort might be very difficult, for money must be spent to implement these technologies before savings can be realized. Innovative funding strategies (such as long-term, low interest loans from the information technology industries) might be required. However, given the difficult economic times ahead (see discussion in next section), investing in such a change strategy could be very cost-effective.

Second, massive faculty development efforts would be needed to prepare faculty to use these technologies for instruction and evaluation. Initial resistance to technological innovation is likely to be quite high; however, as faculty and administrators realize that new and larger markets for higher education are being created, this opposition will diminish. Certainly, if colleges and universities do not adopt these approaches, a competitive non-formal system of instructional delivery to home and workplace settings is likely to appear.

Third, governance of college and university systems would become more complex. Curriculum development and financing of higher education would shift toward centralization, but the learning environment would be decentralized to family and industry settings. New types of state-wide telecommunications regulations would be needed. Inequalities in educational opportunity would be reduced, as instruction becomes more standardized and probably of uniformly higher quality (this opens up possibilities of special federal funding). However, local campus control over educational

size of the potential market for high quality technology-based training is enormous, and some group--public or private--will arise to fill this need.

Tough's work in adult informal education indicates a yet larger potential market for educational services. Cross-cultural surveys indicate that 90% of adults conduct at least one major learning effort per year, with the median person conducting five separate projects per year averaging one hundred hours each.[23] About twenty percent of these projects are planned by a "professional" (someone paid, trained, or designated to facilitate the learning); almost all other projects are designed solely by the learner. The communications technologies offer the potential for delivering tailored, informal experiences to this very large group of potential clients.

The new information technologies, then, can provide alternative forms of delivery which reduce the constraints on learning that many adult and working students face. Often, these media demand modifications in the instructional process to be effective (e.g. the disastrous "talking heads" approaches on television), but the functionalities described earlier seem to be powerful enough to render even long-distance learning interesting if properly applied. The new revenues and students such instructional systems would generate could more than pay for the capital costs and retraining needed to initiate these technology-based approaches.

Implications for Higher Education

These developing technologies illustrate what could be done to change the existing instructional model in higher education. All the necessary hardware currently exists; the software does not. What would

content would be somewhat diminished, and the need for quality control in curriculum development would be very high.

Summary

As the implications above illustrate, the use of instructional technology in higher education would be a mixed blessing. On balance, however, the monetary savings and increased market share such innovations would create make them attractive avenues for exploration. A first step might be to initiate some pilot projects designed to research:

1. the degree to which these technologies can each be used in training-oriented courses,
2. the optimal mix of these different types of educational devices,
3. the "side effects" such technologies have on the sociology of the classroom environment, and
4. the best organizational structure for coordinating multi-campus technological networks.

Education has traditionally been one of the sectors of society most resistant to technological change. Now that information management technologies are becoming cost-effective, higher education should take the lead in exploring their possibilities, especially given the concentration of information the economic challenges of the 1980s.

ECONOMIC IMPACTS ON HIGHER EDUCATION

The financing of higher education and demand for its services are intricately interconnected to the health of the national economy. A detailed forecast of economic trends in the 1980s is beyond the scope of this paper; certainly, developments in this sector are less predictable than demographic or technological change. However, some macro-level statements can be made about "human capital" investments and the work force in the next decade. A sense of the likely range of economic futures for the U.S. can also be delineated, to indicate the amount of flexibility needed in strategic planning for educational finance.

Higher Education as an Investment

To some extent, the choice to attend a college or university is an economic calculation. The costs of higher education (both direct and in foregone earnings) are compared to likely benefits in occupational access and long-term enhancement of income. Historically, these benefits have been high; a number of emerging trends, however, threaten to reduce these incentives for prospective students.

