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ABSTRACT

As part of the process of developing the reauthorization legislation for the Higher Education Act of 1965 and its descendants, the Subcommittee on Postsecondary Education heard testimony on questions pertaining to the postsecondary education pipeline and the requirements of the future work force. In particular the testimony addressed the questions of who is in the educational pipeline toward postsecondary education; what are the requirements of the future work force, particularly for persons with postsecondary education; and what are the challenges facing postsecondary institutions in their efforts to educate those in the education pipeline. On these questions, the following witnesses spoke: Arnold Packer, co-author, Workforce 2000; Anthony Carnevale, American Society for Training and Development; Carol Frances, Carol Frances Plus Associates; K. Scott Hughes of K. Scott Hughes Associates; Stephen Trachtenberg, President of George Washington University; Eugene Deloatch, Dean of Engineering, Morgan State University; and Ken Lay, International Business Machines, Director of International Education. The document also includes prepared statements, letters and supplemental materials from the witnesses as well as Stephen J. Blair of the National Association of Trade and Technical Schools, and E. Thomas Coleman, Representative to Congress from Missouri. (JB)

HEARING ON THE REAUTHORIZATION OF THE HIGHER EDUCATION ACT OF 1965—POSTSECONDARY EDUCATION PIPELINE

HEARING

BEFORE THE

SUBCOMMITTEE ON POSTSECONDARY EDUCATION

OF THE

COMMITTEE ON EDUCATION AND LABOR
HOUSE OF REPRESENTATIVES

ONE HUNDRED SECOND CONGRESS

FIRST SESSION

HEARING HELD IN WASHINGTON, DC, MAY 2, 1991

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HEARING ON REAUTHORIZATION OF THE HIGHER EDUCATION ACT OF 1965

THURSDAY, MAY 2, 1991

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON POSTSECONDARY EDUCATION,
COMMITTEE ON EDUCATION AND LABOR,
Washington, DC.

The subcommittee met, pursuant to call, at 9:40 a.m., Room 2175, Rayburn House Office Building, Hon. William D. Ford [Chairman] presiding.

Members present: Representatives Ford, Hayes, Gaydos, Sawyer, Payne, Unsoeld, Serrano, Mink, Andrews, Reed, Roemer, Coleman, Molinari, Klug, Goodling, Petri, Gunderson, Henry, Armey, and Barrett.

Staff present: Thomas Wolanin, staff director; John Jennings, education counsel; Diane Stark, legislative associate; Maureen Long, legislative associate/clerk; Gloria Grey-Watson, administrative assistant; Eliza Evans, staff assistant; Michael Lance, minority staff director; Jo-Marie St. Martin, education counsel; and Beth Buehlmann, minority education counsel.

Chairman FORD. I am pleased to convene this hearing of the Postsecondary Education Subcommittee as we begin the process of developing the reauthorization legislation for all of the Higher Education Act of 1965 and its descendents.

Today, we have a very distinguished panel of witnesses who are going to talk to us about three specific questions: who is in the education pipeline toward postsecondary education; what are the requirements of the future work force, particularly for persons with postsecondary education; and what are the challenges facing postsecondary education in dealing with those in the education pipeline, and to fulfill the requirements of the future work force.

We hope that these hearings will focus the subcommittee on the challenges of the future for postsecondary education. Our task, then, will be to shape or reshape the Higher Education Act of 1965 to help meet these challenges. I'm looking forward to the comments of the panelists and an opportunity for questions.

Mr. Coleman.

Mr. COLEMAN. Mr. Chairman, I ask that my statement be made part of the record, but just want to also welcome our witnesses and think it's extremely important for us as we approach reauthorization to know exactly who we're supposed to be trying to help and why. And I think this panel today will help us do that.

It's pretty obvious that we live more in a competitive environment. Worldwide technology is certainly a factor, and educational skills that one can receive in a higher education setting are going to be extremely important for not only today but tomorrow's training and employees.

So I look forward to the testimony, and, again, think this is a very logical place to start our reauthorization hearing process. Thank you, Mr. Chairman.

Chairman FORD. Without objection, his full statement will be inserted into the record.

[The prepared statement of Hon. E. Thomas Coleman follows:]

STATEMENT OF HON. E. THOMAS COLEMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MISSOURI

Mr. Chairman, I am pleased that the Subcommittee on Postsecondary Education will focus this morning's hearing on the education demographics underlying the Nation's work force needs and the implications for postsecondary education institutions as we approach the year 2000.

As we approach the 21st Century, an increasingly technology-driven economy will demand a more highly trained and skilled work force. Studies indicate that very few jobs will be created for men and women who are not literate, cannot use mathematics, and who cannot process information for basic problem-solving.

More and more workers will require postsecondary education for the higher skill requirements of new jobs and the typical worker will require additional training and retraining to adjust to rapid changes in technology and the economy.

Public elementary and secondary school education is currently plagued by deep structural problems—high dropout rates, particularly among for low income, minorities, and marginal levels of literacy and educational attainment even for the 80 percent who do complete a high school education. Not only are too many high school graduates under-prepared for the challenges of the work force, but today's economy can no longer absorb workers with only high school diplomas.

What we need to know and what this hearing will address is "who is in the education pipeline?" and, "what are the challenges facing postsecondary education in preparing those in the pipeline for new skills, the new jobs, and the new and greater challenges of the American work force in the year 2000." I look forward to hearing the testimony of the witnesses and hope that we will have answers to these very important questions, as the subcommittee reauthorizes the Higher Education Act during this Congress.

Chairman FORD. Mr. Gaydos.

Mr. GAYDOS. Mr. Chairman, all of us know that education plays a direct role in the quality of life of our Nation's work force; and that is whether it is to learn the basic skills necessary to obtain a first job, or to learn additional skills necessary to perform a job better.

It's essential to understand that our work force must have access to educational programs of all types. Specialized training in engineering at a graduate school, down to job specific training such as carpentry or plumbing, or a training school.

We must insure that the men and women in our work force have this access, and we must insure that resources are available to make education as such an economic reality for all of them.

I want to thank the chairman for having this hearing regarding the needs of our work force. Hopefully, when we begin consideration of the reauthorization legislation we will avoid making decision that might be counterproductive to insuring that we have a well qualified work force, and that our work force can compete with those of other countries on the international field.

I want to thank the chairman, and I yield back the balance of my time.

Chairman FORD. Mr. Barrett.

Mr. BARRETT. I would want to add that it is an honor for me to be a part of this subcommittee and in its efforts to reauthorize the Higher Education Act of 1965.

I believe, as the Washington Post editorial said some time in February, that this action could easily be the most important social legislation of this Congress. Although I don't always agree with the Post editorials, I certainly must totally agree with that statement.

Thank you, Mr. Chairman.

Chairman FORD. Thank you. Are there any further opening statements? Mr. Payne.

Mr. PAYNE. Thank you very much, Mr. Chairman. Let me also commend you for calling this hearing about the demographics of the reauthorization of the Higher Education Act.

Many circumstances have changed since the last reauthorization in 1986. The numbers of nontraditional students, which include older and part time students, has increased dramatically. Low income and middle income families are finding it increasingly difficult to find the money to send their children to college.

Additionally, there are new requirements for the American work force. As we approach the year 2000, we must recognize that we need more postsecondary students to study mathematics, science, and engineering. This means that there will have to be a commitment to developing these programs and institutions nationwide.

Mr. Chairman, I look forward to this series of hearings on the reauthorization of the Higher Education Act, as there are many important issues to cover. Also, I look forward to hearing from our distinguished list of witnesses who will be giving their testimony. Thank you very much.

Chairman FORD. Thank you. Now, Mr. Reed.

Mr. REED. Thank you, Mr. Chairman. I, too, am very happy to participate in these very important hearings. I've had the occasion to participate in a field hearing already in Providence, Rhode Island with respect to this legislation, and several disturbing trends emerged from that hearing.

First, it appears that middle class working families are being inexorably squeezed out of the educational market by the accelerating cost of higher education.

Second, there seems to be a tremendous gap between the numbers of engineers and scientists we will need in the future and the number of people who are engaged now in study to prepare themselves to be engineers and scientists.

And, finally, there is a very disturbing trend in which we don't have sufficient numbers of women and minorities who are preparing themselves to enter the fields of science and technology.

And, indeed, it's somewhat ironic that this afternoon we will be considering the NASA authorization bill. Without scientists and engineers and mathematicians, we won't be able to be preeminent in space or in any other high technology field in the future.

These hearings that you're holding are absolutely critical to the future of our country, and I'm pleased to participate. Thank you, Mr. Chairman.

Chairman FORD. Mr. Roemer.

Mr. ROEMER. Thank you, Mr. Chairman. I, too, am happy to be here and happy to see the excellent panel that we have before us today. And, Mr. Chairman, I just want to reiterate that this Education and Labor Committee assignment was my very first choice when I was elected to Congress. I campaigned on the issue of fairness for middle class families that had been squeezed when they have two and three children that are trying to get into college.

This is also a question of priorities. Last week, in the Science, Space, and Technology Committee, I spoke out against the 10 percent increase for NASA and a space station because we need to make tough decisions and priorities on education and on our work force of tomorrow today.

And I think that this bill that we will consider over the next three or four month period will have tremendous consequences for our economic competitiveness, our fairness issues, and whether or not we make it as a competitive country in the world in the next ten years.

So I'm excited about this hearing and working with the chairman over the next four to five months. Thank you, Mr. Chairman.

Chairman FORD. Mr. Andrews.

Mr. ANDREWS. Thank you, Mr. Chairman. When I was back in my district last weekend, someone asked me if there was a long term economic growth program or agenda in Washington. I told him, yes, there was; it was the Higher Education Reauthorization Act.

And I think it's commendable that we're beginning these hearings in Washington by focusing with this excellent panel today on the fruitful benefits and the growth benefits of reinvesting in our higher education system. I anxiously await what each of the panelists has to say.

And, Chairman, I thank you for kicking these hearings off by focusing on what I think is the singular and primary point before us, which is that if we're going to maintain and enhance the quality of life for every American, then there has to be access to higher education for every American, quality higher education. And I look forward to hearing from our panelists today, and I thank you, Mr. Chairman.

Chairman FORD. Any further statements?

Mr. HAYES. I, Mr. Chairman.

Chairman FORD. Mr. Hayes.

Mr. HAYES. I would like, too, to commend you. It's difficult to hide me given my expansive structure, but I do want to say, Mr. Chairman, that I would like to commend you for convening these hearings. In deference to the time of these important witnesses and the fact that there are three hearings of which I'm a part of, so I'll be moving in and out, I'd just rather hear as much as I can of this first panel.

Chairman FORD. Mrs. Unsoeld.

Mrs. UNSOELD. Mr. Chairman, ditto.

Chairman FORD. Thank you. I think I should make a very brief statement about what we're up to here and what has gone on so far. Mr. Coleman and I, very early this year, as soon as we were reasonably sure what our respective positions were going to be on

this committee, sent a joint letter to over 150 organizations that speak for or purport to speak for the interests of higher education. In that letter we asked them to give us their best advice on what we should be doing for the future of higher education policy at the Federal level by April 18.

We asked for specifics, and we've got specifics. We've got enough to write several books, actually. And the responses were almost overwhelming. They're at the printers now; they've been collated into a comparative study so that everybody, when they're redistributed, can see what the other group is suggesting and what the rationale is for their suggestion.

This is a process that was followed in the last two reauthorizations, each of them culminating in a five-year reauthorization.

We have no preconceived notions about the form of the bill. There is no Chairman's bill before us. There is no President's bill before us. There is no Bill Ford or Tom Coleman bill before us. We're talking at this point about what we need to know before we draft a bill that makes sense. And someplace along the way in this process every member of this committee will have an opportunity to contribute to what will finally become a product of the committee's work, not a product of the Democrats or Republicans or the Congress or the President in the abstract.

But we are not likely, as we go along, to go through the usual futile exercise of a pending piece of legislation with five people lined up to say it's great and another five people lined up to follow them and say it's terrible. And this is the process that's usually used around here.

Mr. Coleman and I occupied our respective positions several years ago in reauthorization. We went through this process and discovered that it was possible to get a tremendous amount of cooperation and input from members of the education community by following this scenario.

And that's where we look down the road. So if somebody's looking to see what our secret plan is up our sleeve, we don't have one. We're really serious about the idea that nothing is sacred that is in the present law. Some of it is really wonderful prose because I wrote it. But it doesn't matter who wrote it if it doesn't work anymore, if it doesn't work well, or if it isn't what we need for the future.

As I stated, there is nothing sacred, nor is there anything condemned because of where it comes from. We don't care where an idea comes from if it has merit and it will contribute to a good product.

And we have invited this administration, which has indicated a great deal more interest than the previous administration did when we did this the last time, to work with us in helping develop the legislation.

So I look forward to developing a bill, having it passed, and having it signed by the President within the next year.

Mr. COLEMAN. Will the gentleman yield?

Chairman FORD. Certainly, Mr. Coleman.

Mr. COLEMAN. I certainly concur in the Chairman's statement, and want to point out that I believe it's not only refreshing but extremely important that Bill Ford, who is the architect of much of

what is current law and has been for a number of years, is prepared to hold this legislation up to look at it in the clear light of day and see if it must be changed to adapt to new not only demographics but to new needs and concerns.

I think that's a sign of very strong leadership, and I'm glad to be able to work with Mr. Ford in this capacity because we have been able to work together in the past. There is no reason for this to become a partisan issue or a philosophical issue. And I believe that it can be accomplished.

I also want to say that I think this administration will be a player. They are interested. We have met with Secretary Alexander informally on several occasions already about this subject. And unlike the last three authorizations, very frankly, the past administration did not make any presentations or suggestions. This one will.

And I'm glad to hear that the Chairman is going to give that opportunity to participate in the process and to eventually, as we come together, get the best ideas from all over so that we might incorporate them into this very important them into this very important piece of legislation.

So I look forward, Mr. Chairman, to working with you on a very long hearing process, but an important one, and hope that at the end of this process we will have a bill like we did the last time, which passed overwhelmingly in the House and was adopted into law.

Thank you, Mr. Chairman.

Chairman FORD. I thank you. Mr. Packer, do you want to lead off?

Mr. PACKER. Thank you, Mr. Chairman.

Chairman FORD. I bet you thought we'd never get to you.

STATEMENTS OF ARNOLD PACKER, CO-AUTHOR, WORKFORCE 2000, EXECUTIVE DIRECTOR, SECRETARY'S COMMISSION ON ACHIEVING NECESSARY SKILLS, U.S. DEPARTMENT OF LABOR; ANTHONY CARNEVALE, CHIEF ECONOMIST AND VICE PRESIDENT, AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT; CAROL FRANCES, CAROL FRANCES PLUS ASSOCIATES; AND K. SCOTT HUGHES, K. SCOTT HUGHES ASSOCIATES

Mr. PACKER. Well, it is a pleasure, Mr. Chairman, to testify before you this morning. I'm the Executive Director of the Secretary of Labor's Commission on Achieving Necessary Skills, or SCANS. Previously, while at the Hudson Institute, I co-authored the Workforce 2000 report.

The question is what do these two projects say about the challenges facing postsecondary education. In the words of your invitation, "What do we know about who is in the education pipeline, and what will be required of the future workforce?"

Let me summarize briefly the two bodies of work. The challenge for the Nation's education system, the full system, is to insure that every American, and I underline "every", is equipped with the competencies to function in the economy of the next century.

We have a choice, as the previous Commission has stated, between a high-skill, high-wage economy and a low-skilled, low-wage

situation. And the bill that you're working on will decide, in part, which choice is made.

In Workforce 2000, we looked at the demographics and found, of course, that the new labor force growth will be smaller than the previous one, and that the minority fraction of the new workers will be greater in the future than it has been in the past.

The bottom line of the Workforce 2000 project is that we have a gap of about 25 million workers whose skills have to be upgraded by almost 40 percent if we are to be on a productivity path that's close to what we've done in the past and on what the administrations budget projections are based.

Only 10 percent of that gap is due to changing demographics. More than half is due to the increasing demands on the work force as we compete in an international market.

These concerns prompted the Secretary of Labor, then Elizabeth Dole, to establish the SCANS Commission a year ago. The panel is chaired by former Senator and Secretary of Labor Bill Brock, who I think is well known to this committee. It is composed of 30 other commissioners, all of whom are leaders from business, education and labor.

The work of the Commission is integral to all four parts of the President's education strategy, as described in America 2000, released last month. Workplace competencies that SCANS is considering will become part of the new world class standards and the American achievement tests that are put forth in the President's program.

We hope that SCANS' concepts will be contained in many of the new generation of American schools that the President has proposed. And SCANS is central to making us a Nation of students which is more related to the concerns of this committee and the legislation.

As the President indicated, learning is a lifetime effort whose purposes extend beyond just making a living. But the SCANS' purview is limited only to the making a living portion of the learning process.

Our task is to assist students, educators, employers and parents by determining the skills needed for employment on a career path. This is out of the hamburger flippers to a job that one can expect to yield a decent living.

The Commission will calibrate these skills be defining the minimum proficiency required for such jobs, required by everyone who will go to work, whether immediately after high school or after going to a postsecondary institution.

The Commissioners addressed this task, informed by the findings of the cognitive scientists that demonstrate that learning is most effective when done in context. Students learn to read and write better and faster when they solve problems that are interesting and relevant to them.

This finding is especially true if the system is to serve all students, including those who need to see relevance before they can do well in academic subjects. If the education system's purpose is to include, and not to exclude, those who begin without the advantage of educated and privileged parents, then teaching them the context of the world of work must be present in every school's curriculum.

Later this month, actually two weeks from tomorrow, the Commission will discuss a draft of our first report. We will include in that report the minimums and some description of assessments which we believe will fit into the President's program for assessing those in the 12th grade.

We expect that those assessments will be used by colleges for admission. And employers will also pay attention to those same assessments, the employers concentrating on the knowledge and skills related to job performance.

We expect that all students will be able to acquire the assessed skills with study. That's very different from intelligence tests which are affected by a host of things. These will be things that one can learn if you work at it.

It also is not going to be marked on a bell curve. That means every student is expected to achieve these competencies.

This is a far cry from where we are today. One of the problems is the lack of knowledge about what the skills are that are necessary. Ask any teacher in the United States what it takes to prepare a young person for entry into a four year college, and you will most likely get a clear and effective answer.

There is no such clarity of response when asked how to prepare youngsters with the knowledge and skills needed for employment. That is the work of the SCANS Commission. In order to tell teachers and students what knowledge and skills are needed, we are trying to define job related competencies; maybe know-how is a better word.

The know-how will be needed for jobs found throughout the economy, from manufacturing to health care to financial services, to restaurants and retail stores. And they will be competencies that are needed at all stages in a person's working life, from entry level to the executive board room.

We are not, and I emphasize that, talking about vocational education or skills needed only by those who will go directly to work. As the President's example of becoming computer literate himself so vividly illustrates, we are talking about all students.

To turn directly to the postsecondary situation and the pipeline, we expect SCANS to play a major role in part three, which urges the rest of us to become a Nation of students. America 2000 states that business and labor will be asked to adopt a strategy to establish job related skill standards built around core proficiencies. Those core proficiencies are the fundamental categories and definitions developed by SCANS.

It is possible to speculate on how the strategy will transform the postsecondary school challenge. In the year 2000, if I can ask you to imagine what it might be nine years from now, 18-year-olds from feeder high schools will be entering colleges and other postsecondary institutions after having achieved SCANS competencies, so students will be very differently prepared than they are today.