First, much of the recent growth in the size of the labor force has come from increased female participation. Estimates are that fifty-six percent of U.S. women will be in the labor force by 1990, a participation rate for females in the prime working-age bracket (20-54) of seventy-five percent. At present, however, women as a group have much lower earnings than men (in 1974, the median wage for women working full-time was only 57 percent of the male median).[24] This situation is not improving, as increasing their educational attainment has unfortunately not helped women to equalize their salaries relative to men. A college-educated woman

earns approximately the same amount, on average, as a white male who has only completed elementary school.

This disparity is partially due to discriminatory forces in high status occupations, but also reflects the fact that women workers tend to be clustered in a few occupations--primarily clerical, nursing, and teaching jobs--which are not highly salaried. The "bottom line" is that, from an economic point of view, women have less to gain from increased higher education than men do; similar arguments can be made for minority groups. Yet, recruitment of women and minorities is very important if colleges and universities are to counter future problems of declining student population.

A second factor that will reduce the financial attractiveness of higher education is that underemployment is increasing, as the number of educated persons grows more quickly than the number of jobs which require academic training. For example, by 1992, about 22 percent of the labor force will have four or more years of college, compared to 16 percent today and 7 percent twenty-five years ago. As a result, a college education has rapidly become no guarantee to a high salary; in fact, between 1970 and 1975, the wages for high school graduates ages 25-34 increased 32% while those of comparable college graduates rose only 19%. Over the last fifteen years, the proportion of male college graduates who have had to settle for non-professional/non-managerial jobs has increased threefold; the proportion of women has grown fourfold. Based on these trends, the U.S. Bureau of Labor Statistics projects a "surplus" of college graduates reaching 140,000 annually by 1985. Students attending colleges and universities in the 1980s will need to be given both realistic

expectations of their employment possibilities and skills in life planning to help them cope with potential underemployment.

One factor which may help alleviate a drop in student enrollment caused by underemployment is that a "promotion squeeze" may develop by 1990. The concentration of workers in the 25-45 age bracket will be very high (52% of the labor force), and the ratio of younger workers to senior workers (who generally occupy the higher positions) will therefore increase sharply. In 1972, for example, there were only 98 workers 35-44 years old for every 100 workers 45-54; by 1985, there will be 142.[25] As career ladders become severely congested, many frustrated workers may use higher education as a route to midlife career change.

A third disincentive to college and university enrollment is that total discretionary income for U.S. households peaked in 1972, and in recent years has declined markedly under the impact of inflation. Drops in discretionary income have a significant effect on the public's ability to support higher education through tuition, taxes, and contributions. Minority families are especially hardhit by this problem, as the income gap between white and black families historically grows in times of economic difficulty. Thus, since inflation will continue at record rates (as later discussion will indicate), the ability of families to make a "human capital" investment in higher education may decline.

The Range of Economic Futures for the U.S.

The 1980s are likely to be a time of major economic instability and uncertainty, as chaotic a period as has existed since the 1930s. On the domestic level, pressure will increase for protection of American jobs by limiting foreign imports, even at the cost of forcing consumers to buy

higher priced goods. Long-term, this may strengthen the eroding American industrial base and provide needed capital for investment. Short-term, protectionism will contribute to the inflationary spiral and may have serious international repercussions as other countries take similar steps in response.

Globally, economic interdependence has become so profound that small scale disruptions in a minor country may culminate in grave worldwide economic difficulties. Oil supplying nations are one obvious example; less well known is the potential impact of defaults on indebtedness by countries such as Mexico, Brazil, Ecuador, or Turkey. (Brazil has accumulated such a large debt--primarily to U.S. banks--that two-thirds of its total export profits go to pay interest costs). A national or even global economic depression could be triggered should any of these countries suddenly repudiate their obligations.

No obvious short-term solutions are available to control these (and other) potential sources of economic instability or to limit the negative consequences should a crisis develop. The spectrum of potential economic futures for the U.S. in the 1980s is thus relatively broad, ranging from a slow reemergence into the prosperity of the 1960s to a sudden collapse into economic catastrophe. Even with its prosperity based on the comparatively secure energy, health, and information technology industries, Texas is vulnerable to economic disruption from these extra-state forces.