Some of these students will already know what sorts of jobs and industries they are considering. They will look to postsecondary institutions for help in obtaining the competencies required in their industry of choice. Older students who graduate, say, this June, will respond to the President's call to become a Nation of students. Some of those older students will want to acquire even the entry

level competencies defined by SCANS, and others will want to reach higher levels of proficiency.

It is, of course, necessary to improve the knowledge and skills in all educational institutions. The goal is to expand the knowledge, skills, competence, and potential for growth of each student. Given this purpose, the fact that students will be periodically assessed on core subjects, learning these in the context of work can be an integral and productive component of a national effort.

Asking employers to constantly reevaluate and suggest modifications to the SCANS competencies will involve American enterprise in support of constant educational improvement. This will be particularly important as the SCANS skills are translated into work force training by American business that's going to be delivered throughout workers' lives.

Some people have talked about a seamless process of American education, perhaps a more apt metaphor is that of a woven tapestry within which the teaching of these skills needed for productivity on the job are integrated with learning for effective citizenship and for fulfilling personal growth. That, we believe, is the message and the mission of SCANS.

Thank you for the opportunity to participate. I'll be happy to answer any questions you might have.

[The prepared statement of Arnold Packer follows:]

STATEMENT OF ARNOLD H. PACKER
EXECUTIVE DIRECTOR
SECRETARY'S COMMISSION ON ACHIEVING NECESSARY SKILLS
BEFORE THE
SUBCOMMITTEE ON POSTSECONDARY EDUCATION
COMMITTEE ON EDUCATION AND LABOR
U.S HOUSE OF REPRESENTATIVES

MAY 2, 1991

Mr. Chairman and Members of the Subcommittee:

It is my pleasure to testify before you this morning. I am the Executive Director of the Secretary's (of Labor) Commission on Achieving Necessary Skills (SCANS). Previously, while at the Hudson Institute, I co-authored the *Workforce 2000* report, an effort funded by the Labor Department.

What do the *Workforce 2000* and SCANS projects say about the challenges facing postsecondary education? In the words of your invitation, what do we know about who is in the education pipeline, and what will be required of the future workforce?

Before getting into the details, let me summarize the findings of those two bodies of work. The challenge for the nation's education system is to ensure that <u>every</u> American is equipped with the competencies to function in the economy of the next century. In the language of National Education Goal #3 (as agreed to by the President and the nation's governors) "...Every school in America will ensure that all students...be prepared for... productive employment in our modern economy." National Education Goal #5 states that "by the year 2000 every adult American will be literate and will possess the knowledge and

skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship."

Nearly four years ago, my colleague Bill Johnston and I wrote *Workforce 2000: Work and Workers for the 21st Century.* This study suggested that the skills gap is constraining economic growth in the United States. The bottom line of *Workforce 2000* is that our economic future depends on improving "the educational preparation of all workers." Rapidly changing technologies are making jobs obsolete overnight. Markets in a globally linked economy change unexpectedly, in ways that dislocate businesses and workers.

Workforce 2000 also documented important demographic facts about the coming changes in the workforce:

- Over the next decade, the American workforce is projected to grow at the slowest rate since the 1930s. A workforce that grew by 24 million people in the 1970s is projected to grow by less than 16 million in the 1990s. Employers will no longer be able to skim the most highly skilled workers off the top and ignore the rest. They -- and the rest of us -- will need to rely on all workers to fill jobs demanding sophisticated skills.
- The average age of the population and the workforce is projected to rise and, correspondingly, the pool of young workers will shrink. The average age of the workforce will rise from 36 to 39 by the year 2000.

- New entrants into the workforce will increasingly be women, minorities, and immigrants, many of whom have been poorly served by the current system of education and training. They will comprise a substantial proportion of the new additions to the workforce by the year 2000. About a third of the new workers will be minorities and a third will be white women.

There will be rapid changes in the nature of the job market. The fastest-growing jobs are projected to be in professional, technical, and sales fields. They will require higher education and skill levels. Skill, rather than seniority, will become increasingly important in determining income. Over half the new jobs will require some college.

In research subsequent to the *Workforce 2000* project, Bill Johnston and I compared the skills that will be demanded by a healthy U.S. economy in the year 2000 with the skills of today's young people, those 21-25 years old. Our research disclosed a massive skills gap. That is, if, and I emphasize if, we are going to improve productivity in the United States, then skills will have to improve. We estimate that closing the gap will require upgrading the skills of 25 million workers in the 1990s. Using a U.S. Department of Labor scale, we found that the U.S. will need to improve the skills of those workers by 38 percent. Only 10% of the gap is the result of demographic change. More than half of the gap is due to increasing demands of the new workplace.

The current education system will neither keep the United States competitive in the global marketplace nor provide a rising standard of living here at home. The entire system -- from pre-school toddlers to graduate education and continuing education for mature people who are already in the workforce -- needs improvement.

These are some of the reasons why President Bush has proposed a new education strategy. The strategy has four parts: creating better and more accountable schools for today's students; creating a new generation of American schools for tomorrow's students; transforming America into a nation of students; and making our communities places where learning happens.

Clearly, Parts I and II of the President's strategy will affect the pipeline that leads from the high schools to postsecondary education. Entering students will be better prepared for college-level work. Part III, as described later, will alter the demands placed on postsecondary education by specifying the skills needed by employers.

A year ago, the same concerns over American productivity and education led to the creation of the Secretary's (of Labor) Commission on Achieving Necessary Skills, or what we call SCANS. The panel is chaired by former Senator and Secretary of Labor William E. Brock. It is composed of 31 Commissioners, all of whom are leaders from business, education, labor, and government. (I have submitted a copy of our mission statement and a list of

the SCANS commissioners for the record.)

The work of the SCANS Commission is integral to all four parts of the President's education strategy as outlined in *America 2000*. Workplace competencies identified by SCANS will be considered in developing the New World Class Standards and the American achievement tests, as described in Part I, and we hope that SCANS concepts will be contained in many of the 535 "New Generation of American Schools." (Part II) SCANS is central to making us a "nation of students." (Part III) Finally, SCANS can encourage employers to participate in every community's effort.

As the President indicated, learning is a lifetime's effort whose purposes extend beyond just making a living. One also has to learn how to be a good citizen. Education "...is also about making a life." SCANS' purview, however, is limited to the "earning-a-living" part of the learning process. This limit should not be construed as restricting SCANS' findings to vocational education or to those not going on to postsecondary education. As I noted before, National Education Goal #3 requires that the education system be evaluated in terms of its ability to equip <u>all</u> students to work in tomorrow's economy.

The Commission's effort is concentrated on the education that takes place after elementary school and before the end of one's working life, including a primary focus upon middle school and high school.

SCANS' task is to assist students, educators, employers, and parents by determining the skills needed for employment on a

career path. The Commission will calibrate these skills by defining the minimum proficiency required for such jobs; required by everyone who will go to work, whether immediately after high school or after attending postsecondary institutions. SCANS' Commissioners are wrestling with the challenge of specifying the minimum proficiency acceptable for students beyond the mandatory school age (generally 16).

SCANS will also ask whether the required knowledge and skills can be taught and measured. It is our belief that the answer is in the affirmative.

The Commissioners addressed this task informed by the findings of cognitive scientists, such as SCANS Commissioners Lauren Resnick and Tom Sticht, that demonstrate that learning is most effective when done in context. Students learn to read and write better and faster in the context of solving interesting and relevant problems. It is our very strong belief that students learn more when they understand the relationship between what they are being taught and what will be required of them in the world of work. Simply put, greater learning takes place within the context of the students' understanding of the world of work.

This finding is especially relevant if the education system is to serve all students, including those who need to see relevance before they can do well in academic subjects. If the education system's purpose is to include -- not exclude -- those who begin life without the advantages of educated and privileged parents, then teaching in the context of the world of work must

be present in every school's curriculum.

Later this month, SCANS Commissioners will discuss a draft of SCANS' first report; so the following only reflects initial considerations and some conjectures on my part. Indeed, even when the report is published SCANS will solicit opinions around the country that may change some views before the Commission wraps up its work in February 1992. These conjectures, therefore, do not represent either the Commission's final judgment or Administration policy.

Let us imagine the challenge to post-secondary education at the turn of the century in "America 2000." School and work have been restructured and both institutions are far more productive than they are today. Students of all ages learn more per hour in schools of all sorts and all workers earn more per hour at the job. Postsecondary institutions of all types are receiving young students from high school and serving older students who are already at work or looking for work.

SCANS and the High School Pipeline

Let us begin with those in middle school and high school, part of the pipeline that feeds both higher education and work. All students are studying the five core subjects enumerated by the President: English, mathematics, science, history, and geography. The students are continuously being assessed in these subjects. Formal nationally comparable assessments -- the American achievement tests -- are being made in the 8th and 12th

grade. Assessment serves both to guide instruction and to certify competency. For example, the assessment taken in the 8th grade indicates where students need to exert more effort if their high school years are to lead to higher education and/or a career.

Daily, less formal assessments are guiding teachers and students alike. Learning to play the piano or violin is a good analogy. The formal assessment comes at the recital but the informal assessment is instantaneous and continuous at each rehearsal.

Assessments of students' competency in the 12th grade are being used by colleges for admission. Employers are also paying attention to the 12th-grade assessments in their hiring and placement decisions. Employers are concentrating on assessments of the knowledge and skills related to job performance. Importantly, all students are able to acquire the assessed skills with study (unlike, for example, intelligence as measured by IQ tests).

Thus, as stated in *America 2000*, standards in the five core subjects "incorporate both knowledge and skills to insure that, when they leave school, young Americans are prepared for further study and the work force." This goal is yet to be fulfilled, especially for those who will leave high school this June and move directly into the workforce. Whether they are dropouts or high school graduates is almost immaterial. They are not being given the skills adequate to the task before them or adequate to

their potential for future growth.

Ask any teacher in the United States what it takes to prepare a young person for entry into a four-year college. Most can give you a very clear and effective answer. There is no such clarity of response when asked how to prepare youngsters with the knowledge and skills needed for employment.

That inability to respond is not limited to teachers. Business has never communicated its needs clearly and coherently. That is the work of the SCANS Commission. In order to tell teachers and students what knowledge and skills are needed for employment, the Commission is seeking to define job-related functional (or career) competencies -- or know-how. The competencies will be needed for jobs found throughout tomorrow's economy -- from manufacturing to health care to financial services to restaurants and retail stores. The appropriate competencies will be needed at all stages in a person's working life -- from entry level to the executive board room. We are not, I emphasize, talking about vocational education or skills needed only by those who will go directly to work. As the President's example of becoming computer literate so vividly illustrates, we are talking about all students.

At our meeting, two weeks from tomorrow, SCANS' will consider five sets of competencies. As verified, by job-holders and their supervisors in our field research, these five SCANS competencies include such things as: allocating resources (managing time with schedules, allocating money through budgets,

designing space layouts, and assigning staff to various tasks); using technology (selecting, applying, and maintaining equipment or processes); using information: (finding, evaluating, and communicating information, writing reports, and using computers for these tasks); understanding systems (understanding interrelationships, predicting consequences and correcting performance, and improving or designing systems); and interpersonal behavior (teamwork, leadership, teaching, negotiating, serving customers, and working with cultural diversity).

The five competencies rest upon a foundation that includes the basic skills such as the Three R's of reading, writing, and arithmetic, and mathematical reasoning, speaking and listening; higher-order thinking skills such as problem-solving, decision-making, knowing how to learn, reasoning, mental visualization, and creativity; and personal characteristics and motivation such as responsibility, integrity, self-esteem, social skills, and self-management.

The challenge then is to teach these SCANS' competencies and their foundation as an important part of learning the five core subjects. Then schools will build an educational system with greater relevance, interest, and challenge. They can do so while teaching the five academic core subjects using "real world" examples. Let me illustrate what we mean.

The principles of allocating resources could be taught in almost any of the five core subjects. Consider schedules, for

example. The skill of managing time is needed in most jobs throughout the economy and at all stages of a career. It can be as simple as arranging one's own time or as complicated as planning the logistics for Operation Desert Storm. Imaginative teachers might teach this skill in their mathematics and/or history courses.

Interpersonal skills could be covered in any of the five core subjects where the school uses cooperative learning (where groups of students are jointly assigned a problem and their joint solution is evaluated). In these classes, students would be asked to demonstrate that they can work in teams, teach and lead their classmates, negotiate, and work with cultural diversity.

Clearly, these are just examples. Each school will decide what works best in their community, with their staff, and with their students. Some teachers, when outlining responsibilities at the beginning of the term might say: "You will have two exams and a final, write a paper, work on a project in a group, and teach one unit. It will be your responsibility to see that your fellow students do well in the final on the unit you will teach. Teaching is an important competency: SCANS research has found that most workers -- from nurses to salespersons to corporate executives -- do some teaching of patients, customers, or subordinates."

Clearly, as students advance they will become more proficient in each of SCANS' five competencies (resources, technology, information, systems and interpersonal skills).

Performance in the 12th grade will be superior to that in the 8th. Performance after postsecondary school or after workplace-based training programs will be at a still higher level.

SCANS and Postsecondary Education

SCANS plays a major role in Part III of the President's strategy which urges "the rest of us (yesterday's students/today's workforce) to become a nation of students." *America 2000* states:

> "Business and labor will be asked to adopt a strategy to establish job-related (and industry-specific) skill standards, built around core proficiencies."

America 2000 goes on to call for a public-private partnership to develop the standards that will be informed by SCANS and by the Labor Department's Commission on Work-Based Learning. Specifically, the standards will begin with the "...Fundamental categories and definitions developed by...SCANS."

It is possible to speculate on how the President's strategy will transform the postsecondary school challenge. In the year 2000, 18-year olds from feeder high schools will be entering colleges and other postsecondary institutions (as well as the workplace) after having achieved SCANS' competencies. Some of the students will have begun to develop ideas about the kinds of jobs and industries they are considering. They may look to postsecondary schools for help in obtaining the competencies required in their industry of choice.

Older students will also place demands on postsecondary

Older students will also place demands on postsecondary institutions as they respond to the President's call to become a "nation of students." Some older students, those who did not have the opportunity to acquire them in high school, may want to acquire even the entry level competencies defined by SCANS. Others will want to reach higher levels of proficiency.

Conclusion

Where does all this fit with the overall effort to reform and markedly improve American public education as announced by President Bush and Secretary of Education, Lamar Alexander?

The President's proposals form a whole. Each of the four parts complements the other three. Up until now, the educational effort has been far too fragmentary. Many good things have been done, but because they have not been done in conjunction with other good things, they tend to be less efficient and less productive. Viewed in this light the SCANS effort takes on added consequence.

It is, of course, necessary to improve the knowledge and skills taught in the core curriculum, as enccuraged by the President and the governors. The goal is to expand the knowledge, skills, competence, and potential f growth of each student.

Given this latter purpose and the fact that students will be periodically assessed on core subjects, learning these in the context of work -- coupled with a series of evaluations that measure progress and motivate students -- can be an integral and

employers to constantly reevaluate and suggest modifications to the SCANS competencies will involve American enterprise in support of constant educational improvement. This can be particularly important as the SCANS skills are translated into workforce training by American business throughout workers' lives. Some people have talked about a seamless process of American education. Perhaps a more apt metaphor, given the American experience, is that of a woven tapestry within which the teaching of those skills needed for productivity on the job are integrated with learning for effective citizenship and fulfilling personal growth. That we believe is the message and mission of SCANS.

Thank you for the opportunity to participate in this hearing today. I would be happy to answer any questions you might have.

U.S. Department of Labor

SCANS

Secretary's Commission on Achieving Necessary Skills

MISSION STATEMENT

A series of Commissions and studies have amply demonstrated that the United States will be at a serious competitive disadvantage unless we fundamentally alter the nature and content of public education. The overwhelming majority of our youth, college-bound or not, are simply not prepared by our schools for highly productive employment.

Our Commission will define the necessary functional and enabling skills which society must provide to every child in this country by the age of sixteen. These "process" skills will be generic, applying across the spectrum of jobs -- from manufacturing to the service sector. These will be skills that can be developed and expanded to serve across a range of positions that one can aspire to in a life-long career.

We believe that these skills are best learned in context and especially in the context of realistic workplace problems. Thus, the teaching of functional skills will require the most radical change in educational content since the beginning of this century. We intend that these changes affect every school, every child, and every workplace.

We will also be laying out guideposts to upgrade skills among those currently in the workforce by defining competencies they will need to succeed in high performance jobs.

Our mission is more than just producing a report; once these skills are defined we will bring employer, labor, educator, and parent groups together to make the needed changes. Using an appropriate format, we will convey the relationship between learning and earning to the students. The Commission will foster a continuing relationship among education, labor, and business so that this nation can adapt to a changing world. We will disseminate our results widely to bring about the behavior required if American youngsters are to achieve the necessary skills. SCANS will encourage schools to develop ways to teach the skills identified and to assess when an individual has mastered them. SCANS will also encourage employers to recognize and fully utilize students and workers who have these skills.

The Commission recognizes that many efforts throughout the country have goals similar to ours. We accept the responsibility to work with these groups and coordinate our efforts. Our objective is to build partnerships that will endure beyond this Commission's tenure and which will have a maximum impact on today's youth and tomorrow's workforce.

We are committed to the idea of dealing with international competition by enhancing skills and thereby enabling and empowering workers. The implementation of SCANS recommendations and guidelines will improve the ways that schools prepare students for a broad range of choices in a high-performance economy and the way that employers utilize the talents of highly-skilled workers. This, in turn, will increase the productivity of the American workforce, improve our ability to compete in the global marketplace, and provide more meaningful employment, greater career opportunity, and a better standard of living for American workers.

12/1/90

Secretary's Commission on Achieving Necessary Skills

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Chairman FORD. Thank you. Mr. Carnevale.

Mr. CARNEVALE. Thank you, Mr. Chairman, for inviting me here today. I come as a representative of the American Society for Training and Development, which is a professional society of more than 50,000 human resource professionals, personnel people, industrial labor relations experts, and so on who work principally in private companies in the United States.

As such, I want to begin my testimony with a caveat and something of an apology, and that is that the committee and others in the education community should know that employers, our own and others, don't believe that the only purpose of higher education is to provide American employers with viable and skilled employees. We understand fully that the American education system has other masters and other missions.

In a culture that values individualism above all else, and in a political system that bases itself on participation, it is also the role of the American education system to provide us with free thinking, autonomous individuals who can make a contribution to culture and who can participate fully in our political system, fully in decisions, in fact, that often times circumscribe and build the rules for private economic production.

But I would add that the schools' higher education and other schools also have a mission to provide American young people with the capacity to get and keep a job in a free market, capitalist economy which this one, essentially, is. If you don't acquire the skills and the access to work, if you can't get and keep a job, our experience tells us that you will drop out of the community and stop participating in the political process anyway.

So, in a sense, preparation for work is a pivotal piece of the higher education role. It facilitates and allows the higher education system to fulfill its other missions, we would argue. We feel we should say that at the outset.

A couple of points that I'd like to raise in a more salient way to do with the economic performance of higher education. First of all, point number one, that higher education is more important now than ever to the overall economic performance of the Nation, productivity, for example.

Consistently throughout the last century, American education has contributed about 22 to 25 percent to productivity improvements in the United States. The principal means by which the American education system has made that contribution is by graduating more and more people, first from grade school, and then from high school.

But we're about to, in a purely mathematical sense, run out of our capacity to graduate huge shares of the population from high school. I think it's by age 18 or 19, somewhere around 80 to 85 percent of American young people get a high school degree in one way or another.

And so it's a purely arithmetic, mathematical reality. Productivity contributions from education will have to come from increased participation, and to use Mr. Gaydos' and others' words, increased access to postsecondary education. And by postsecondary education, we mean education in two-year schools, education in four-year

schools, and education at work, which in the Unites States is, by now, more than a $30 billion enterprise annually.

So the issue ultimately in education for American employer institutions is to encourage the Congress and others who have responsibility for this system to help provide that access and increase participation in the Nation's higher education system.

The second point, higher education is now more important to individual and their earnings capacity than it's ever been. And that really is news these days. In 1973, if you were a college graduate and you had 10 years of work experience, you made about 50 percent more per hour in your earnings than a high school graduate with 10 years of work experience.

By 1980, the returns to higher education, the returns to a college degree, fell. By 1980, the earnings advantage of a college graduate had fallen from the 1973 level of 50 percent to about 30 percent. In fact, between 1973 and 1980, what happened was the baby boom suffused the work place with new workers who were relatively well educated, and the value of higher education went down.

What's happened since, and it's really a remarkable turnaround, is since 1980, when the returns to higher education were about 30 percent in terms of earnings capacity, the returns to earnings for people with college degrees plus 10 years work experience, have gone from 30 percent in the case of males to 89 percent. So if you're a male in the United States and you get a college degree, you'll earn 89 percent more per hour than a male with a high school degree and 10 years work experience. The numbers are not quite so good for females, incidentally; the shift is from about 30 percent to 60 percent, but still a doubling of the returns to higher education.

So, again, the issue that comes up here is access. We have a two-way escalator operating in the American economy, more and more. The people on the up escalator are the people who get postsecondary education; the people on the down escalator are the people who don't get postsecondary education. In fact, and in research done quite recently, it appears as if the value of a high school degree is, in fact, falling at the same time as the value of a college degree is going up.

Finally, let me try very quickly to give you our sense as to why that is happening. There are a couple of reasons. One of them is the demographic reason, which is apparent and reported on continuously in these and other environments. There are fewer people in the entry level labor pool. In addition to that, the composition of the entry level labor pool is increasingly made up of people who come from backgrounds where they do not get sufficient human capital investment prior to coming to work, to work effectively and to increase their earnings.

But there's a more powerful reason. The demographic change is incremental; the proportion of Hispanic workers in the American work force will change. Between the year 1988 and 2000, for instance, the proportion of Hispanic workers in the United States will increase by about 3 percent. The proportion of black workers, I think, will increase by about two, and the proportion of white workers in the American system will drop by a few percentage points.

These changes are ineluctable, but they're incremental. The more powerful and radical change that is occurring is the one that Arnold alluded to. The requirements, the skills requirements at work, are going up very rapidly as a result of a whole series of processes that we all read about in the newspaper and hear about constantly—changes in technology, a more flexible and powerful technology that is largely driven by communications and computer technologies is creating new skill demands.

Technology is taking over, more and more, the repetitive work, intellectual and physical, and people are left with handling exceptions and dealing with each other in much more high skilled environments.

And in addition to that, worldwide competition has changed the set of competitive standards by which we compete. In the old days, productivity was good enough, the ability to make more and more stuff with fewer and fewer resources. Nowadays, if you're going to win in the competitive race, you also have to provide quality, you have to be able to provide variety in your products and services, you have to be able to customize your products and services for individual consumers, you have to provide convenience in customer service, and you have to provide speed of innovation and speed of moving innovations off the drawing board and into the hands of customers.

And more and more, those competitive requirements, incremental improvements in those competitive standards, occur down the line in work organizations at the point of production, at the point of service delivery, and at the interface with the customers. And it is at that point in every organization where nonsupervisory workers are. It is at that point in many organizations where noncollege workers are. And the skill requirements are changing most rapidly at that point in production systems, requiring that nonsupervisory workers, traditionally noncollege, get some kind of postsecondary education, whether it's high school plus two years or a four-year degree.

And that is the major challenge over the next decade, I would argue, for the higher education system. Thank you.

[The prepared statement of Anthony Carnevale follows:]

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A WORKFORCE FOR THE NEW ECONOMY

SUBMITTED TO THE

SUBCOMMITTEE ON POSTSECONDARY EDUCATION
HOUSE COMMITTEE ON EDUCATION AND LABOR

MAY 2, 1991

CONGRESSMAN WILLIAM D. FORD

CHAIRMAN

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Introduction

The extensive field research reported in this study finds American employers and employees working together to build more flexible organizations, work processes, and skills in order to meet new competitive standards and fully utilize new technologies. The findings reported in *America and The New Economy* describe an emerging economic order founded on a whole new set of competitive standards that are transforming organizations, jobs, and skills requirements. In the past American employers and workers competed for customers on the basis of productivity – the ability to produce high volumes of goods and services at low prices. In the new economy competitive advantage is based not only on productivity but also on the ability of American employers and workers to meet new standards of quality, variety, customization, convenience, and timeliness. In order to meet new market standards and fully exploit the inherent power of new technologies, authority and resources are being pushed down the line to work teams that make products and serve customers.

The challenge to business, labor, education, and governmental leaders implicit in this firsthand report from America's workplaces is to work together to empower all Americans with the toolkit of skills and family support that will enable them to take full advantage of freedoms and opportunities presented in the new work environment. The good news for American workers in this report is that the economy it describes is an open invitation to take charge of their own economic destiny by developing skills critical to success in the new economy.

America and The New Economy summarizes what was learned from almost five years of first hand exploration in the new world of work. It is the written record of field work and statistical analysis that began in the mid-eighties when it became obvious to the nation's leadership in business, labor and government, that something profoundly different was happening in the American economy. At that time, a bewildering array of opinions emerged on the American economic prospect. Some of the more pessimistic perspectives on our economic future were quite frightening for Americans, both as workers and parents. Also, as opinions on the nation's economic prospects diverged and multiplied, it became increasingly difficult for American business, labor, education, and governmental leaders to find enough common ground to form a cohesive response to economic changes. This study was initiated to investigate the validity of some of the more alarming claims. It was also intended to help build a common understanding of economic change among business, labor, education, and governmental leadership that would allow more effective collaboration in the interest of the nation's economic competitiveness and to

promote opportunity for all Americans. The results of the study suggest no cause for panic over the nation's economic prospect. But findings do suggest the need for concerted action in response to unprecedented economic changes.

This report provides a map of the new economy that can be used as a guide to action by the nation's business, labor, education, and governmental leaders as they work together in the new economic environment. It is also intended to inform individuals as they plan their own careers. *America and The New Economy* maps the real economy of organizations and workers, and not the statistical economy so often the focus of debate in Washington. It reports the best competitive practices in real companies and among real workers that are both models of excellence and causes for optimism in assessing the nation's competitive future.

America and The New Economy

The Six Standards For Competitive Success

The distinctive signature of the new economy is a set of new competitive standards that separate winners from losers. Productivity the primary competitive standard in the old economy, has been transformed and joined by an expanded set of standards critical to success in the new economic environment. The new competitive standards include a more robust version of the traditional productivity standard: the ability to provide variety and to customize products and services; a focus on convenience for customers; and, timely innovation:

Robust Productivity: In the old economy market share and competitive advantage were driven by producing high volumes and selling at low prices. The old time religion of productivity emphasized cost cutting as the principle means to the achievement of low prices. In the new economy cost efficiency is still important but productivity gains are increasingly realized with an emphasis on investment and innovation rather than cost cutting. Old fashioned strategies for achieving productivity emphasized "lean and mean" organizations and workforces. Lean and mean organizations and workforces can result in cost savings but are not sufficiently robust to provide quality, flexibility, customer service, and speed, also necessary in the new competitive environment. In the new economy, the old time religion of cost cutting has been displaced by productivity strategies that depend on "robust" organizations and workforces empowered with autonomy and enabled with investment.

We are still ahead in the productivity race. The U.S. produced $20,891 per person in 1989. Our closest competitors the Canadians produced $19,679 per person. The Japanese were fourth with $15,656 in output per person. But our competitors are catching up. The Canadians went from 69.5% of American productivity in 1950 to 94.2% of American productivity in 1989. The Japanese went from 16.1% of American productivity in 1950 to 74.9% of American productivity in 1989.

The American prospect on productivity suggests guarded optimism:

- We will need productivity performance somewhere between 2.5% to assure our continued leadership. Although our recent performance has hovered around a disappointing 1.0%, projections of future productivity performance are more optimistic. In addition, there is evidence to suggest that manufacturing productivity in the U.S. is

approaching levels in Japan and Europe already. Moreover, our productivity performance in agriculture, services, and other non-manufacturing industries is superior to many of our competitors.

• We have already paid the price of integrating the inexperienced baby boom into the workforce. The American workforce is aging and becoming more experienced every year. We should continue to realize productivity dividends from a more experienced workforce well into the next century.

• Our gloomy demographic prospects have been overstated. It is true that our entry level workforce will decline in size and that an increasing share of new workers will be drawn from populations in which our human capital investments, prior to work, are insufficient to allow them to meet increasingly stringent competitive standards. But there is time. Employers are not likely to be overwhelmed by scarce workers or unprepared workers any time soon. Changes in the mix of new workers will be incremental. For instance, between now and the year 2000 the largest single group of new workers will continue to be white men and women who will comprise 32% and 35% of new workers respectively.

• Capital drawn down since the late forties to bear, educate, house, and train the baby boom is now available for more productive investment. The demographic demand for housing, for instance, is expected to decline by a full 30% over the foreseeable future.

• New information and communications technologies are still in their infancy. We are still in the primitive phases of developing and applying these new technologies. The application of technical changes usually takes a long time. Electricity was available after 1860 but was not in common use until the 1920s and the sale of steam engines did not peak until the early 1900s.

• America's savings performance since the early eighties has not been good as a result of increased consumption and dissaving resulting from high government deficits. As saving declines there is less money available for investment and what savings there are go to pay debts accruing as a result of high deficits. While constant pressure on deficits to free up available savings for productive investment is critical, its importance is often overstated. Savings did not decline in the U.S. until the eighties, while precipitous productivity declines began almost ten years earlier, in the early seventies. Moreover, detailed studies

by Denison, and more recently by Baumol, show that investment accounts for a healthy 40% of productivity increases but that almost 60% of productivity increases result from innovat' s at work or process improvements that occur as organizations and workers make incremental improvements on the job. In other words, the principle lever for productivity improvement is not higher levels of investment but learning, that occurs in work organizations and work teams deep within the economy itself. Finally, opportunity drives investment at least as much as savings. So long as American workers, organizations, and technologies represent good prospects for investment, foreign savings will continue to be invested here.

Quality: Quality is primary among the new competitive standards. It was no accident that when the nation established its first award for overall economic excellence it was an award for quality, not productivity. American performance on quality is mixed. The quality of our automobiles is on a par with the Europeans but still inferior to Japanese quality in most instances. Quality data on textiles, computer chips, and steel is mixed, and quality performance in consumer electronics, chemicals, and machine tools is disappointing. There is still such a thing as American quality. We set the world standard in commercial aircraft, aerospace, large computers, appliances, and health care. There are also individual quality leaders even in industries where our overall performance is mixed. For instance, the GM/Toyota NUMMI plant in auto, Milliken Mills in textiles, Harley in motor cycles.

Variety and Customization: Plain vanilla isn't good enough in the new economy. There is an explosion of products and services in every industry. There are 572 varieties of cars, trucks, and vans compared with 408 only nine years ago. Banking has become financial services, expanding from a few to more than a hundred services which can be delivered in customized packages for individual consumers. The number of items c.. ied on supermarket shelves has double in just ten years as the food industry has learned to tailor products to every taste and diet.

Convenience and Customer Service: Busy people crave convenience. Providing convenience is good business. First there was fast food and now there is food delivered fast. Financial services companies have embedded convenience in new technologies with the ATM machines and electronic banking. Good customer service pays off. It costs five times as much to get a new customer as it does to keep the one you already have. Loyal customer is worth $140,000 over a lifetime to an auto maker and $ 4,400 a year to a supermarket. Every unhappy customer complains to ten others and 82% of customers that go elsewhere do so because they are dissatisfied with the product or service or feel they have been treated badly. Available evidence

suggests that Americans are demanding better customer service and feel they aren't getting it. There are notable exceptions. WalMart, the Aid Association for Lutherans, Nordstroms, Federal Express, Motorola, Xerox, and IBM and a host of others, lead the way in customer service in American markets.

Timeliness: The early bird gets market share in the new economy. According to one study of hi-tech markets, products that come out on time, but over budget, earn 33% less than products that come to market at budget but six months late.

Institutions compete in several successive races against the clock:

- First Event: Develop an innovation, whether a product, a new technology, or a new work process.
- Second Race: Move the initial innovation off the drawing boards and into the hands of customers.
- Third Event: Race up the learning curve, making continuous improvements and developing new applications.
- Final Event: Use the knowledge accumulated in the race up the learning curve to make a breakthrough to another major innovation.

The American performance on timeliness is mixed. For instance, Japanese auto makers redesign every four years while we still try to make a basic design work for more than ten years. As a rule, it takes us up to sixty-six weeks to get from fiber to apparel while many of our competitors are able to reach the customer in twenty-three weeks. The news on the ability of American employers to outrun the competition is not all bad. We are the fastest to the market in aerospace, computers, appliances, and health care. There are individual examples of speedy institutions in every industry; Milliken in textiles, WalMart in retail, Motorola, Xerox, and Hewlitt Packard in hi-tech.

Seven Forces That Shape New Markets

The report discusses seven forces that are driving changes in competitive standards including:

(1) The Increasing Wealth of Nations: People are demanding productivity, quality, variety, customization, convenience, and timeliness to meet higher standards. American incomes doubled between the end of World War II and the early seventies, though they have grown more slowly

since. American families have increased their incomes since the early seventies by working more, putting more family members to work, and borrowing. Incomes in the rest of the world were relatively low in the late forties but increased astronomically since then. West Germans made only 40% of American incomes in 1950 but made almost ninety percent of American family income by the late eighties. The average Japanese family made only 17% of what American families made in the late fifties but made almost eighty percent of average family income in the U.S. by the latter eighties.

(2) Economic Globalizations: The genie of international trade has long been out of the bottle. The combined value of imports and exports are roughly a quarter of our GNP. We now compete in international markets for technology. Tastes have been homogenizing rapidly as income and the reach of markets expand. Trade barriers have been reduced significantly since the fifties. Advances in the technologies of transport, communications, and management have allowed companies to produce and sell flexible volumes tailored to individual markets. Companies no longer go overseas for cheap labor. Labor has become a small portion of costs in leading industries. It approaches 10% of costs in hi-tech manufacturing and little more than 15% of total cost in low-tech manufacturing. Increasingly, companies go overseas to access technical skills, new technologies, and experience with indigenous markets. Perhaps the most important effect of the new global economy is that it has intensified and upped the ante in economic competition. If we don't supply quality, variety, customization, convenience, and timeliness at reasonable prices somebody else will and that somebody else is likely to be located outside the U.S.

(3) The Diversification of Taste: There is no one size fits all in the new economy. Consumers worldwide have more money in their pocket and want goods and services tailored to their individual needs. In addition, growing wealth gives a voice to underlying differences in tastes of different age groups, regions, life styles and other differences that were there all along.

(4) The Importance of Time: Americans, especially American women, have more money but less time to spend it. Men have lost more than two hours of their free time per week and are spending an hour and a half per week doing personal chores. Women are working an additional six hours per week and have lost almost three and a half hours of free time. Busy people have neither time nor patience for shoddy quality, products that are not tailored to their individual needs, poor customer service or slow response times.

(5) Commercialization: More and more of the work and play traditionally provided outside markets is being commercialized. The commercialization of homemaking, recreation, and

personal care stems in part from the new work roles for women. Child care, elder care, and cleaning have traditionally been services performed by women who didn't work or who worked one shift on the job and another at home. Increased choices for women and financial pressures on the American family suggest that the commercialization of services traditionally provided through the family structure will continue. Americans are also more willing to pay for play. Recreation for Americans of all ages is increasingly delivered for profit whether in retirement communities or in recreational service for younger working Americans. Commercialization impacts on both service and manufacturing industries as the delivery of family and recreational services mixes human contact with an expanding array of gadgets for cooking, cleaning, personal care, home entertainment, and recreation outside the home. Commercialization inevitably expands market standards beyond price competition. For example, price is not the only criterion for choosing care for our loved ones. When we shop for personal care we want quality, a variety of choices, care customized to our personal needs, timely delivery of services, and convenience.

(6) Consumer Involvement: A distinctive feature of the product and service markets of the new economy is the extent of consumer participation. For instance, shoppers at supermarkets read labels for quality and content customized to individual diets. User friendly gadgets, from VCRs to ATMs, allow consumers incredible variety of choices tailored to individual needs and delivered conveniently. Self service at the gas pump is convenient and the salad bar tailors the restaurants offerings. The consumer is increasingly a member of the work team.

(7) Flexible Technologies: The new market standards would not have been possible without an equally new role for technology. Flexible computer based and communications technologies are at the heart of the new competitive standards. The computer has brought a whole new level of quality, flexibility, and speed to production and service delivery. Variety and customization can be delivered conveniently and with precise quality with a few keystrokes. Faxes, satellites, cable, and other communications technologies give the new competitive standards a global reach. User friendly software makes the new technology as invisible to the user as the carburetor is to most drivers.

The New Competitive Framework

The new competitive standards are birds of a feather. They are best understood as a framework in which each standard makes sense only in the context of the others. Each is connected to the others in a flexible and organic whole. Employers who begin pursuing one standard usually end up embracing them all because each overlaps and leads on to the next.

The new competitive framework breaks the iron laws of mass production that ruled the old economy. In the old economy it was generally presumed that there was a tradeoff between productivity and low prices on the one hand and quality, variety, customization, and convenience on the other hand. It was generally believed that producing high volumes of standardized goods reduced costs and raised productivity. Adding quality, variety, customization, and customer service was assumed to increase cost. For instance, one rule of thumb said that cutting variety in half raised productivity by 30% and that doubling volumes cut costs by 25%. The iron law that linked high volumes of standardized goods with low prices has been broken in the new economy. For example, one U.S. manufacturer of automobile components produces ten million parts per year and offers eleven varieties. This company's Japanese competitor produces only three and a half million units per year but offers thirty-eight different varieties. Remarkably, with one third the scale of production and three times the variety, the Japanese company has a labor productivity one and a half times the American company and produces at half the unit cost.

Companies that begin by trying to speed up the time it takes to get products to the customer usually end up saving money as well. Hewlitt Packard's just-in-time production system has reduced cost by 20%. Harley Davidson reduced the time it took to make a motorcycle from thirty to three days and cut production costs by half.

Quality also saves money and is often the best antidote for a case of low productivity. The typical factory invests twenty to twenty five percent of its operating budget finding and fixing mistakes. Xerox's quality program drove costs down by 20%. GM's Lansing assembly plant drove costs down by 21% after instituting a quality program.

Focusing on good customer service also improves productivity performance. The Aid Association for Lutherans replaced specialized functional departments in its insurance services with teams responsible for providing service to individual regions. As a result, personnel costs were cut by 10%, the overall number of cases handled increased by 10% and the time it took to process a case was reduced by 75%.

Continuous Learning: The Cornerstone of Economic Progress

In the new economy technology is treated as malleable and inextricably connected to human and organizational forces at work. It is generally understood that technical investments without complementary investments in organizations and people can be disastrous. The dynamic of

economic change inside the organization is both social and technical. The processes of technical and economic progress in the new economy are driven by learning. The cumulative dynamic of learning in the new economy tends to confer runaway momentum in the competitive race. Once organizations or whole nations build a lead in a particular technology or product or service line it is difficult for others to catch up in the race up the learning curve. Some learning can be copied or reverse engineered but the more experiential kinds of learning critical to economic and technical progress are difficult and time consuming. For instance, experience is the best teacher when workers require applied skills like problem solving that can only be learned in the context of real world situations or skills like team work that require fundamental attitudinal changes.