Perhaps the most "optimistic" probable future for the U.S. in the next decade is one in which technology and industrial productivity successfully meet the challenges that now confront the American economy. This scenario would have the following characteristics:

--The next five years are a period of national economic instability and uncertainty, with high rates of inflation eroding education's resource base and with intense competition among the human service sectors for limited amounts of funding.

--The five years following see the gradual reemergence of national economic prosperity, brought about by technological advances which relieve energy shortages and by large amounts of capital investment which increase American productivity.

--The political climate for augmenting educational funding becomes increasingly positive, as massive job retraining and the emergence of an information-based economy make "human capital" an attractive investment.

The other extreme--and we will call it "pessimistic," although some would prefer it to the first--presents a very different picture:

--The initial five years of national economic instability and uncertainty described above culminate in an economic collapse, as technology and technocracy prove impotent to solve resource and productivity problems. Inflation and unemployment both reach record levels; little money is available for education.

--Americans go through a period of intense reexamination of cultural values and priorities, as traditional problem-solving strategies prove useless in alleviating this crisis. A "transformational" society begins to emerge, stressing cooperation, environmentalism, humanism, and community at the expense of material affluence and high technology.

--The political climate for increased educational funding begins to improve, as Americans recognize the crucial need for education in attaining this new value system and in moving to a lower consumption lifestyle.

Neither of these extreme scenarios is likely to occur, but they do illustrate the endpoints on a continuum of probable futures for the U.S. in the next decade. One striking conclusion which can be drawn is that the range of possible futures which educational policymakers must be prepared to anticipate is relatively large and the level of uncertainty, particularly about secure funding for education, is unusually high. Hence, state plans for higher education will need a high degree of flexibility and a large number of contingency strategies to be effective.

Inflationary Pressures on Higher Education

How may such a variable and hazardous economic outlook affect the human service areas? Education, health, government, and the other labor-intensive service industries are likely to experience grave financial difficulties in the next decade. Certainly, a severe downturn in the national economy would adversely affect budgets in these areas; less obvious are the negative effects that a long period of high inflation would have. Considering the impact of inflation on colleges and universities in some detail can illustrate how a number of quantitative fiscal changes may interact to produce a profound qualitative shift.

Part of inflation's potential for grave damage occurs because citizens seem to be approaching the maximum percentage of their income that they are willing to spend for education (currently a little less than 9% of GNP). The aging of the population; the dwindling percentage of taxpayers

with students in college; and competition from the recreation, transportation, housing, food, and health sectors for the consumer dollar all are eroding potential funding for higher education. Developments such as serious consideration of Jarvis Proposition 2 in California (which would slash human service expenditures by one-third) indicate that the trend toward more funds for education may be starting to reverse, in part because of the erosion of consumer discretionary income discussed earlier.

Education's proportion of the tax dollar has continuously risen because, in periods of inflation, capital-intensive industries outperform labor-intensive sectors. For example, from 1965-75, the Consumer Price Index rose 69%, but educational costs rose 155%. Much of this can be attributed to salaries rising faster than capital costs. The continuous improvement of machines in efficiency stands in sharp contrast to recent low rates of increase in human productivity and is a key factor in this disparity.

For any sector of the economy, even small yearly reductions in budget cumulate to a major drain on fiscal resources fairly quickly. At present, inflationary losses for many educational agents are running at least fourteen percent per year (even with severe cost-cutting), but revenues are growing at only around seven percent per year: about a seven percent net debit. In ten years, an average seven percent loss per year will leave colleges and universities with one-half the revenues (in real terms) they now have.

Further, given the general economic woes society will experience from high inflation, higher education will not have a strong claim on social

priorities in terms of extra funding. Creating a favorable business climate, reducing stress on the poor, minimizing government spending, and coping with international tensions will take priority. Thus, even a high employment economic climate may well pose major problems for colleges and universities if inflation stays high; recession or depression would create even more severe difficulties.