Oftentimes the process of economic and technical change is "path dependant" - characterized by incremental changes with one innovation leading to another. In the early stages of technical or economic innovation several alternative paths are open. Eventually, a particular innovation is widely adopted. Once adopted, learning by doing and learning by using leads to the accumulation of incremental improvements. Complementary innovations and commercial investments also accumulate, until eventually the momentum and sunk costs commits the organization and even whole industries to a particular technical path. It is difficult to change paths once the process of accumulation reaches a critical mass that allows for a self reinforcing momentum even when superior alternatives emerge. Moreover, it is difficult to access particular paths of technical development once they are fully developed.

There are some short cuts for those who join a particular developmental path once it has become a beaten track. To an extent, state-of-the-art practices can be borrowed and copied. But much of the learning by doing and learning by using that accumulates along a particular developmental path is not easily copied, except through experience. For instance, Americans can describe Japanese quality and methods but have difficulty emulating them because they presume profound attitudinal and institutional changes that can only be arrived at experientially. Workers can be taught sufficient skills to produce quality but even competent employees do shoddy work. The real skill required to produce quality is the ability to take responsibility for final products or services. This means workers need to take responsibility for more than their own job assignment or work effort. Before workers can take responsibility for quality they need to be empowered to exercise a higher level of responsibility and they need to make profound changes in their own attitudes and commitments at work. These kind of profound organizational and individual changes are not easily copied. They take time and are learned through experience. Hence, we can understand Japanese quality rationally without knowing it subjectively. We can understand

the state-of-the-art along a particular developmental path but getting from here to there requires time consuming experiential learning.

The cumulative nature of technical and economic change can be troublesome especially when it leads down suboptimal paths or arrives at dead ends. Alternative paths are usually long since overgrown and alternatives, new or old, are warded off by sunk costs in the current technology. Our current dependency on oil based technologies is a case in point. At the turn of the century steam was a viable alternative to internal combustion. But switching to steam at this late date is not likely. First, we are unsure if steam represents a viable alternative. It would take more time than we can afford to learn our way into a steam-based technology that could perform as well as oil-based technologies. Second, we don't have the complementary industrial, financial, and human assets available to support a steam-based technology.

There are many other examples of the path dependant nature of technical change:

- Early investments by the military and subsequent development gave an early lead to water-cooled nuclear reactors in the sixties and fixed the path of development in the industry. Subsequent research suggests that gas cooled reactors might have been better.

- The British continued to build narrow gauge tracks long after it was demonstrated that wider tracks were more efficient. Changing any section of the railroad track changing the whole world require rail system as well as the width of the trains that ran on the track.

- The "QWERTY" keyboard, named for the upper row of left hand keys, persists despite superior alternatives. The British still drive on the wrong side of the road.

- The world is still divided into 110v and 220v nations.

- The Irish stayed in potatoes until famine drove them from their homeland.

- We use VHS because it built up a critical mass of distributors, not because it is superior to BETA.

- The U.S. Chose hydraulics as the core technology in robotics and the Japanese chose electronics. The Japanese path proved the high road.

It is critical for organizations, industries and whole nations to choose optimal paths of technical development. Dead ends and suboptimal paths can be costly in human welfare. If a nation decides to make potato chips rather than computer chips it will give away good paying jobs and sacrifice important technical and organizational learning as well as skill development that would lead on to spill over benefits in other industries and even better jobs later on. The new economy suggests a bicycle theory of economic development: Get on the right technical path and keep pedaling. If you leave the path, you will only have to catch up later. And by then it may be too late because your competitors will have built up an insurmountable lead in accumulated experiential learning.

How do organizations or even nations choose the optimal path of technical progress? The basic difficulty is that we never know enough about the future to make the right bets and pick the winners. The path dependant nature of learning processes turns economic progress into a game of chance. It leaves us with two strategies: First, we need to mobilize our current knowledge base as best we can to discern best bets on the most likely winners. Second, we need to spread our bets around, encouraging as many alternative paths as possible without diluting our available financial, organizational and human capital. Both strategies argue for maximum access to a free flow of knowledge in organizations, nations, and in the global economy.

The New Economic Life Cycle

Technologies, products and services are constantly evolving, following a path not dissimilar from organic life cycles. Traditionally, economic life cycles have exhibited five separable phases: innovation, installation, competition, maturity, and eventual breakthrough to new life cycle. In the new economy, however, economic life cycles have sped up and lost their sequential structure. The life cycle of innovations in work processes, technologies, products and services in the new economy are open ended and less orderly then the classic sequence of innovation. For example, today's global institutions sometimes skip the initial development of innovations. Instead they often borrow innovations developed elsewhere focusing on the latter more commercial phases of the economic cycle.

In the classic economic life cycle there is a tendency to require flexibility only from senior white collar and technical elites and only in the initial innovative phases of the life cycle of particular innovations. In the new economy, however, it is becoming clear that a workforce segmented into broadly skilled and empowered elites and narrowly skilled nonsupervisory employees with limited autonomy can result in costly delays in installing innovations, making continuous

improvements and learning new applications. Moreover, economic cycles are speeding up as competition intensifies. As a result, employees at all levels need greater autonomy and the skills to use it effectively in order to expedite the cycle time required to get innovations off the drawing board and into the hands of customers ahead of the competition.

Organizing and Managing The New Economy

The new economy is preceded by two typical organizational structures: Large top-down hierarchies characteristic of big business and big government and small organizations typical in small business, the professions and highly fragmented industries like health care. Large organizations have their virtues. Their size and allows them to afford to mobilize capital, conduct R&D, train their workers, and realize scale economies that ultimately translate into low prices for consumers. Their top-down rigidity, however, has made them less able to provide variety, customization, convenience, and speed. Smaller organizations in small businesses have their traditional merits as well. They have been generally more able than large institutions, to provide quality and products and services tailored to the needs of individual customers. At the same time, however, their small size and isolation have discouraged productivity and a consistent quality of product or service delivered.

Both the large scale behemoths and smaller organizations have been challenged in the new competitive environment. Large scale organizations are learning many of the virtues that are the hallmark of smaller organizations. They now emphasize quality as well as high volumes and low cost in production and service delivery. In addition, large organizations are shedding some of their traditional rigidity in order to produce in flexible volumes, provide a greater variety of products and services, accelerate innovate processes and effectively utilize flexible technologies. Large organizations are moving away from the one size fits all approach to customers. Big organizations are also becoming more sensitive to individual customers by tailoring products and services and providing convenience.

The shape of large scale institutions is changing in response to new competitive demands. They are flattening hierarchies and pushing autonomy down the line empowering workers at the point of production, service delivery, and at the interface with the customer. At the same time, smaller organizations are retaining their independence while joining together to realize scale economies. By joining together they can afford more R&D share the costs of human and machine capital development. By working together they are also able to reduce costs and provide both lower prices and a more consistent quality of output.

Organizations large and small are moving toward a common organizational format that combines the strengths of large and small institutions. That new organizational format is best described as a network. The networks of the new economy are driven by common goals and outcome standards rather than top-down authority. They preserve balance between the autonomy of individuals and teams at work and the integration of interdependent network partners in pursuit of common goals.

Networks are nested one inside the next. The primary network is the work team. Task forces and project teams are examples of networks that cut across the functional divisions in organizations. Every organization is a member of a network made up of other organizations that are its suppliers, customers, financial backers, and regulators. The success of individual organizations in a network ultimately depends on the performance of the network as a whole.

Jobs And The New Economy

Although the new economy will likely create jobs in the aggregate, the processes of economic change will inevitably distribute new jobs unevenly. The new economy will bring good jobs for the vast majority, bad jobs for some, and no jobs at all for others. As a community we are challenged to redress the unequal benefits and burdens characteristic of economic. Ours is a society based on work. A job is the price of admission to the American polity and culture. People unable to get and keep a job eventually disappear from community life, drop out of the political system and fall into the underground economy. Indeed, sustained joblessness eventually encourages those locked out of the economy to create alternative economies and cultures that are a threat to the mainstream American way of life. The same destructive processes are at work for both the chronically unemployed and the dislocated experienced worker. There is no fit measure that allows us to choose between these two groups. The chronically unemployed usually start out and end up at the bottom of the economic heap for lack of skills and the opportunities skill provides. Dislocated employees experience an economic loss that rarely results in persistent poverty but involves an equal amount of suffering. In the case of the dislocated employee it's not so much where they land as how far they fall that hurts.

Looking beyond the aggregate numbers to the kinds of jobs the new economy is generating reveals a pattern fitted to the emerging demands of the new competitive standards and networks. The most noticeable trend in the kinds of jobs typical of the new economy is the shift toward service work. There are many reasons for the shift toward service work. Consumer demand shifts toward services as income increases. Higher productivity in manufacturing and extractive

industries results in more output from fewer more highly skilled workers in combination with more powerful technologies. New competitive standards require more service workers to design, develop, and market a greater variety of products and to deliver them to customers quickly and conveniently in a global market. The increasing number of transactions among complex economic networks also encourages demand for service workers ranging from sales and customer service personnel to lawyers and accountants.

Skill leverages job opportunity in the new economy. People who stay in school have always had an advantage at work, but they are doing better now than ever before. In 1978 a college graduate with ten years of work experience earned 38% more than a high school graduate with ten years work experience. By 1988 male college graduates earned 86% more than males with only high school degrees. Female college graduates earned 60% more than their counterparts with high school degrees. People with two year degrees earned almost - more than high school grads. Those who got some training from their employers increased their earnings advantage by another 30%.

Skill In The New Economy

American employees are developing new skills in response to new competitive standards, technologies, and work organizations. Skill requirements are expanding up and down the line as competitive advantage draws on the skills of both college educated white collar and technical workers and noncollege employees who tend to be concentrated at the point of production, service delivery, and at the interface with the customer. Skill requirements in the new economy are concentrated in six areas:

The Academic Basics: Reading, Writing, and Computation

Reading skills needed for work are developed on three levels: (1) basic literacy--the ability to decode and comprehend written material; (2) reading-to-do--the ability to utilize basic reading skills, short-term memory, and information processing to locate printed information for immediate use; and (3) reading-to-learn and reading-to-do--the ability to use basic literacy skills in conjunction with long-term memory and writing, computation, learning, adaptability, and job-specific skills in order to decode, problem solve, or troubleshoot.

On average, American workers spend from 1.5 to 2 hours every working day reading forms, charts, manuals, electronic display screens, and general literature. In the new economy, reading

skill requirements will increase and deepen because the growing complexity and scale of global economic activity will require more written communication. Also, the expanding reach and complexity of electronic and organizational networks will require more reading to stay in touch. Better reading skills will be needed to stay abreast of change, foster incremental improvements, and accelerate innovation. In addition, the infusion of information technologies will require more reading from operating and repair manuals and electronic screens.

In all cases, individuals must be able to apply reading skills in the context of a task or job responsibility; competency is measured by performance of a task rather than by direct tests of reading ability. At work, people decode forms, phrases, and abbreviated technical language, not the fully developed information they learned to read at school. Comprehension at work requires the ability to understand written cues. Therefore, standards for reading skills at work need to be set after assessing the context in which these skills are to be applied.

Writing at work involves a two-stage process: (1) prewriting--topic selection, preparation, and accessing and organizing information; and (2) writing--spelling, penmanship, reading, editing, and revising. Rapid change and the growing complexity of information networks inside and outside organizations require better writing skills from a growing share of American workers. Only about 8.4 percent of the average employee's communicating time is spent writing, yet writing is most often used at critical junctures in the work process. Written communications become part of a relatively permanent information base; they are shared and used to inform and guide people inside and outside organizations over time. Inaccurate or unclear writing can pollute the shared information base and affect the quality and efficiency of work upstream and downstream.

The essential standards for writing at work are brevity, clarity, and accuracy. Most writing at work involves transcribing key terms and standard sentences: 42 percent involves filling out prepared forms; 25 percent requires recording, summarizing, or using language peculiar to specific occupations and jobs; 23 percent involves writing memos and letters; and only 10 percent is dedicated to writing academic-style reports and articles. Therefore, an individual's mastery of writing on the job is tied to work-related competencies.

There are five elements of computational skill required at work: (1) quantification--the ability to read and write numbers, put numbers in sequence, and recognize whether one number is larger or smaller than another; (2) computing--the ability to add, subtract, multiply, and divide; (3) measurement and estimation--the ability to measure time, distance, length, volume, height,

weight, velocity, and speed and use such measurements; (4) quantitative comprehension--the ability to organize data into quantitative formats; and (5) quantitative problem solving--the ability to recognize and set up the problem and compute the answer.

New organizational, competitive, and technical requirements at work require higher computational skill levels. Flexible and decentralized organizations and networks are becoming integrated by complex, shared information systems that rely on quantitative measures of markets, performance, and quality. Products and services are increasingly customized, requiring employees to constantly reset quantities and dimensions for production and delivery. New flexible technologies and software require mathematical skill to utilize their logically patterned capabilities fully.

Almost 75 percent of Americans are computationally literate. Most Americans know how to quantify, compute, and measure, but can't apply what they know. As a result, workplace computational skills are best taught in an applied fashion. In school, mathematics is taught as an end in itself, as a sequence of operations from the simplest to most complex, followed by drill and practice on the mathematical operations themselves. Tests are standardized and emphasize proficiency in separate operations. At work, computational skills focus less on the correct performance of mathematical operations and more on using math to solve problems. Curriculums should emphasize:

- selection and use of mathematical operations to solve particular work-related problems and
- contextual examples of possible job situations.

Ultimately, grade equivalents are only clues to job-related computational skill needs. The requirements vary by occupation, although all employees should be able to organize information into quantitative formats, select appropriate computational tools, and recognize errors resulting from inappropriate use of quantitative operations.

Learning to Learn

Knowing how to learn is the most basic of all skills because it is the key that unlocks future success. Learning to learn involves knowing the principles and methods that allow us to perform in three domains: (1) the cognitive domain of skills we use to collect, know, and comprehend information; (2) the psychomotor domain of skills we use to control our bodies in order to accomplish tasks; and (3) the affective domain of skills we use to know, understand, and respond to feelings and behaviors.

Equipped with this skill, an individual can achieve competency in all other basic workplace skills. Learning skills are required in order to respond flexibly and quickly to technical and organizational change; make continuous improvements in quality, efficiency, and speed; and develop new applications for existing technologies, products, and services.

Communication: Speaking and Listening

In the new economy, workers spend most of their day engaged in some form of communication. Reading and writing are essential communication tools, but it is through listening or speaking that we interact most frequently at work. The average worker spends 8.4 percent of his or her communication time at work writing, 13.3 percent reading, 23.0 percent speaking, and 55.0 percent listening (Carnevale, Gainer, and Meltzer, 1990).

The competitive standards of the new economy require effective communication skills. For instance, to ensure high quality, employees must take responsibility for final products and services, which means they have to be able to communicate with others upstream and downstream in the work process. In addition, new standards for speed and reduced cycle time require quick and informal communication. Variety and customization require fluid communication in order to switch from one product or service design to the next. Improvements in customer service also require effective communication skills. Moreover, new organizational formats and technologies also require better communication skills. Flexible networks rely on communication in order to integrate work efforts effectively. As new technologies take on repetitive physical and intellectual tasks, employees will spend more time communicating with co-workers and customers. Speaking skills needed for work can be broken down into three areas: (1) nonverbal skills--body language and appearance, which deliver 55 percent of the meaning in face-to-face communication; (2) vocal skills--rate, pitch, and loudness, which transmit 38 percent of the message in face-to-face communication and 70 percent to 90 percent of the message over the telephone; and (3) verbal skills--language, which transmits only 7 percent of the message, but tends to be worth more later, when the listener gets past nonverbal and vocal characteristics in the communication process. Listening skills for work involve receiving and assigning meaning to aural stimuli.

Adaptability: Problem Solving and Creative Thinking

An organization's ability to overcome barriers to achieve productivity and quality improvements; to develop new applications for existing technologies, products, and services; and to manage variety and customization of products and services depends on the problem-solving and creative abilities of its employees. In addition, new flexible organizational formats require equally flexible workers and work teams capable of solving problems on their own. Moreover, as technology takes on repetitive work, workers spend more of their time using their problem-solving and creativity skills to handle exceptions to routine mental and physical tasks.

Problem solving is the ability to bridge the gap between what is and what ought to be. Problem-solving skills include the ability to recognize and define problems, invent and implement solutions, and track and evaluate results. The ability to solve problems involves a significant measure of creativity. Creativity is a continuum of thinking and application including (1) creative thinking--breaking traditional patterns of thought, (2) inventiveness--turning a creative idea into practical applications, and (3) innovation--applying a creative idea.

Developmental Skills: Self Esteem, Goal Setting, Motivation, and Personal and Career Development

Self-esteem skills needed for work are based on the ability to maintain a realistic and positive self-image. A positive self-image gives an individual a firm foundation to reach maximum potential both on and off the job. New and more intense standards for organizational performance require each employee to have a strong, positive sense of self. Accepting responsibility for organizational performance beyond one's formal work assignment is necessary to ensure high quality and requires a positive self-image. Self- esteem is also necessary to manage the growing intensity of interaction with co-workers and customers. Increased personal autonomy requires self-confident workers. Overall, the capacity to cope with the fast pace of change at work demands employees who are confident in their own abilities.

Motivation at work involves ability to translate work into an instrument for the development of the self and the realization of potential. Goal setting is the ability to set performance targets that are consistent with goals for personal development. Motivation and goal setting are inextricably intertwined. Motivation inspires goal setting and goal setting clarifies and connects us to our deepest motivations.

The velocity of change is accelerating at work. Flexible organizations and technologies are giving workers more autonomy and increasing the intensity of interaction among co-workers and between employees and customers. These changes require that employees become personally and actively engaged on the job. In addition, as the locus of responsibility for overall performance resides more with the individual, employees must assume responsibility for motivating themselves and setting goals. Personal and career development skills allow individuals to adapt to changing work requirements in a way that ensures employment security and fulfills personal potential.

New requirements for competitive, organizational, and technical flexibility have reduced job stability. Employees should expect to have to change as job requirements change. Lifetime employment in the same job or even with the same employer is no longer a realistic expectation. As a result, self-conscious personal and career development is central to employment security as well as individual development and career success.

Group Effectiveness: Interpersonal Skills, Negotiation, and Teamwork

Work is a group activity. Throughout the postwar era, economists have observed that the major share of productivity improvements results from the ability of work groups to use their human and technical capital more effectively to move up the learning curve. Meeting competitive standards other than productivity also depends on the effectiveness of work groups. For example, high quality is more than the sum of individual excellence. It requires successful interaction throughout the organization. Flexible and fast responses to customers also require effective teamwork. Flexible organizational formats and technologies increase the intensity and importance of group interactions at work. Whenever people work together, successful interaction depends on effective interpersonal skills, formal . gotiation to resolve conflict, and successful teamwork. For example, they need interpersonal skills such as the ability to judge appropriateness of behavior, cope with undesirable behavior, absorb stress, deal with ambiguity, share responsibility, and interact comfortably with others. They need negotiation skills to overcome disagreement by compromising with, accommodating, and collaborating with others. Teamwork skills relate to the ability of groups to pool human talents to pursue common goals.

Influencing Skills: Organizational Effectiveness and Leadership Skills

Organizational effectiveness skills needed for work include the ability to work effectively in the context of explicit and implicit organizational cultures and subcultures. An organization is a maze of explicit and implicit power structures and cultures. Understanding how to operate within the organizational maze is key to peak performance in the new economy. Networks driven by common goals and information are supplanting both rigid hierarchies and fragmented structures. Workers will require strong organizational skills to participate effectively in the new networks. Also, because of increasing independence on the job, workers will need organizational skills to align their own efforts and goals with those of the organization and thereby minimize friction and wasted effort.

Leadership skills at work involve influencing others to serve the strategic purpose of an organization or the developmental needs of an individual.The pace of change and competitive standards in the new economy require workers to assume leadership roles beyond their own formal assignments. Moreover, the new economic environment requires fluidity in leadership roles; every person at every level of an organization may need to assume a leadership role at one time or another, depending on the requirements of the task at hand. In addition, the growing utilization of more flexible technologies and organizational networks is creating more fluid work processes that demand spontaneous leadership.

CONCLUSION

As we enter the last decade of the twentieth century, the nation is breaking a path toward the new economy. But numerous obstacles impede our progress and have become the focus of enormous social, economic, and scientific energy as pressure for growth continues to build.

Inside the workplace, flexible technology needs to be matched with more skilled and autonomous workers and work teams. New, more flexible work organizations that drive authority and resources toward the point of production, service delivery, and the customer are also required if we are to take advantage of the inherent potential of new human and machine combinations.

Barriers that impede progress toward the new economy are apparent outside the workplace as well. Environmental limitations to growth await a technical solution. The new economy is emerging in the midst of a financial dilemma--one that is fraught with savings-and -loan bail-

outs, junk bonds, and foreign debt. Also, although the new economy will require massive public and private investments in the nation's human, organizational, and technical infrastructure, at a time when the financial capital necessary for this overhaul is being absorbed in an orgy of public and private consumption. In addition, it is increasingly clear that our ability to stabilize domestic markets is no longer enough; the new economy has gone global, and global economic events tend to affect and impinge on our domestic economy. The unpredictability of global economic events requires new mechanisms for stability. Finally, the demographic surpluses of the 1970s are giving way to longer term demographic scarcity. The number of available workers is declining rapidly. Moreover, more employees will come from populations in which our human capital investments prior to work have been insufficient (Johnston and Packer, 1987).

We can be cautiously optimistic about the American prospect in the new economy. Much will depend on our ability to break through the barriers. Other nations face many of the same obstacles, but we move into the new economic era with the additional burden of our past successes. Old and once successful habits die hard. We set the standards in the old economy. The United States labors on toward the new economy, however, dragging the dead weight of our past industrial successes along behind.

Chairman FORD. Thank you. Ms. Carol Frances.

Ms. FRANCES. Chairman Ford and members of the House Subcommittee on Postsecondary Education, I'm honored by your request to testify. And, Chairman Ford, I wonder if I could reintroduce myself and mention to you an occasion when you had given a speech before an education association. And afterwards, you were informally discussing your concerns about the American worker, and you spoke with vehemence about the time somebody had showed up at the airport to pick you up for a speech in a foreign car. And you told them to go out and get an American car to pick you up.

I was so impressed with the intensity of your concerns that I went out and bought an American car when I had a choice. My name is Carol Frances of Carol Frances and Associates, and my testimony draws on a study Scott Hughes and I are completing on the impact of demographic and work force trends on higher education in the 1990s.

I will address the first question of who is in the education pipeline, and Scott will respond to the second and third questions. Mr. Chairman, Congress, on three historic occasions, has helped shape the Nation's higher education infrastructure to meet economic and work force challenges, first with the land grant colleges, second with the GI bill, and, third, with the enactment of the Higher Education Act of 1965.

The first two of these great visionary experiments strengthening the connections between education and the work force, have been towering successes because they were well conceived and adequately funded. The great design of the Higher Education Act, with its system of need based student aid, was well conceived to meet an urgent national need, but is suffers from wide gaps between high expected gains and less than expected performance, due entirely to inadequate funding.

I am going to talk about who is in the pipeline, but I also want to talk a little bit about the national investment priorities and how they are reflected in the building of that pipeline.

The Federal budget reflects our investment priorities and the budget increases. From 1980 to 1990 the Federal budget increased by $661 billion. Of this $661 billion increase in Federal outlays, only $6.7 billion was invested in strengthening our education and training programs. This additional funding represented only one percent of the additional Federal revenues generated over that decade.

Underfunding plagues not only the education programs, but also the training programs. A Department of Labor report concludes that there is currently funding only for about one out of every 20 people who are eligible for training under the Job Training Partnership Act.

Now I want to talk about the pipeline, and I want to talk about the pipeline as if I were an engineer in a private company concerned with total quality control. And one of the first things I would look at is who are the new people in the pipeline. Women and minorities account for the overwhelming proportion of new people in the education, or the higher education, and of the education pipeline.

Analyzed by gender, over 70 percent of the increased college enrollment from 1980 to 1990 was accounted for by women. Close to 60 percent is accounted for by women aged 25 and over, and almost 50 percent is accounted for by women aged 35 and over. In absolute numbers, women aged 25 and over increased from one-fifth to one-fourth of all students.

Analyzed by race, of the new people in the pipeline minorities account for half of the increase in enrollment from 1980 to 1988. This has been celebrated as a success of the programs and broaden access to college for minority students.

But I think we should be cautious in assessing that increase. There are increases in the numbers, but there, for some groups, are even larger increases. I mean, there are increases in enrollment, but there are even larger increases in the population. And, therefore, though we have seen increasing numbers, we have not necessarily seen increasing college going rates of the minority students.

And even stronger criterion for measuring the success of these programs, and that is, have they closed the gap between minority and white college going rates. And if we look over the last decade and we look at all the age and race groups, we would have to conclude that in spite of all of our efforts, the gaps between the white and the minority rates of going to college have widened.

Okay, let's look at the pipeline now. And remember that I'm trying to look at this as an engineer looking at a pipeline and reporting to management about problems that need to be fixed, recognizing, however, that many people go through the pipeline with ease, and for many people it does work smoothly. But because we're interested in total quality control, we're looking at the problems.

First of all, the pipeline is too small. Estimates vary, but there is evidence that close to 20 million people in this country never got far enough along in the pipeline to learn to read well enough to function effectively in the work place, let alone learn a new job. We did some extensive work with the National Council for Occupational Education and found that in many cases when people were dislocated, they couldn't learn the new job because they didn't have the reading and writing skills needed in the new situation, which mean they had to have basic education even to get back into the pipeline.

The pipeline also starts in the wrong place. It starts too late. There's some evidence from Department of Education studies that many youngsters have ideas about themselves about what they want to do when they grow up as ea[illegible]y as the eighth grade. Those ideas shape their choices about what classes they enroll in, and it tracks them into or out of classes that they need to prepare to go to college for work in information based jobs. They never even get near the higher education and work force pipelines.

These choices that the youngsters make, or their families make, are too often determined by income, rather than their basic abilities.

Very seriously, the pipeline leaks. One of every four young people does not finish high school. They drop out before gaining the skills needed to be productive workers. The high school dropout

rate in the United States is staggering, and it is all the more devastating because it's higher than that of other industrialized nations.

Jim Mingle, President of the State Higher Education Executive Officers, returned recently from a visit to Germany where he talked with educators. When he came back, he reported that the Germans didn't even know what the term "dropout" means because they have so little experience with it.

Another problem with the pipeline is that the pipeline is bent. Rates of progress through the pipeline differ significantly by race and income level. The increasing availability of student aid has not prevented the gaps from widening between the majority and minority population groups.

And differences in college going rates by income level have persisted over 20 years. Students from higher income families are still four, five and six times more likely to enroll in college than students from lower incomes.

The pipeline is also crimped by poor state of articulation between two-year and four-year colleges. And two-year colleges now serve more than half of the Americans who set out to get a college education.

And another consideration is that at the other end the pipeline is stretched out. Fewer and fewer students are able to get their college degrees in four years. And more and more of people over the traditional college age are still undergraduates.

Close to 80 percent of students 22 to 24 are still undergraduates. Why is this? It is probably not the leisurely pace of affluent students enriching their learning experiences as much as it is the result of financially hard pressed students having to struggle through with inadequate resources to pay for college, juggling a job with classes.

Delayed entry into the work force at more productive and higher valued jobs of this age group could result in an economic loss of close to $25 to $30 billion. If more adequate student aid funds were available along with incentives for timely completion of education and training programs, the shortened delay could produce substantial economic gains.

And we also talk about the flow of students through a pipeline into the work force, but I think we should recognize that more than 60 percent of all students are already in the work force working part time or full time, where the concerns are adequate compensation for the work that they do.

I want to acknowledge the superb work that Mr. Packer has done that has captured the headlines on work force concerns over the last several years. But I also want to say that there is some information in there that I think we need to emphasize and look at in just a little different way.

The Workforce 2000 book focuses our attention on the changing composition of the work force, which numbers are based on the net increase in the work force, which is about 19 million people to the year 2000 from 1988 when they started. Now, that net increase which has captured the headlines is very important to employers; however, I would argue strongly that is not an adequate number for educators and those who are looking at the education and training needs of this country.

Because it is not the net number, it is the total number of people that need to be considered as we are building capacity to meet these education and training needs. That 40 million total new entrants is twice the number of the net new entrants. So when we're talking about our education and training requirements, we need to look at the total, as well as the net.

I think we should also look at the pipeline in terms of training for displaced workers. I was stunned, doing a piece of work for the Department of Labor, to discover that about 10 million workers, that is one out of about every 12 workers in the country in the American work force, have been displaced in the last five years. They do studies every two years, and then they look at what happened over the preceding five. And this number is declining over early 1980s, but it's still very large.

When workers lose their jobs, about one-third leave the work force. Another third go back to work but at lower wages than they had in their earlier jobs. Less than a third of those displaced workers do as well or better on those new jobs, and those who do, are those who are educated.

So education and training is critical to the reintroduction of these workers into productive new employment. I do want to mention one existing student aid program which had enormous potential for strengthening the links between higher education and the work force, as well as to reduce student debt, which is the college work study.

I want to close my remarks with the conclusion looked at from an investment perspective and the reports of the chief executive officer, which is we need to fix the pipeline. We need to fix the pipeline or lose our competitive position. In competition with other producers, the waste of five or 10 or 20 percent of our raw materials is scandalous, but fixing the pipeline will cost money. Can we find the money in the budget?

Now, what I want to do is stress the sharp contrast in making that decision between the public sector and the private sector when they make an investment decision. The public sector looks at the costs of investment, and today we look at the costs and we look at the budget deficits, and many decide we can not find the money to make the investment in our human resources.

But in clear contrast, the private sector makes wise investment decisions not on costs, but on returns. I want to say I got this idea when I served on the board of the Common Fund, which now manages about $10 billion of college and university endowment funds. And when we had the investment managers come in and one of the very sharpest would say, "Yes, I know I do charge twice as much as my competitor, but I will earn you three times as much money."

Now, as the wise investor, which one are you going to go with? You're going to go with the one who will earn you the most money. I think we need to look at our investment in human resources with this eye to the returns on the investment that is made. In business, management looks at how much revenue is made after the cost, and we need to have the same kind of criterion in the public sector as well.

We are not a poor country; we are a rich country making very poor investment choices. We need to prepare our people to work in a new kind of capitalism, intellectual capitalism, where our national assets are knowledgeable people.

Thank you very much for the opportunity to speak.

[The prepared statement of Carol Frances follows:]

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON EDUCATION AND LABOR

SUBCOMMITTEE ON POSTSECONDARY EDUCATION

HON. WILLIAM D. FORD, CHAIRMAN

HEARINGS ON THE
REAUTHORIZATION OF THE HIGHER EDUCATION ACT

HIGHER EDUCATION AND WORKFORCE CONNECTIONS: WHO IS IN THE EDUCATION PIPELINE?

TESTIMONY PREPARED BY

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WASHINGTON, D.C.

MAY 2, 1991

Introduction

Chairman Ford and Members of the House Subcommittee on Postsecondary Education. I am honored by your request to testify about the connections between higher education and the workforce.

My name is Carol Frances, President of Carol Frances + Associates. This testimony draws on a study Scott Hughes and I are completing on The Impact of Demographic and Workforce Trends on Higher Education in the 1990s. The information has been developed in work supported by the American Association of Community and Junior Colleges, the National Council for Occupational Education, the Association of Urban Universities and most recently by the National Association of College and University of Business Officers. The views presented here are our own and do not reflect official positions of these organizations. In our joint presentation I will respond to the first question addressed to the panelists by the Subcommittee:

"Who is in the education pipeline?"

Scott Hughes will respond to the second and third questions.

Historic Advances in Building Connections Between Education and the Workforce

Mr. Chairman, Congress has on at least three historic occasions helped shape the nation's higher education infrastructure to meet economic challenges. First, one hundred and thirty years ago, Congress created the land-grant universities to educate and train people to strengthen agriculture and industry. That experiment promoted increases in our productivity so great we could feed our own growing industrial giant and, later, many of the world's people.

Second, in 1944, Congress enacted the GI bill, to reward veterans with benefits, and avert a threat of postwar unemployment. The GI Bill funded dramatic growth of education opportunity in this country, and with that support millions of people sought college education and entered the workforce educated and trained to fuel a surge in the nation's productivity.

Third, Congress enacted the Higher Education Act of 1965, with successive amendments over the past 25 years, to broaden educational opportunity.

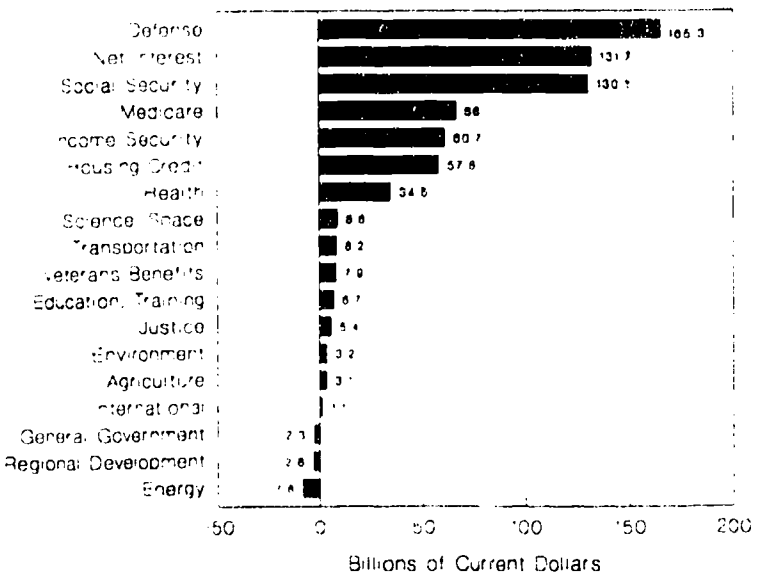
The first two of these great visionary experiments strengthening the connections between education and the work force have been towering successes because they were well conceived and adequately funded. The third great design, the Higher Education Act with its system of need-based student aid, was well conceived to meet an urgent national need but it suffers from wide gaps between the high expected gains and less than expected performance, due primarily to inadequate funding.

The federal budget reflects our federal spending priorities. Between 1980 and 1990 the federal budget increased by $661 billion. Of this $661 billion increase, only $6.7 billion--one meager percent--was invested in strengthening our education and training programs. The places the added funds were spent are shown on Charts 1, 2 and 3.

Underfunding plagues both the education and the training programs. A Department of Labor report concludes that there is currently funding for only about one out of every twenty people who are eligible for training under the JTPA (Job Training Partnership Act).

Figure 1

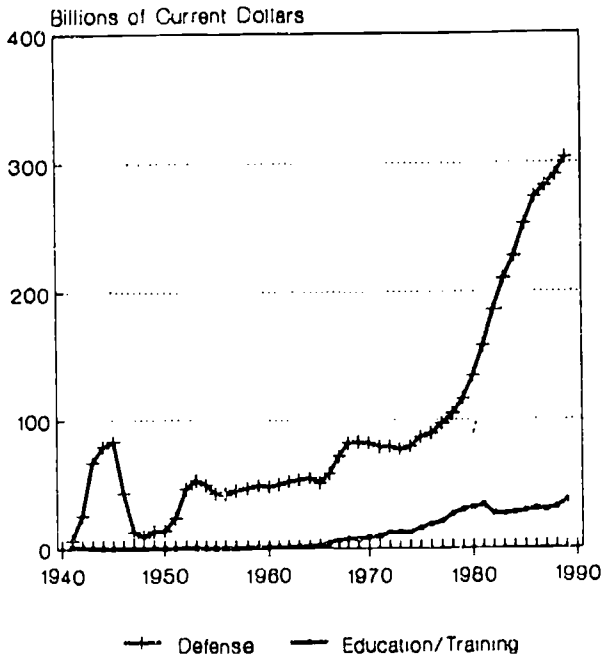
INCREASE IN FEDERAL BUDGET OUTLAYS BY MAJOR FUNCTION 1980-1990



Source: OMB Budget Historical Tables, FY 92

Figure 2

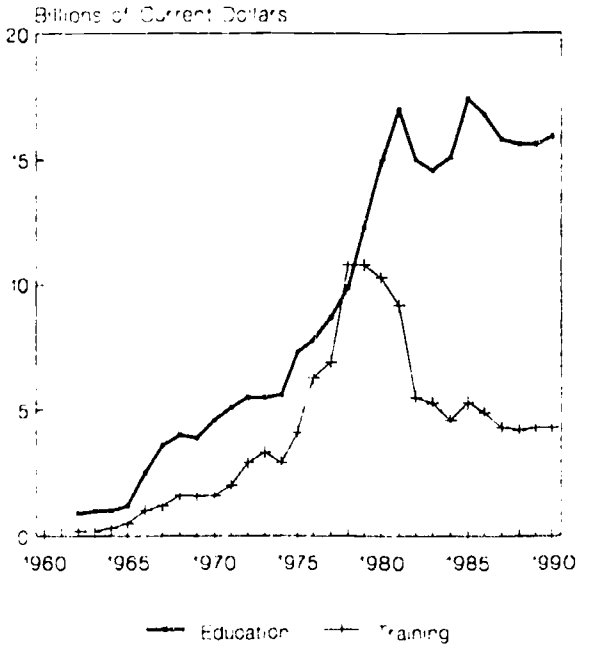
FEDERAL BUDGET OUTLAYS FOR NATIONAL PRIORITIES



Source: Based on data from OMB Historical Tables.

Figure 3

FEDERAL BUDGET ALLOCATIONS FOR EDUCATION AND TRAINING



Source: OMB, Budget Tables

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New People in the Pipeline

Women and minorities account for the overwhelming proportion of the new people in the pipeline.

Analyzed by gender, over 70 percent of the increase in college enrollment since 1980 is accounted for by women. Close to 60 percent is accounted for by women age 25 and over, as illustrated in Chart 4. Almost 50 percent is accounted for by women age 35 and over.

In absolute numbers, the women age 25 and over increased from one-fifth to one-fourth of all students.

Analyzed by race, minorities account for about half of the increase in enrollment from 1980 to 1988. The trends in enrollment differ enormously by race. Virtually all of the increase in minority enrollment was accounted for by Hispanics and Asians, with very little accounted for by Blacks. The differential rates of increase in college enrollment by race since 1980 is shown in Chart 5.

What Kind of a Pipeline Have We Got?

For many people the pipeline works smoothly. But like engineers working toward total quality control, we should examine the pipeline and fix it where it is broken. The information I am presenting is like a report to management on problems with the pipeline.

The pipeline has an opening that is too small, it has leaks all along its course--and at the other end, the pipeline is bent and broken in places, and stretched out and flattened at other places. In short, the pipeline is wasting our resources and could cost us a lot of money if we don't fix it. Our competitors have better pipelines.