Summary

Clearly, detailed regional economic studies would be useful in assessing the nation's likely economic status in the next decade. Such research might include:

--statewide projections of labor force size, composition, and occupational mix

--forecasts of underemployment and the vulnerability of each regions economy to national unemployment and inflation

--assessments of the relative effectiveness of various strategies in reducing the cost of higher education (including both capital-intensive and labor-intensive modifications).

The data from these studies would aid in the preparation of contingency plans for the market orientation and financing of higher education.

Conceivably, the economic problems discussed above will be smoothly resolved and there will be ample funds for higher education. However, the threat of high inflation coupled with problems of unemployment, resource depletion, and political instability could create a very difficult economic future. Beset by adverse changes in both demographics and finance, colleges and universities might then seriously have to consider shifting to the more capital-intensive, educational technology based model of instruction outlined earlier.

CHANGES IN EDUCATION'S POLITICAL CLIMATE

Forecasting shifts in the cultural and political context of higher education is very difficult. The attitudes of citizens are likely to be quite volatile in the next few years, as economic turbulence and technological advance create rapid, unstable social change. However, a few general statements can be made about probable changes in cultural beliefs and values, the political mood which these will engender, and the implications for colleges and universities.

The Cultural Context of the 1980s

Social instability and change and a growing sense of lack of control will create difficulties in coping for many people, as the technological and bureaucratic complexity of society increases and the economic situation worsens. Reliance on the advice of "experts" for most decisions will become increasingly necessary, yet citizens will resent making choices on the basis of blind trust. Universal socialization of the population to the multiple, higher-order cognitive and affective skills required for participation in society would help alleviate this erosion of democracy by technocracy (and may be essential to the proper functioning of a high technology society). However, many will be unwilling to allocate to higher education the major resources needed to do this socialization.

Heightened values conflicts will occur, as multiple special interest groups do battle on individual ethical issues such as abortion, individual rights and responsibilities, and biomedical manipulation. Perceived incapacities of technology and technocracy to deal with current crises will cause a major struggle between those who continue to espouse a narrowly

rational, high technology-based, materialistic "American Dream" and those who proselytize for a shift to a more adaptive, ecological, spiritual lifestyle. This conflict will reflect the uncertainty among Americans about whether the "optimistic" or the "pessimistic" economic scenario discussed earlier will prevail.

Planning, leadership, and self-renewal will become increasingly problematic for institutions, as responding to crises in the "here and now" consumes ever greater amounts of time and resources. One risk of this cultural anomie at a time of economic distress is the emergence of a charismatic dictator, who will use "rally around America" ideology as a basis for limiting diversity and pluralism.

Leadership will become very difficult in higher education, as multiple, continual problems drain resources. The strains which students experience in their lives will make maintenance of traditional academic standards almost impossible. A pervasive sense of lack of control will cause disillusionment, apathy, and cynicism about the possibilities of preserving the current college and university system.

Shifts in Politics and Governance

Financial pressure on citizens will intensify the existing "anti-taxes" movement, and business groups will attempt to link anti-regulatory arguments to this cause. The result will be a pervasive "reduce governance" stance. Conflicting pressures will come from those who push for "strong leadership" to ride roughshod over inconvenient regulations and safeguards. Representative democracy will thus be eroded by pressures both for localism and for unitary authority.

Public response to emerging resource crises (e.g. water) will continue to be directed toward programs for crash priority replenishment. These will tend to be oriented toward high technological sophistication rather than conservation measures involving lifestyle changes. Competition among federal (and state) priorities will become extremely intense, to the relative detriment of long-range needs and issues.

Demands for accountability and evidence of competence will force conservative decisionmaking and the proliferation of paperwork to document performance. These tendencies will create further problems in institutional ability to respond to change. Gains made toward increased citizen input into decisionmaking may be reversed as efficiency and effectiveness decline and public antipathy to red tape and slow decision procedures grows. "Academic freedom" and tenure will be seen as luxuries by increasing numbers of taxpayers.

Concern will increase about the relative economic and military status of the United States in the world. National defense will reemerge as a top priority area, and the performance of colleges and universities will be adversely compared to that of their counterparts in other countries. A tendency toward forceful action to ensure availability of key resources will be coupled with a belief that U.S. affluence is more important than global egalitarianism. Some conventional "police actions" may occur as a new, multiple country Cold War evolves. Should this take place, potential college and university students may instead be conscripted into military service, and an emphasis on high quality schooling for the intellectual elite is likely to reemerge.

Alternative student financing systems may well be considered as

federal funds become more constrained. Joseph Froomkin discusses three possible approaches in his book on federal policy in higher education: the laissez faire strategy, the Swedish model, and the eclectic system.[26]

--The laissez faire strategy would burden each student with the full cost of his higher education, using a system of public loans (conventional or income-contingent) and eliminating college and university subsidies from public expenditures.

--In contrast, the Swedish model assumes that all costs of post-secondary education are shouldered by the state, regardless of the family income of the student. Here, grants and very long-term, low interest loans would supplement current public subsidies from taxes.

--The eclectic model combines features of each by using government subsidies to encourage college and university students to study and work concurrently. The bachelors degree would become a six year program for many students, who would spend 25-30 hours per week in the workplace.

Whether any of these models are actually adopted, contingency planning should be done to evaluate their relative strengths and weaknesses, as the federal and state governments are both likely to begin examining current financing systems carefully.

In general, a temptation for federal policymakers will be to fund only immediate-impact, targeted programs as a method of building constituent support for educational funding by Congress. Such a strategy can only backfire eventually, as problems of colleges and universities worsen for lack of attention to their root causes.

Summary

Heightened tension, struggles among special interest groups, and a general vacuum of common purpose in the society will make the 1980s a very difficult time politically. Funding from traditional sources will become increasingly hard to obtain, as the historical role of higher education is seen as somewhat peripheral to current societal concerns. The autonomy of college and university governance could be threatened, as citizens demand efficiency in achieving relatively limited goals. To surmount these challenges, higher education will need to forge a new role in the 1980s, an overarching purpose which again makes it central to America's strength and prosperity.

NEW DIRECTIONS FOR HIGHER EDUCATION

The next decade does not appear to be a period in which colleges and universities can afford to cling to present approaches, hoping for American society to return to the educational attitudes and funding characteristic of the 1960s. Earlier in this paper, a shift in the current model of higher education toward capital-intensive, technological strategies was suggested as a potential new direction. Given generally conservative attitudes on what colleges and universities should be, how might such a change be justified?

One approach might be to define a new function for higher education. Colleges and universities, as a collective whole, would become responsible for coordinating knowledge production and distribution systems. That is, higher education, as the sector best equipped to accomplish these vital purposes, would:

- --coordinate the process of anticipating societal needs for knowledge
- --develop in educational institutions the capacity for training appropriate levels of human resources
- --assess the ability of current institutional research mechanisms for generating needed knowledge, and augment this capability where necessary
- --organize the dissemination to citizens of vital knowledge so that it is fully utilized

Such a mandate would include expanding educational services to all adults, using campuses, families, communities, the workplace, and the media. Intrinsic would be activities as diverse as helping develop TV programming to respond to a gasoline crisis, initiating long-range studies of "the

basics" needed by citizens in the next ten years, and participating in "partnerships for productivity" with industry.

Some of these activities now take place at varying levels of quality within colleges and universities. Others have been left to the "invisible hand" of economic self-interest. A lack of overall coordination and integration, however, has resulted in many of the emergent problems of the 1980s. For higher education to assume these central coordination responsibilities seems the best solution, because the production of knowledge and human resources is its primary function and this new role is entwined with its current goals and responsibilities.