The Pipeline is Too Small

The estimates vary widely but there is evidence that close to 20 million people in the workforce never got far enough along the educational pipeline to learn to read well enough to function effectively in the workplace, let alone learn a new job.

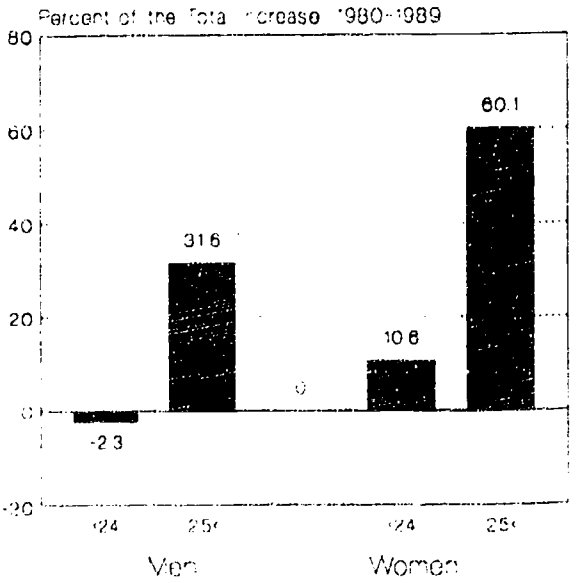
The Pipeline Starts in the Wrong Place

Evidence from the Department of Education studies indicates that many youngsters have ideas about what they want to do when they grow up by the time they are in the 8th grade. Those ideas shape their choices about what classes to enroll in and tracks them into--or out of--the classes they need to prepare for college and for work in information-based jobs. They never even get near the pipeline between higher education and the workforce.

Those early choices are too often determined more by their families' income than by their abilities.

Figure 4

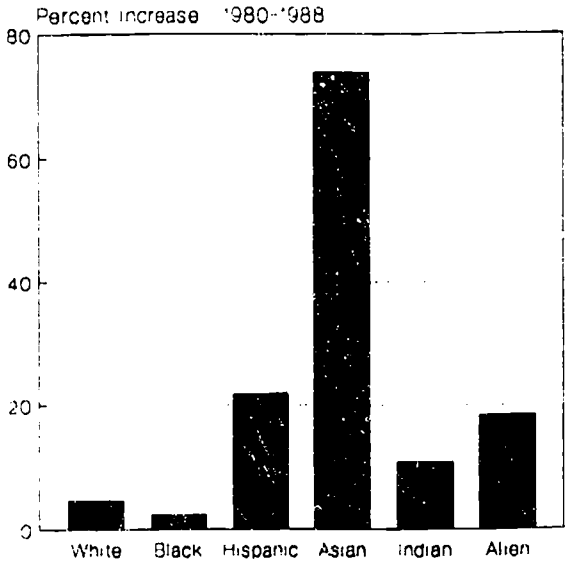
WOMEN AGE 25 AND OVER ACCOUNT FOR 60 PERCENT OF THE INCREASE IN COLLEGE ENROLLMENT



Source: U.S. Department of Education,
Digest of Education Statistics 1990

Figure 5

SHARP DIFFERENCES BY RACE IN THE RATE OF INCREASE IN COLLEGE ENROLLMENT



Source: U.S. Department of Education, Digest of Education Statistics, 1990

The Pipeline Leaks

One in every four young people does not finish high school. They drop out before gaining the skills needed to be a productive worker and earn a decent living.

The high school drop-out rate in the United States is staggering, all the more devastating because it is higher than that of other industrialized nations. Jim Mingle, President of the State Higher Education Executive Officers returned recently from visiting German educators and reported that they didn't even know what the term "drop-out" means because they have so little experience with it.

The Pipeline is Bent

Rates of progress through the pipeline differ significantly by race and income level. Increasing availability of student aid has not prevented the gaps in education participation rates between the majority and the minority families from widening over the last decade. Differences in college-going rates by income have persisted. Students from higher income families are still four times more likely to enroll in college than students from lower income families even though for 20 years much of the student aid available has been targeted for needy students.

The pipeline is also crimped by the poor state of articulation between four-year colleges and the community colleges, which now serve more than half the Americans, who set out to get a college education.

The Pipeline is Stretched Out

Fewer and fewer students are able to get their college degrees in four years. More and more people over the traditional college age are still undergraduates. Close to 80 percent of the students 22 to 24 are undergraduates. Why? It is less the leisurely pace of affluent students enriching their learning experience; it is more the result of financially hard-pressed students having to struggle through with inadequate resources to pay for college, juggling a job with classes.

Delayed entry into the work force at more productive and higher-value-added jobs of this age group could result in an economic loss of close to $25 to $30 billion. If more adequate funding of the student aid, along with incentives for timely completion of education and training programs, could shorten this delay in entering the workforce, the net economic gains could be substantial.

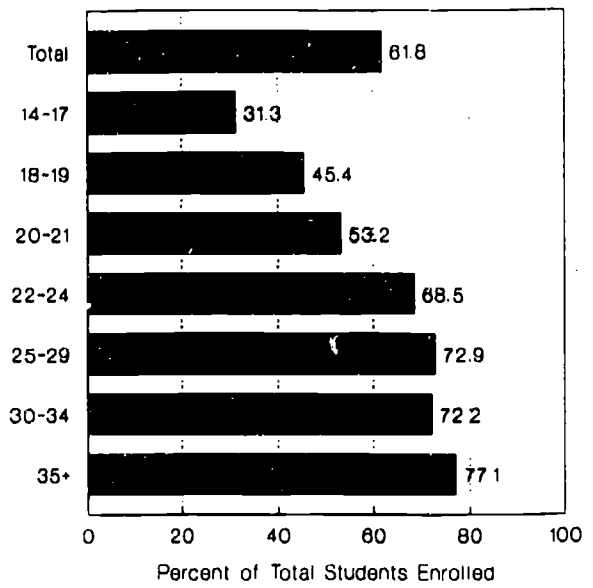
Pipeline? Students are Already in the Workforce

More than 60 percent of all students are already in the workforce. The percent of students who are employed is shown for different age groups on Chart 6.

Of those students over the traditional college, between 70 and 80 percent of the students work at full-time or part-time jobs. Many of the older students never had the opportunity for higher education when they were younger, because of lack of resources to pay for college, or because of race or sex discrimination. Many are now returning to school, but without much student financial aid.

Figure 6

PERCENT OF STUDENTS EMPLOYED BY AGE



Source: U.S. Department of Commerce
Bureau of the Census

Nation's Education and Training Need: The Total Need

From now until the year 2000, the United States will experience close to the slowest growth in the labor force in the 20th century. The net increase of 15 million will be the smallest percentage gain of any decade in this century. The changing composition of the net increase has captured the headlines in the last several years. The net increase is very important to employers. But for educators the total number of people entering the labor force is a more important policy planning number. The net increase is the total number of people entering the labor force minus those leaving. The education and training system must respond to the education and training needs of the total number of new entrants, not the net. The total number of new entrants in about twice as big as the net.

The total number of new entrants is close to 40 million, while the net new entrants is under 20 million. Looking at the net increase underestimates the education and training job to be done by approximately half.

Training for Displaced Workers

The stunning fact is that about 10 million workers, one out of every twelve workers, in the American workforce have been displaced in the last five years. When workers lose their jobs, about one-third leave the workforce. Another third go back to work but at lower wages than they had been earning. Less than a third do as well or better on their new job. Education and training are critical to productive new employment.

Potential of College-Work Study to Enlarge the Pipeline From Education to Work

College Work Study has enormous potential to strengthen the links between higher education and the workforce, as well as to reduce student debt. The program exists, and has proven successful.

One tested, proven, and effective way to leverage limited dollars is to organize and train work-study students to provide tutoring in reading, math, and science for youngsters in elementary and secondary schools who need help. More college-work study would be a welcome alternative for many students who resist still more borrowing to pay for their college education.

It offers opportunities for partnerships between the federal, state, and local governments and colleges and universities. It also offers opportunities for the private sector to participate by providing matching money, training professionals to train student tutors, and facilities.

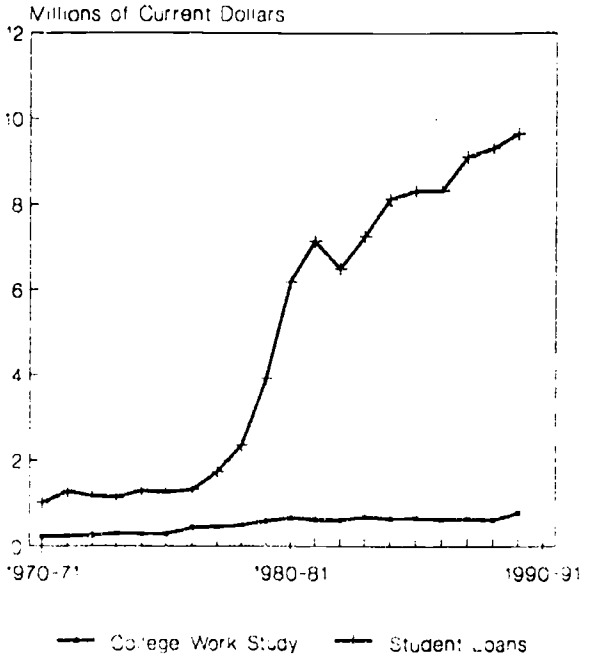
The level funding of the College Work Study program as compared with the sharp increases in the Guaranteed Student Loans is compared on Chart 7.

National Investment in Human Resources

An estimated 40 to 50 million working Americans must upgrade their job skills over this decade to ensure that we can compete in the global marketplace in the year 2000. That total roughly equals all the number of Americans that have been educated with 20 years of Pell Grants and four GI Bills spanning five decades. To do this while we improve education for students still coming through the pipeline will be an enormous challenge.

Figure 7

COLLEGE WORK STUDY FUNDS COMPARED WITH GUARANTEED STUDENT LOANS



Source College Board

We Need to Fix the Pipeline

We need to fix the pipeline or lose our competitive position. In the private sector, the waste of 5 or 10 or 20 percent of the raw materials by any company would be considered scandalous. But fixing the pipeline will cost money. Can we budget the money we need?

In making that decision, there is a striking difference between investment criteria in the public sector and the private sector. In the public sector we look at the costs of the investment. Some people look at the costs and the budget deficits and decide that we cannot find the money to make the investment in our human resources.

In clear contrast, in the private sector wise investment decisions are made on the basis of returns. In a business firm, management looks at how much revenue will be earned after costs.

We are not a poor country. We are a rich country making poor choices.

As a nation we must focus on the returns to needed investment in human resources or lose out to other countries who are making smarter decisions. Only by a national human resources strategy, in which all federal incentives for education and training are carefully orchestrated with each other and with state and local investment, public and private, can the challenge be met.

Chairman FORD. Thank you very much. Mr. Scott Hughes.

Mr. HUGHES. Thank you very much, Mr. Chairman and members of the subcommittee. Thank you for inviting me and giving me an opportunity to share with you my views of the impact of our Nation's work force on our postsecondary education system.

The material that Carol Frances and I are speaking to is sponsored by the National Association of College University Business Officers, though our remarks today are attributable to ourselves only.

I'm addressing questions two and three on the subcommittee's agenda. The second question, what are the requirements of the future work force, particularly for persons with postsecondary education.

The requirements for the future work force as they relate to persons with postsecondary education are the following, as I see them. There are three: number one, increased educational needs of women and minorities; number two, increased employment for service industry occupations requiring better communication skills, analytic abilities and broader understanding of how elements relate within organizations; and, number three, reeducate displaced workers due to corporate downsizing, productivity improvements and corporate mergers and acquisitions.

As many as 40 million people need increased postsecondary education services, estimated by the American Society for Training and Development to cost as much as $45 billion. The U.S. work force faces major turbulence which will intensify in the coming decade. While job opportunities will increase significantly in some fields and professions, they will decrease very markedly in others.

The knowledge and skills needed to succeed in the work force in the 1990s will continue to change as we speed up the transition from an industrial society to an expanding information service based society.

The work force in the 1990s is expected to be characterized by five significant trends: number one, slowing growth in the labor force; number two, a shift in the composition of the work force toward women and minorities; number three, a high number of displaced workers; number four, large variances in employment growth by sector and occupation; and, finally, number five, increased education attainment levels required by high growth occupations.

Together, these characteristics of the work force in the 1990s position higher education to be the Nation's new strategic industry. Greater growth in the labor force is projected to slow in the 1990s to the lowest rate since the turn of the century, only 11.6 percent.

Productivity gains will need to be achieved through greater emphasis on improving technical, professional and managerial skills of existing workers. Education and training becomes even more important since so many new entrants to the work force will be unprepared to meet the knowledge and productivity demands of the new jobs in the 1990s.

Sixty-eight percent of all new entrants to the labor force are projected to be women and minorities. This increase in women and minorities in the work force combines the large numbers of white

men leaving the work force will have a dramatic impact on the composition of the work force in the 1990s.

While white men represented 44 percent of the work force in 1988, they are expected to decrease to 39 percent of the work force by the year 2000.

Employment growth is expected to vary significantly by occupation in the 1990s. Some occupations will experience considerable employment growth between 1988 and 2000; for example, employment for computer analysts is projected to increase by 52 percent, from 503,000 jobs to 763,000. At the same time, many occupations are expected to experience very low and even negative growth.

A correlation exists between those occupations which are expected to experience growth and those which require a high level of educational attainment. For example, based on projections of current educational attainment levels, 64 percent of all employment opportunities for computer and math analysts will require four or more years of college.

Computer and math analysts are projected to experience the greatest percentage growth in employment opportunities between 1988 and 2000. An estimated 23 percent of all jobs will require four or more years of college by the end of the century.

Finally, the wage gap between those with high school degrees and those with college degrees is widening. According to Frank Levy, a University of Maryland economist, in 1979 the average college graduate aged 25 to 34 earned 18 percent more than a high school graduate of the same age. By 1986, that gap had increased to 43 percent, and remains at about that level today.

Let me move on to the third question: What are the challenges facing postsecondary education to deal with those in the education pipeline and to fulfill the requirements of the future work force?

The challenges facing postsecondary education are at least three: number one, pushing responsibility downward towards teachers and students, inviting innovation and creativity and encouraging flexibility; number two, help create a work force which makes the Nation's economy more competitive and productive; and, number three, reexamine what quality education means from the perspective of the student learner and how quality relates to cost so that relative value can be determined.

Higher education is coming under increased pressure to help create a work force which makes the Nation's economy more competitive internationally. According to Clark Kerr, and I quote, "The push by national economic and political leaders for higher education to make a greater contribution to U.S. industrial competitiveness will intensify, leading to more and better skills, training, and more and better research, particularly in applied areas."

The work force and the demographic trends are causing a paradigm shift in higher education from its historic, generally recognized identity as a provider of a discrete learning experience for young people, to a new identity as a provider of lifelong education to adults engaged in the work force.

In the new paradigm, higher education is being viewed as an opportunity, an increasingly a requirement, to stay abreast of changing demands and shifts in society and the work place. The majority of higher education consumers are minorities and women who have

been previously underrepresented in educational attainment and earning power in the work force.

Attendance is becoming less than full time, intermittent, and over most of one's adult life. Academic objectives include self-actualization as well as career development.

Along with this paradigm shift in higher education comes a new look at the quality of the service provided. Postsecondary education institutions will need to emphasize the relationship of quality and value of the services they offer compared to their costs.

Quality education in this context refers to the perceived value, as defined by the learner. Features such as ease of scheduling, transportation, location, and influence in job qualifications, promotions, bonuses and salary increases influence, in the learner's concept, the quality of educational services.

Students may look for guarantees that colleges and universities can meet their education needs. In response, colleges and universities may begin to offer warranties on their services and even go so far as to offer money back guarantees, in which students pay tuition only upon evidence of their acquiring the knowledge and skills that they sought upon enrollment.

The demographic and work force influences in the 1990s continue to reshape college and university teaching, support services, and management. In many ways, the reshaping happens naturally as the free market characteristics of supply and demand come together. For example, community colleges have been especially service oriented and market driven by offering instruction opportunities to employees under programs subsidized and sponsored by their employers.

As institutions adapt to take advantage of new education opportunities, four strategies are emerging: increased quality of services; increased use of technology and communications; increased labor productivity and efficiency; and reducing administrative and support costs.

These strategies are becoming the new postsecondary education agenda for the 1990s. These are my prepared remarks, and I look forward to any questions you may have, Mr. Chairman. Thank you.

[The prepared statement of K. Scott Hughes follows:]

Years of Challenge

The Impact of Demographic and Work Force Trends On Higher Education In the 1990s

K. Scott Hughes
Carol Frances
Barbara J. Lombardo

A NACUBO MONOGRAPH

Preface

Years of Challenge is intended to provide one frame of reference for the financial management concerns confronting colleges and universities in the 1990s. The importance of higher education as a national resource is growing as society and business enterprises require increased levels of skill and knowledge. More than ever before, America will draw on the education of its populace to maintain its productivity, its competitiveness, and its standard of living.

National demographic and work force trends are dramatically affecting postsecondary education. Much of the material in this monograph brings together information and concepts not previously consolidated. The authors are not attempting to advance a theory so much as to synthesize existing data, and then develop conclusions. While demographers and policy analysts have, for a long time, studied the impact of changing populations on college classrooms, much less has been researched on the impact of the changing needs of the work force on higher education. When the two trends are studied in tandem, it becomes apparent that fundamental structural changes are needed in America's higher education systems.

The National Academy of Sciences/National Research Council recently formed a Committee on Postsecondary Education and Training for the Workplace. The committee will address such key topics as program coordination, allocation of resources, student aid, the appropriate federal role in higher education, and program design. The committee expects to take nearly two years to arrive at a set of recommendations; their results are scheduled for early 1993. This underscores not only how important work force and demographic trends are, but also how complex the issues can be. *Years of Challenge* is one of the many starting places in the reevaluation of higher education.

This monograph is rich in quantitative data in the form of graphs and tables. The intent is for institutional presidents, trustees, legislators, business officers, budget analysts, and other policy makers to have useful source materials at their finger tips. In addition to the actual text of the monograph, the authors have included an *Executive Summary*, which serves as a synopsis of the major points concerning work force and demographic trends and their relationship to higher education.

The material in this monograph was presented as key testimony to the U.S. House of Representatives' Subcommittee on Postsecondary Education in May 1991, supporting the reauthorization of the Higher Education Act of 1965. Congress is especially concerned about the challenging education and training demands of the work force in the 1990s.

The views expressed are those of the authors and represent one perspective of the complex and challenging higher education environment.

Executive Summary

This Executive Summary is a synopsis of the material contained in the main section of Years of Challenge. It is intended to be used as a broad overview by busy policy makers who may not have the time to read the entire monograph at their leisure. For a more in-depth analysis of the following points, please refer to the text of the monograph.

America is experiencing a cultural revolution in its higher education system. Not since the 1940s and the advent of the GI Bill of Rights has this country faced such a dramatic change in the very essence of its higher education capabilities.

What makes the 1990s such an exciting era for colleges and universities is the convergence of driving forces of change that will forever alter the current concept of higher education. The next ten years will see:

- The continuing reduction in the traditional 18-24 year-old college-going population
- The increasing participation of women
- The increasing participation of minorities and foreign students
- The increasing participation of individuals over 35, including retirees
- Continuing, striking shifts in state and regional populations

Coincident with these demographic shifts is America's transition from the industrial-based era into the information/service age, which will result in the following:

- The labor force will increasingly demand a higher level of educational attainment from workers
- Major dislocations in the work force due to "downsizing," "rightsizing," and the emergence of flatter network organizations
- An increasing mobility of the work force and multiple career changes
- Fierce international competition for market share and productivity gains
- Advances in technology and communications, and a change in the concepts of work and education

These major cultural phenomena are drastically transfiguring America's higher education institutions. Many of these trends have been building for years, and even decades. As these trends evolve and intensify, higher education is placed in a position of both challenge and opportunity. The purpose of this report is to describe the demographic and work force trends with the most important and interesting implications for institutions. Conclusions are drawn regarding the set of circumstances facing higher education. The report ends with a group of recommended management strategies for the 1990s.

Demographic and work force trends will demand that higher education respond to certain issues. Among these issues are:

- The increased educational needs of women and minorities
- The increased domination of the economic market by the service industry, resulting in the need for workers with high-level communication skills, well-grounded analytical abilities, and a broad understanding of how elements interrelate within organizations

- The need to reeducate displaced workers due to corporate downsizing, productivity improvements, and corporate mergers and acquisitions

As many as 40 million people need increased postsecondary education services, estimated by the American Society for Training and Development to cost as much as $45.4 billion.

The U.S. work force faces major turbulence, which will intensify in the coming decade. While job opportunity will increase significantly in some fields and professions, it will decrease markedly in others. The knowledge and skills needed to succeed in the work force of the 1990s will continue to change as the transition from an industrial society to an expanding information/service-based society gains momentum.

The work force of the 1990s is expected to be characterized by the following decisive trends:

- Slowing growth in the labor force
- A shift in the composition of the work force toward women and minorities
- A high number of displaced workers
- Large variances in employment growth by sector and occupation
- Increased education attainment levels required by high-growth occupations

Together, these characteristics of the work force in the 1990s give higher education a crucial role in maintaining America's productivity. Indeed, because of its key responsibility in preparing the work force for the challenge of global competition, higher education can be considered this nation's new strategic industry.

Rate of growth in the labor force is projected to slow in the 1990s to the lowest rate since the turn of the century—only 11.6 percent. Productivity gains will need to be achieved through greater emphasis on improving technical, professional, and managerial skills of existing workers. Education and training become increasingly important, since so many new entrants to the work force will be unprepared to meet the knowledge and productivity demands of the new jobs of the 1990s.

Sixty-eight percent of all new entrants to the labor force are projected to be women and minorities. This increase in women and minorities in the work force, combined with the large numbers of white men leaving the work force, will have a dramatic impact on the composition of the work force in the 1990s. While white men represented 44 percent of the work force in 1988, they are expected to decrease to 39 percent of the work force by the year 2000.

Employment growth is expected to vary significantly by occupation in the 1990s. Some occupations will experience considerable employment growth between 1988 and 2000. For example employment for computer analysts is projected to increase by 52 percent, from 503,000 jobs t 763,000 jobs.

At the same time, many occupations are expected to experience low—and in some cases, negative—growth. Employment for machine operators is projected to decrease by 3 percent, from 4.9 million jobs to 4.8 million jobs. Employment in agriculture, forestry, and fishery is projected to decrease by 5 percent, from 3.5 million jobs to 3.3 million jobs.

A correlation exists between those occupations expecting to experience growth and those that require a high level of educational attainment. For example, based on projections of current educational attainment levels, 64 percent of all employment opportunities for computer and math analysts will require four or more years of college. Computer and math analysts are projected to experience the greatest growth in employment opportunities between 1988 and 2000. At the other extreme, in the field of machine operators (where, as has been shown, employment is decreasing), only 4 percent of the jobs require a college degree. Educational attainment required for jobs clearly is increasing. An estimated 23 percent of all jobs will require four or more years of college by the

end of this century.

Finally, the wage gap between those with high school degrees and those with college degrees is widening. According to Frank Levy, a University of Maryland economist, in 1979 the average college graduate aged 25-34 earned 18 percent more than a high school graduate of the same age. By 1986 that gap had increased to 43 percent, and it remains at about that level today.

Demographic and work force changes are making higher education leaders address the fundamental nature of their programs and services. To come to grips with these major challenges, higher education needs to:

- Push responsibility downward toward teachers and students; invite innovation and creativity; and encourage flexibility
- Help create a work force that makes the nation's economy more competitive and productive
- Reexamine what quality education means from the perspective of the student learner; and how quality relates to cost so that relative value can be determined

Higher education is coming under increased pressure to help create a work force that makes the nation's economy more competitive internationally. According to Clark Kerr, "the push by national economic and political leaders for higher education to make a greater contribution to U.S. industrial competitiveness will also intensify, leading to more and better skills training and more and better research, particularly in applied areas."

The work force and demographic trends are causing a paradigm shift in higher education, from its historic identity as a provider of a discrete learning experience for young people to a new identity as a provider of lifelong education to adults engaged in the work force.

In the new paradigm higher education is being viewed as an opportunity (and increasingly, a necessary one) to stay abreast of changing demands and shifts in society and the work place. The majority of higher education consumers are minorities and women who have been previously underrepresented in educational attainment and earning power in the work force. Attendance is becoming part-time, intermittent, and over most of one's adult life. Academic objectives include self-actualization as well as career development.

Along with this paradigm shift in higher education comes a new look at the quality of the service provided. Postsecondary education institutions need to emphasize the quality of the services they offer compared to the cost of these services.

"Quality" education in this context refers to the perceived value as defined by the learner. Features such as ease of scheduling, transportation, location, and influence on job qualifications, promotions, bonuses, and salary increases influence the learner's concept of quality educational services. Students may look for guarantees that colleges and universities can meet their educational needs. In response, colleges and universities may begin to offer warranties on their services, and even go so far as to offer "money-back guarantees" in which students pay tuition only upon evidence of their acquiring the knowledge and skills that they sought upon enrollment.

The demographic and work force influences in the 1990s continue to shape college and university teaching, support services, and management. In many ways the adjustment happens naturally, as the free market characteristics of supply and demand come together. For example, many community colleges offer instruction opportunities to employees under programs subsidized and sponsored by their employers.

As institutions adapt to take advantage of new education opportunities, four strategies are emerging. Colleges and universities should work to:

- Increase the quality of their services
- Increase their use of technology and communications
- Increase labor productivity and efficiency
- Reduce administrative and support costs

These new strategies are becoming the postsecondary education agenda for the new decade. The institutions that succeed in the coming years will be those that realign their services and redefine their product in response to the changing service demands of their students.

Introduction

America is experiencing a cultural revolution in its higher education system. Not since the 1940s and the advent of the GI Bill of Rights has this country faced such a dramatic change in the very essence of its higher education capabilities.

What makes the 1990s such an exciting era for colleges and universities is the convergence of driving forces of change that will forever alter the current concept of higher education. The next ten years will see:

- A continuing reduction in the traditional 18-24 year-old college-going population
- The increasing participation of women
- The increasing participation of minorities and foreign students
- The increasing participation of individuals over 35, including retirees
- Continuing, striking shifts in state and regional populations

Coincident with these demographic shifts is America's transition from the industrial-based era into the information/service age, which will result in the following:

- The labor force will increasingly demand a higher level of educational attainment from workers
- Major dislocations in the work force due to "downsizing," "rightsizing," and the emergence of flatter network organizations
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These major cultural phenomena are drastically transfiguring America's higher education institutions. Many of these trends have been building for years, and even decades. As these trends evolve and intensify, higher education is placed in a position of both challenge and opportunity. The purpose of this report is to describe the demographic and work force trends with the most important and interesting implications for institutions of higher education. Conclusions are drawn regarding the

set of circumstances facing higher education. The report ends with a group of recommended management strategies for the 1990s.

Major Demographic Changes Affecting Higher Education

Higher education was once the bastion of the young, the white, and the privileged. For years, however, this has been changing; today, the mosaic of higher education is more variegated and dynamic than ever.

Clark Kerr, President Emeritus, the University of California, has stated that the 1990s will be a decade of major change or conflict for U.S. universities and colleges (figure 1). One major cause is the powerful demographic shifts that America is experiencing.

Kerr has also stated that higher education has been most influenced by external factors such as population shifts, economic cycles, and public policy changes (figure 2).

This section of the monograph concentrates on the major demographic characteristics affecting demand for higher education services. These characteristics encompass statistics relating to the general population—race, age, gender, immigration, family status—and statistics relating to higher education, specifically, including college enrollment and college-going rates. Four key observations emerge which, collectively, characterize the major demographic trends affecting higher education in the coming decade. These characteristics are the extreme regional variation of demographic trends, the increasing participation of older age groups in higher education, the continued demand from women for educational opportunities, and broader cultural diversity.

In the following section, these individual traits are analyzed, and the implications and opportunities that arise for higher education institutions are examined.

Dramatic Regional Variation of Demographic Trends

The total U.S. population is projected to increase by 7 percent, or 18 million, in the 1990s; this estimate leads to 268 million citizens by the year 2000. This represents a slowdown in the nationwide growth rate, which increased by 10 percent, or 23 million, in the 1980s (figure 3).

The key to understanding and responding to population trends is to recognize the potent differences in population trends by state and region. The range of growth rates among the states is extraordinary. California, projected to increase by 4.7 million, will account for 26 percent of the total

population increase for the entire nation. Arizona is forecast to increase its population an estimated 26 percent, or almost 1 million by the end of the decade. California, Virginia, Florida, North Carolina, and Georgia account for two-thirds of the total projected population increase for the nation. At the same time, 13 states are projected to experience net decreases in population. Iowa, Louisiana, and Oklahoma are each anticipated to undergo a net decrease of over 200,000 people, and the population of Wyoming is expected to decrease by 13 percent (figure 4).

State population projections are subject to much more variability than projections for the nation as a whole because large numbers of people move from one state to another in search of job opportunity. Thus, projections in state population growth or decline are subject to substantial change due to economic forces. State population trends are critically affected by the interstate migration of people, which is in turn directly affected by individual state economic performance. For example, several states are currently having fiscal difficulties which may keep their population growth below the projected levels. Texas serves as an interesting example of the mutable nature of a state. After the problems in the oil industry and the collapse of real estate markets in major cities in the 1980s, Texas had been projected to experience a sharp slowdown in its population growth. However, an increase in the price of oil, a resurgence of the real estate market, and the rewards of industry diversification are contributing to an economic resurrection that may support a larger population increase than ever imagined.

Implications for Higher Education

Substantial regional and state variations in population trends have crucial implications for higher education. The following points illustrate the delicate relationship between geographic population shifts and higher education institutions.

Institutions will be affected in vastly different ways by demographic trends depending on where they are located and whether they draw from a local, state, regional, or national market. Colleges and universities therefore need to conduct individualized analyses, instead of relying on national trends to predict enrollment. Economic trends in particular states and regions should also be considered when evaluating population projections. For example, institutions in California and Florida which draw heavily on in-state populations will need to plan for profound enrollment increases.

Institutions will need to differentiate themselves and develop market "niches." It will become increasingly necessary for institutions in areas with slow growth or decline in population to differentiate themselves in the higher education marketplace. These institutions should examine,

clarify, and redefine their market "niche," or the particular segment of the higher education market they are targeting. For example, institutions in geographic areas with low population growth, such as Iowa and Wyoming, may reach out to older age groups seeking continuing education. The trends discussed later in this report present considerable opportunities for institutions in lower population growth areas to redefine their markets and their educational services, and to target specific population groups such as older age groups, women, and minorities.

Institutions may need to change their organizational structures to deliver educational services more effectively. Population pressures—whether growth or decline—can generate the need for colleges and universities to alter their basic design by expanding, consolidating, or merging. For example, the University of California has considered adding up to three new campuses in preparation for the population increases expected in California, while a number of small independent colleges in the Northeast are merging and consolidating in an attempt to adapt to the decreasing population growth in that region.

Increasing Participation of Older Age Groups in Higher Education

A second key observation characterizing the changes affecting higher education is the increased participation of older segments of the population. Virtually all of the enrollment growth which occurred in the 1980s can be accounted for by students older than 25.

The 1980s saw population growth in the 25-34 year-old sector, as well as the 35+ sector. However, in the new decade, the 25-34 age group will actually decline, while the 35+ age group will continue to grow.

Most undergraduate college enrollment projections have traditionally focused on the 18-24 year-old age group. Although the shrinkage of this core majority is a well-established trend, it is a trend that is growing more pronounced. For example, although the 18-24 age group still represents the majority of all college students, it currently represents a considerably smaller percentage of all college students than it has in the past. In 1970, the 18-24 year-old age group represented 69 percent of all college students. In 1990, that percentage had decreased to 57 percent. During the 1990s the population of this age group is projected to decline by 1.2 million people, to 24.6 million.

The number of individuals in the 25-34 year-old bracket is also projected to decline in the 1990s, by 16 percent. However, the 35+ age group is projected to grow by 25 percent or 20 million, to 104.6 million in the 1990s. At the same time the 5-17 age group is projected to increase by 10 percent to 49.8 million (figure 5).

Many people predicted decreases in college enrollment in the 1980s based on the decreases in the 18-24 year-old population. However, overall college enrollment actually increased by more than 10 percent in the 1980s, from 12.1 million in 1980 to 13.6 million in 1990.

This surge in the 1980s was due to increases in college enrollment in both the 25-34 and the 35+ age groups. Between 1980 and 1988, enrollment among those in the 25-34 age group increased by 5 percent, from 3.1 million to 3.3 million. Enrollment in the 35+ age group increased by 46 percent, from 1.4 million to 2.1 million. Students in the 35+ age group accounted for 86 percent of the enrollment increase over that time period, and students in the 25-34 age group accounted for 20 percent of the increase. This counterbalanced the drop in enrollment by other groups (figure 6).

The percentage of any population group attending college is referred to as the "college-going rate." If one holds college-going rates by age group constant over the next decade, enrollment would decline in every age group except the 35+ age group. College-going rates doubled in the 35+ age group between 1970 and 1988. Overall, college-going rates vary widely by age group (figure 7).

Implications for Higher Education

These trends in population, college-going rates, and enrollment have vital implications for higher education, and are described further below.

Continued increases in enrollment. In the 1980s, increases in the number of people in the 25-34 age group helped offset decreases in the number of 18-24 year olds and therefore helped to sustain enrollment. In the 1990s, however, a decrease is projected in the 25-34 year-old population. If one were to assume constant participation rates by age group, total enrollment in higher education would decrease from 13.4 million in 1989 to approximately 12.5 million in 2000.

However, participation rates among older age groups increased momentously in the 1980s and in all likelihood will continue to increase in the 1990s. As noted above, enrollment in the 35+ age group increased by 46 percent between 1980 and 1988, from 1.4 million to 2.1 million. For this reason, college enrollment is expected to continue to increase in the 1990s.

The opportunity for certain institutions to improve services to older age groups. The trends described above indicate that demand for higher education in the traditional, 18-24 college-going age group may not increase, while there is great potential for increases in demand among older age groups. In fact, Richard Fischer, associate provost and director of continuing education at the University of Delaware, estimates that over 1 million senior citizens are currently enrolled in higher education degree programs.

Many people choosing early retirement return to school. For example, the Wall Street Journal recently profiled a man who, after a 24-year career with General Electric, took an early retirement and plans to study English at a local college. These trends create important opportunities for colleges and universities to respond to the needs of these older age groups.

Colleges and universities need to increase research efforts to assess the particular educational demands of these older age groups. Serving older students will be more appropriate for some institutions than others. Community colleges, for example, have taken the lead in serving the older part-time student. Other institutions, with more traditional academic programs—and/or located in nonurban locations—may have less capability and opportunity to serve these populations.

Older students often have jobs and families, and increasingly adults are heads of single-parent families. The typical adult lifestyle constrains the ability to attend higher education institutions on a full-time basis. Over a period of 20 years, the number of U.S. families headed by a single man increased 129 percent, from 1.3 million families in 1969 to 2.9 million families in 1989 (figure 8). The number of U.S. families headed by a single woman increased by 83 percent, from 6 million families in 1969 to 10.9 million families in 1989. The educational demands and income levels of single heads of households is an emerging trend that will need to be closely watched and researched.

As an indication of these changing demands, the number of students attending college part-time increased from 5 million in 1980 to 5.8 million in 1989, a jump of 16 percent. Part-time students accounted for 58 percent of the enrollment increase between 1980 and 1989 (figure 9). Offering degrees for part-time students, as well as providing flexibility in terms of location, classes, and student/teacher interaction, are opportunities for higher education institutions to appeal to older students.

Increased competition for state funds. Changes in population trends by age group will have a major impact on competition for state funds. For example, the rapid population growth in the 5-17 age group creates competition from elementary and secondary public schools for increased state funds. Especially in a recessionary economy, this leads to greater difficulty finding money in state budgets to support higher education.

Another trend that has been building for decades is the growth of the elderly segment of America's population; this is also contributing to increased costs for health care. State governments spent 58 cents per $100 of personal income on health and hospitals in 1979. In 1989, state governments spent 63 cents per $100 of personal income on health and hospitals, an increase of 9 percent (figure 10). As the population ages, more pressure will be exerted on state governments and on society in general to increase spending on health care, creating increased competition with higher

education for state funding.

State funding of higher education decreased from 94 cents per $100 of personal income in 1979 to 91 cents per $100 of personal income in 1989. Continued decreases in the 1990s are anticipated due to increased competition for state funding from elementary and secondary education, health care, and other services.

Continued Demand from Women for Educational Opportunity

The most pivotal change in higher education enrollment can be traced directly to women, and the phenomenon of the gender shift. Women's participation in higher education has increased profoundly since the 1950s (figure 11). In 1950, 727,000 women attended college, representing 32 percent of all college students. By 1988, 6.9 million women attended college, representing 54 percent of all college students. By 1989, the population of women attending colleges and universities had increased to 7.3 million, and the latest figures for 1990 indicated that women made up 55 percent of all students in higher education. This gender shift reached an impressive point in 1978—the year that women became the new majority of college students.

A number of factors account for this increase in the enrollment of women. Many of the women attending college since the 1950s are older women who are pursuing degrees after raising children. Women are entering the work force in great numbers, and pursuing careers that require college degrees. The need for two incomes in families just to maintain current standards of living is sending women back to the work force. Also, some women find it necessary to acquire additional academic credentials in order to break through the corporate "glass ceiling" and gain parity with their male counterparts in top management positions.

Of the 6.9 million women attending college in 1988, 46 percent attended part-time. Women accounted for 78 percent of the total enrollment growth between 1980 and 1989. College-going rates increased at a much higher level among women than among men in the three race categories of whites, blacks, and Hispanics (figure 12). The college-going rates of adult white women increased by 24 percent between 1980 and 1989, while college-going rates of adult white men increased 15 percent in that same time frame. College-going rates among black women increased 14 percent, almost three times the increase of black men. College-going rates of Hispanic women increased by 9 percent, almost double the increase of Hispanic men over the same time period.

Women differ notably from men in the types of degrees they pursue. Although women have

made important inroads in the physical sciences and engineering, they still pursue degrees predominantly in the humanities and social sciences (figure 13).

For example, in 1986 women represented only 36 percent of all those students awarded bachelor's degrees in chemistry, and 15 percent of all those students awarded bachelor's degrees in physics. Only 12 percent of students earning bachelor's degrees in electrical engineering were women, and only 13 percent of students earning bachelor's degrees in civil engineering were women. Women also represent a minority of students earning professional degrees. Only 31 percent of all medical degrees and 23 percent of all dentistry degrees awarded in 1986 were earned by women. Although women represented a large percentage (40 percent) of all students earning law degrees in 1986, they still constituted a minority of all law degree graduates.