Such a new goal transcends "fine tuning" of the existing system to give a simultaneous mandate for expanded services and a carefully limited set of objectively measurable priorities which colleges and universities are best equipped to execute. The costs of implementing these additional responsibilities may well be more than defrayed by the increased efficiency of integrated efforts and by the benefits in societal productivity that ensue. In fact, when compared to the results of a laissez faire approach for the past decade, this strategy provides such a potential strengthening of economic productivity as to be justified on that basis alone. Thus, this proposed change represents a discriminate augmentation of higher education's mandate based on cost/benefit considerations and arguments for efficiency and effectiveness.

What would need to be done to explore this potential new direction? First, a series of studies needs to be undertaken to determine and document the cost to society of not now coordinating:

1. the anticipation of societal needs for knowledge,

2. the development of human resources,

3. the generation of needed knowledge, and

4. the dissemination of knowledge to citizens.

Such studies could serve as the basis of a rationale for organizing the activities now taking place in these individual areas.

Second, the relative roles of individuals; corporations; educational institutions; local, state, and federal governments; and other social agents in knowledge production and distribution need to be delineated. In particular, the essentiality of a central coordinating role must be evident if public and private support is to be obtained.

Third, current college and university efforts to improve portions of the knowledge production and distribution process need to be assessed. The competence of existing programs in this area must be documented and their cost-effectiveness shown.

If such a rationale is carefully built and documented, the very trends that threaten the wellbeing of colleges and universities will become arguments for the priority of maintaining high quality higher education.

Perhaps some other new direction would be more appropriate. The key point is the necessity of determining how colleges and universities can be perceived as centrally important to the prosperity of the nation. Otherwise, even the best planning efforts will be met by indifference on the part of decisionmakers outside of education.

CONCLUSION -

All of education is predicated on images of the future. Educational research is tailored to the future contexts in which it is to be used, instruction is based on a vision of the world in which today's students will be decisionmakers, and college and university budgets assume that economic and demographic projections will be accurate. What does it mean for our daily work if the future seems ever more indeterminate and negative developments increasingly likely?

When people aren't certain about what's going to happen, or the future seems threatening to them, the natural response is to retreat into a psychological framework in which we say, "I don't know what's really going to happen, but the safest thing is to assume that at least some things will stay the same. These perennial issues are the areas in which I'm going to work; it's too risky to respond to a mere probability." So, almost all our current efforts are spent wrestling with "eternal" educational issues and problems. Perennial concerns are crucial and should absorb perhaps 70% of our resources, but the other 30% needs to be oriented toward resolving the uncertain future issues outlined above. The least speculative stance to adopt is to acknowledge and prepare for legitimate indeterminacy.

This paper has argued that major demographic, economic, and political disruptions are likely in the 1980s. The various research studies suggested in each section will be useful in anticipating these oncoming problems, particularly if these projects are integrated into an overall planning and monitoring system for higher education. Use of some such approach would be helpful in evolving a master plan which can move from reacting to

projected developments into shaping a new vision of what higher education can become.

The 1980s will be a grim period in part because America believed that a pre-college education was sufficient for most citizens, that a high technology society could be run by a small group of experts and staffed by a large group of people with rudimentary knowledge in "the basics." This assumption is obviously wrong; a complex society requires that each citizen be as intelligent and creative as possible. The costs to our society of not educating one person--in terms of crime, welfare expenditures, and foregone productivity--are far higher than the expenses of a good education from birth throughout life. For this reason, it is vital that higher education assume a more central role in the lives of citizens, thus laying the foundation for a bright future.

Footnotes

[1]These projections assume that future birthrates hover around the replacement level (i.e. 2.1 children per woman) and that women will have children in their early to mid-twenties. The projection assumes that females who are products of the "baby boom" will have fewer children later in their lives and that many will choose not to bear children. From Alternative Futures and Post-Secondary Education in Pennsylvania (Report R-39). Robert Johansen and Maureen McNulty. Institute for the Future. Menlo Park, CA, 1977.

[2]From Demographic Trends Influencing the Elementary and Secondary School System. Office of Technology Assessment, U.S. Congress. Washington, D.C., 1977.

[3]For a more extended discussion, see "Educational Challenges of the 1980s" by Robert G. Wegmann in Needs of Elementary and Secondary Education in the 1980s. Subcommittee on Elementary, Secondary, and Vocational Education, Committee on Education and Labor. Washington, D.C., 1980.

[4]College Enrollment: Testing the Conventional Wisdom Against the Facts. American Council on Education. Washington, D.C., 1980. Also see Three Thousand Futures for Higher Education, the last Carnegie Commission report.

[5]Derived from The Urban Predicament. William Gorham and Nathan Glazer, eds. The Urban Institute. Washington, D.C., 1976. "Texas Teacher Supply: A Crisis Ahead" by Clifton S. Harris at UT-Dallas cites

three projections of Texas demographics which may provide useful information for student population forecasts.

[6]U.S. Congress, Office of Technology Assessment. Computer-Based National Information Systems: Technology and Public Policy Issues. Washington, D.C.: Government Printing Office, 1981.

[7]Bell, D. The Coming of Post-Industrial Society: A Venture in Social Forecasting. New York: Basic, 1973.

[8]Machlup, F. The Production and Distribution of Knowledge in the United States. Princeton, NJ: Princeton University, 1962.

[9]Porat, M. "The Information Economy." Ph.D. Dissertation, Stanford University, Institute for Communication Research, 1976.

[10]O'Toole, J. et al. Employee Entitlements in the Eighties. Report F-38. Los Angeles, CA: University of Southern California, Center for Futures Research, 1979.

[11]Denison, E. "Explanations of Declining Productivity Growth." Survey of Current Business (August 1979): 1-23.

[12]Abbott, W. "Beating Unemployment Through Inflation." The Futurist (August 1978): 215-221.

[13]Goldstein, H. Training and Education By Industry. Washington, D.C.: National Institute for Work and Learning, 1980.

[14]Norman, C. Microelectronics at Work: Productivity and Jobs in the World Economy. Washington, D.C.: Worldwatch Institute, 1980.

[15]Levin, H. Economic Democracy, Education, and Social Change. Program

Report No. 79-B16. Stanford, CA: Stanford University, Institute for Research on Educational Finance and Governance, June 1979.

[16]Coates, J. A Mini-Assessment: Environmental Consequences of Developing Communications Technologies. Washington, D.C.: J.F. Coates Inc., 1981.

[17]Lipson, J. "Riding the Wave of the New Information Technologies: The Administrator's Role." Paper presented at EDUCOM Conference, October 1981, Kansas City, Missouri.

[18]Kay, A. A Dynamic Medium for Creative Thought: The Dynabook. Palo Alto, CA: Xerox Palo Alto Research Center, 1973.

[19]Dede, C. "Educational Technology: The Next Ten Years." Instructional Innovator (March 1980): 17-24.

[20]Dede, C. "Educational, Social, and Ethical Implications of Technological Innovation." Programmed Learning and Educational Technology (November 1981): 204-213.

[21]U.S. Department of Education, National Center for Education Statistics. Digest of Education Statistics 1980. Washington, D.C.: Government Printing Office, 1980.

[22]Fraser, B. The Structure of Adult Learning, Education, and Training. Washington, D.C.: National Institute of Work and Learning, 1980.

[23]Tough, A. "Major Learning Efforts: Recent Research and Future Directions." Adult Education (Winter 1978): 250-263.

[24] Handbook of Labor Statistics, 1975. U.S. Department of Labor, Bureau of Labor Statistics. Washington, D.C., 1975.

[25] The Demographic Context of Educational Policy Planning. Peter S. Morrison. RAND Corporation. Santa Monica, CA, 1976.

[26] Needed: A New Federal Policy for Higher Education. Joseph Froomkin. Institute for Educational Leadership Policy Paper Six. Washington, D.C., 1978.