However, in the fields of study that are traditionally popular with women, they are clearly in the majority. For instance, in 1986 women earned 76 percent of all bachelor's degrees in education. Women represented 66 percent of all those students awarded bachelor's degrees in English, and 72 percent of all those students awarded bachelor's degrees in foreign languages.

Implications for Higher Education

As can be imagined, this gender shift has serious ramifications for colleges and universities. Higher education has a new majority, and with this comes a new set of opportunities and priorities. Three major implications are detailed below.

The opportunity exists for institutions to continue and increase their responsiveness to the interests of women. Colleges and universities have changed considerably in response to the increasing numbers of women college students. During the 1970s many all-male private institutions began to admit women. Courses and majors of special interest to women began to appear in the 1970s and 1980s. Women's studies programs, among other offerings, are now the norm at most colleges and universities. It is anticipated that colleges and universities will continue to realign their services in response to the demands of women students in these and other ways.

There will be continued heavy demand for the services of community colleges. As indicated above, significant numbers of women students attend college part-time, and pursue two-year degrees. It is therefore likely that women will continue to attend community colleges in high numbers, as they offer the close geographic proximity, flexibility, and particular degree programs that meet the needs of many women.

There is a need for institutions to be responsive to the particular degree choices of women. It is

essential that higher education institutions be attuned to the degrees pursued by women. Strong programs in the humanities and social sciences will continue to attract women students. However, as women respond to work force changes which increasingly provide greater rewards and opportunities to those with science degrees and professional degrees, shifts in their degree preferences will likely occur.

Broader Cultural Diversity

The single most compelling demographic factor in the 1990s is the increasing cultural diversity of the student population. This trend has been developing for some time; the influence of cultural diversity both requires a response from and creates new opportunities for higher education.

The population trends among age groups vary meaningfully by race (figure 14). For example, while the overall population of the 18-24 age group is projected to decline by 1.2 million or 4.6 percent in the 1990s, the Hispanic population in that age group is projected to increase by 2.8 million or 16 percent. The Asian population in that age group is projected to increase by 1.0 million or 24 percent.

Minority students accounted for 47 percent of the enrollment growth between 1980 and 1988 (figure 15). Asians and Pacific Islanders have surging enrollment rates, with a combined 74 percent increase in enrollment between 1980 and 1988. Enrollment among Hispanic students grew 44 percent in that same time period.

The number of people who immigrated to the U.S. in the 1980s was higher than in any other decade since the first decade of this century (figure 16). During the 1980s, the U.S. admitted over 6 million immigrants to the country. Well over 40 percent of those immigrants were from Asia. A large number of these immigrants had been residing in the U.S. but were officially admitted to the country in 1989 under the Immigration Reform and Control Act (IRCA) of 1986. Six states accounted for 80 percent of all immigrants admitted to the country during 1989: California, New York, Texas, Illinois, Florida, and New Jersey.

Increasing numbers of foreign students are enriching the cultural diversity of American colleges and universities. Foreign student enrollment has increased vigorously over the last several decades, from 53,000 in 1960 to 387,000 in 1988 (figure 17). Asian students have represented more than half of all foreign students in the U.S. for the last three years. The rate of increase in foreign students slowed somewhat in the early 1980s when an overvalued dollar increased their cost of enrolling in American institutions, but foreign students are nevertheless an important market for

colleges and universities.

Implications for Higher Education

Immigration, the growth in the population and enrollment of minorities, and increased foreign enrollment considerably broaden cultural diversity in the student population. Cultural diversity certainly challenges higher education, but it also presents a number of unique opportunities. Higher education has the opportunity to:

Realign services to target culturally diverse groups. For some time, colleges and universities have worked to address increasing cultural diversity by realigning their services to address minority groups. Some institutions have added required courses in minority studies; some institutions have found it necessary to enhance the language skills of foreign graduate students before they are given responsibility for instructing undergraduates; some institutions are making efforts to increase minority representation in their faculty and administrations in order to become more responsive to and reflective of their student bodies. Higher education will continue to respond to increasing cultural diversity in these and other ways, especially in those states where cultural diversity and immigration rates are highest, such as California and Florida.

Focus on serving increased foreign student market. The increase in foreign enrollment presents an opportunity for independent colleges concerned with declining enrollment to focus on services to foreign students. For example, colleges could provide orientation programs for incoming foreign students and make efforts to integrate them into the student population. Course offerings could place greater emphasis on Asian languages, and on English as a second language.

Pursue collaboration with foreign universities. A number of Japanese universities are actively seeking American higher education institutions with which to collaborate on programs to educate visiting Japanese students. In these situations, both sides benefit: Japanese students are exposed to American culture and a high standard of education, and institutions receive a steady stream of students. This trend will continue and is likely to expand to universities in other Asian countries, such as Korea, which are rapidly increasing their economic presence in the United States.

Summary and Conclusion of Demographic Trends

The analysis of demographic trends identifies four key forces which, collectively, characterize the major demographic trends affecting higher education in the new decade. The

influence of women, the regional variation of demographic trends, cultural diversity, and the participation of older students are all interrelated, and the particular ways in which they react with one another will determine their implications for individual higher education institutions.

For example, institutions in states experiencing low population growth may increasingly target older age groups. Since women are one of the forces driving the growth of minority participation in higher education, institutions targeting minorities will have to be especially responsive to the needs of minority women. States where immigration rates are highest will need to be particularly responsive to increasing cultural diversity. These forces and their implications for higher education institutions are summarized below.

Dramatic Regional Variation of Demographic Trends

Population shifts will emphatically change state and regional populations in the 1990s. Higher education demand will therefore vary profoundly among institutions in different geographic areas. Institutions will need to conduct individual analyses of the population trends in their home states in order to accurately project and plan for changes in enrollment. Higher education institutions can respond to these changes by developing market niches, clarifying and redefining their target markets, and changing their organizational structures through expansions, mergers, and consolidations.

Increasing Participation of Older Age Groups in Higher Education

Increased participation of older students will lead to increased overall enrollment in the 1990s. As older individuals continue to pursue higher education services in greater numbers, opportunities are created for higher education institutions to realign their services in response to the particular service demands of older students. Such realignments include providing greater flexibility in the time, place, and content of programs, as well as offering more part-time degree options.

Increasing population growth in the very youngest and the very oldest age groups will create greater competition for state funds as demand increases for elementary and secondary education and health care services.

Continued Demand from Women for Educational Opportunity

As women continue to represent the majority of all college students, higher education institutions should continue to realign their services in response to the particular service demands of women students by offering part-time degrees, two-year degrees, and courses and majors of special interest to women. Demand for community colleges will remain intense, since they present the geographic proximity, flexibility, and particular degrees that meet the needs of many women. Opportunities also exist for higher education institutions to provide services responding to the needs of women as they continue to enter the sciences and seek professional degrees in greater numbers; this in turn is a response to work force trends which provide more rewards and opportunities to holders of these degrees.

Broader Cultural Diversity

The most significant of the four demographic trends previously identified with regard to higher education in the 1990s is the increased cultural diversity of the population. Institutions will need to make major changes in their efforts to serve an increasingly culturally diverse student body. The ever-building cultural diversity of the population requires changes in virtually every aspect of higher education, including admissions policies, financial aid, faculty recruitment, degree offerings, curricula, the professor/student relationship, and student life. Opportunities also exist for institutions to target foreign students and to collaborate with foreign universities to develop programs for visiting students.

The demographic changes described above present major challenges and opportunities for higher education institutions in the 1990s. Greater flexibility in educational offerings; changes in curricula; and target marketing of older students, women, and foreign students are just a few of the ways in which higher education institutions can respond to these challenges. The institutions that succeed in the coming years will be those that realign their services and redefine their product in response to the changing service demands of their students.

The Impact of Work Force Trends on Higher Education

The U.S. work force has been undergoing major changes which will intensify in the coming decade. Although job opportunities will increase significantly in some fields and professions, they will decrease markedly in others. The knowledge and skills needed to succeed in the work force of the 1990s will continue to change as the transition from an industrial society to an expanding

information/service-based society gains momentum. The 1990s will be a watershed period in this transformation. According to Richard Nolan, chairman and co-founder of Nolan-Norton Co., 1995 will represent the middle point of the global information society, just as 1945 represented the middle point of the industrial society.

Corporations are making major shifts in their organizational structures as they eliminate layers of middle management and lower-level positions. Corporations are evolving into flatter, less hierarchical structures. But corporations are not the only ones undergoing change; the work force is also evolving. Increasingly, individuals are developing career "portfolios" in which they engage in several different careers with different organizations throughout their working lives. New jobs are being created faster in small firms than in large firms. More people are going into business and working from home offices instead of moving up career ladders in large firms. America is entering a new era of "intellectual capitalism" in which the most important asset of the business world is the knowledge of its workers.

The scope of the nation's unmet education and training needs created by these work force and demographic trends is immense (figure 18). It is estimated that the potential market for higher education could total between 15 million and 40 million people. Groups needing education and training include:

- Existing workers who must upgrade their skills
- Underemployed workers
- Unemployed workers
- Dislocated workers
- Individuals reentering the labor force
- New entrants to the work force
- High school dropouts
- Disabled people of working age
- Immigrants

In a separate study, the American Society for Training and Development (ASTD) estimated that an additional $45.4 billion is needed to fully train U.S. workers in order to keep up with the new demands of their jobs (figure 19). Major categories of unmet training include technology, management, customer service, and basic skills.

In order to successfully serve these diverse groups in need of higher education, colleges and

universities will need to make major changes in virtually every aspect of their organizations, including admissions, financial aid, curricula, teaching styles, faculty recruitment, tuition pricing, and student life. Those institutions that can respond to the needs of these varied groups will find a robust market to serve in the new decade.

Work force trends will have formidable effects on the demand for the services of higher education institutions in the 1990s. For example, major shifts in student demand for higher education services are emerging as students pursue programs and degrees in the professions experiencing greatest growth. Also, mid-career professionals are losing jobs due to organizational changes; many of these professionals will be pursuing further education in order to rechannel their careers. As individuals pursue multiple careers, they will return to colleges and universities for further education to facilitate the transition process, and for opportunities to learn and grow. Together, these work force and demographic trends are causing a paradigm shift in higher education, from its historic identity as a provider of a discrete learning experience for young people to an expanded identity as a provider of lifelong education to many adults engaged in the work force. Along with this paradigm shift comes a new focus on quality as colleges and universities compete with more unconventional providers of lifelong learning experiences.

The changing role of education will continue to differentiate colleges and universities. Some, like community colleges, will continue to grow and adapt to the changing needs of their clients. Other, more traditional institutions will be forced to reexamine their roles and missions given changing demographic and educational demands.

Characteristics of the Work Force in the 1990s

Major changes are taking place in the size and composition of the work force which have serious implications for higher education. The work force of the 1990s is expected to be characterized by an overall slowdown of growth, a shift in the composition of the labor pool, a high number of displaced workers, large variances in growth by geographic region, and the requirement of elevated educational attainment levels. Together these changes in the nature of the work force will give higher education a crucial role in America's productivity. In fact, because of its key role in preparing the work force for the challenge of global competition, higher education can be considered this nation's new strategic industry.

Slow Growth in the Labor Force

The rate of growth of the labor force is projected to slow in the 1990s to the lowest rate since the turn of the century (figure 20). The labor force is projected to increase by only 11.6 percent in the 1990s, in contrast to the 27.9 percent growth rate in the 1970s and 14.7 percent growth rate in the 1980s.

America's increased standard of living has been built, in large part, by productivity gains achieved through the ready availability of relatively low-cost, entry level workers in the 1970s and 1980s. In order to maintain and improve the nation's current standard of living, control the national debt, and remain competitive in the global marketplace, productivity must continue to increase, in spite of the slowdown in the labor force growth rate. Productivity gains will need to be achieved through greater emphasis on improving the technical, professional, and managerial skills of existing workers. Education and training will become even more important, since so many new entrants to the work force will be unprepared to meet the knowledge and productivity demands of the new jobs in the 1990s.

Shift Toward Women and Minorities

There will be an estimated 42.8 million new entrants to the U.S. work force between 1988 and 2000. During the same time period, 23.4 million individuals are projected to leave the work force, resulting in a net increase of 19.4 million workers. The total work force is projected to increase by 16 percent, from 121.5 million in 1988 to 141.1 million in 2000 (figure 21).

Almost half of all those projected to leave the work force between 1988 and 2000 will be white males. Over 11.2 million white men are projected to leave the work force between 1988 and 2000, accounting for 48 percent of all those leaving the work force in that time period. During the same time period, over 13.5 million white men are projected to enter the work force, accounting for 32 percent of all new entrants.

Over 8 million white women are projected to leave the work force between 1988 and 2000, accounting for 36 percent of all those leaving the work force in that time period. However, almost twice as many white women, or over 15 million, are projected to enter the work force, representing 35 percent of all new entrants. During this time period, 1.5 million more white women will enter the work force than white men.

Over 14 million minority individuals are projected to enter the work force between 1988 and 2000, accounting for 33 percent of all new entrants. Of these minority entrants, half are projected to be women. At the same time, an estimated 4.1 million minorities will leave the work force,

accounting for only 17 percent of all leavers.

Sixty-eight percent of all new entrants to the labor force are projected to be women and minorities. This increase in women and minorities in the work force, combined with the large numbers of white men leaving, will have a striking impact on the composition of the work force in the 1990s. White men will become increasingly less representative of the average employee. While white men represented 44 percent of the work force in 1988, they are projected to represent 39 percent of the work force by the year 2000. The work force of the 1990s and beyond will be much more varied in gender and race than it has ever been before.

Displaced Workers

Though the overall number of displaced workers has decreased since the first national survey in 1986, at current rates, one out of every dozen workers in the United States will be displaced in the 1990s. The work force is expected to be characterized by high numbers of displaced workers. Between 1985 and 1989, 4.3 million workers lost their jobs (figure 22). Only 62 percent of these workers were reemployed as of January 1990. Only one-third of all workers who lost their jobs between 1985 and 1989 are currently employed and earning salaries equal to or above the salaries they earned before losing their previous jobs. The factors, both new and old, that lead to the increasing number of displaced workers include corporate mergers, acquisitions, and divestment; increased international competition; corporate downsizing; plant relocation; and plant closings. These displacement trends are likely to continue (and most probably intensify) well into the 1990s. Many of these displaced workers are expected to seek further education and training experiences to facilitate career transition.

Variance in Employment Growth by Sector and Occupation

Job growth is expected to vary significantly among sectors of the economy. Jobs in the service industries have grown steadily since the 1940s, while jobs with goods manufacturers have increased only slightly since 1940, and have remained almost stable in the 1980s (figure 23). In 1990, there were about 4 jobs in the service industries for every job involved with the production of goods. Many jobs in the service sector frequently require a high level of communication skills, considerable analytical abilities, and a thorough understanding of how elements interrelate within organizations.

Employment growth is expected to vary dramatically by occupation in the 1990s, as illustrated in data extracted from the Department of Labor's *Outlook 2000* (figure 24). Some occupations are projected to experience considerable employment growth between 1988 and 2000. For example, employment for computer analysts is projected to increase by 52 percent, from 503,000 jobs to 763,000 jobs. Employment for engineers is projected to increase by 25 percent, from 1.4 million jobs to 1.8 million jobs. Employment opportunities in marketing and sales are projected to increase 20 percent, from 13.3 million jobs to 15.9 million jobs.

At the same time, many occupations are expected to experience extremely low growth—and in some cases, even negative growth. Employment for machine operators is projected to decrease by 3 percent, from 4.9 million jobs to 4.8 million jobs. Employment in the category of agriculture, forestry, and fishery is projected to decrease by 5 percent, from 3.5 million jobs to 3.3 million jobs.

Increased Educational Attainment Levels Required

A correlation exists between those occupations that are expected to experience growth and those that require a high level of educational attainment (figure 25). For example, based on projections of current educational attainment levels, 64 percent of all employment opportunities for computer and math analysts will require 4 or more years of college. Computer and math analysts are projected to experience, percentage-wise, the greatest leap in employment demand between 1988 and 2000. Employment in health assessment is projected to increase by 38 percent, and 56 percent of those jobs require 4 or more years of college. At the other extreme, employment for machine operators is projected to decrease by 3 percent between 1988 and 2000, and only 4 percent of the jobs in that field require 4 or more years of college. Employment for workers involved in heavy physical labor is projected to increase by only 2 percent, and only 3 percent of those jobs will require 4 or more years of college. One of the few exceptions to this correlation between employment growth and the level of educational attainment required is the occupation of college teaching. While opportunities are projected to increase by a net of only 3 percent in this field, 86 percent of all college teaching jobs require 4 or more years of college. However, the large number of retirees from college teaching will create considerably more overall opportunity in this field than the net increase of 3 percent.

There is no question that the level of educational attainment required for jobs is increasing. An estimated 23 percent of all jobs will require 4 or more years of college by the end of this century.

Furthermore, the wage gap between those with high school degrees and those with college degrees is widening. According to Frank Levy, a University of Maryland economist, in 1979 the average college graduate aged 25-34 earned 18 percent more than a high school graduate of the same age. By 1986 that gap had increased to 43 percent, and it remains at about that level today.

Opportunities for Higher Education

Together these characteristics of the work force of the 1990s have thrust higher education into a position to become the nation's new strategic industry. If higher education does not aggressively seek to satisfy the rising demands of the work force, others will do so. For example, U.S. employers already spend $30 billion a year on formal training, as reported by the ASTD.

Although there will be a slowing of growth in the work force in the 1990s, there will be a dynamic shift in its composition as women and minorities enter in greater numbers, educational attainment levels required for jobs increase, and individuals respond to the widespread differences in employment opportunities among occupations.

Whereas an estimated 23 percent of all jobs will require 4 or more years of college by the end of this century, few gender/race groups have attained this level of education, according to Arthur Levine. He estimates that even though 40 percent of Asian men and 27 percent of Asian women have 4 or more years of college, only 8 percent of black men and women, 9 percent of Hispanic men, and 6 percent of Hispanic women have at least 4 years of college. Even among whites, only 21 percent of men and 13 percent of women have at least 4 years of college. These work force trends create opportunities for higher education institutions to help individuals prepare for jobs and careers in the emerging high-growth occupations.

For example, as noted previously, women students as a group still pursue degrees in the humanities and social sciences in greater numbers than degrees in the physical sciences and engineering. Many of the occupations experiencing the greatest growth in the 1990s are those occupations requiring a high level of education in technical fields. Higher education institutions should anticipate, encourage, and begin to respond to a shift of more women into technical degree areas as the differences in employment opportunities for those with and without technical degrees become even more sharply defined.

According to the Hudson Institute's *Workforce 2000: Work and Workers for the 21st Century*, "the types of jobs being created by the economy will demand much higher levels of skill than the jobs that exist today. Minority workers are not only less likely to have had satisfactory

schooling and on-the-job training, they may have language, attitude, and cultural problems that prevent them from taking advantage of the jobs that will exist." Many will need to start in the work force at low-paying, entry level positions and achieve advancement by gradually increasing their education and skill levels as they adapt to their work environments.

A recent report on minorities and education issued by a national panel commissioned by the Education Commission of the States points out that by the end of this century, minorities will comprise close to one-third of the nation's work force, and a majority of all new jobs will require a college education. Yet in 1987 minorities received only 12 percent of all college degrees awarded in the United States.

This gap between future job requirements and the education and training levels of many minorities, especially blacks and Hispanics, creates opportunities for institutions to realign their services. Changes in admissions and financial aid policies, program offerings, and faculty hiring may be necessary to facilitate the preparation of minorities for jobs in the future.

The state of the economy affects employment and unemployment which, in turn, affects college enrollment. During periods of economic recession, college enrollment usually increases as people out of work return to college. The large numbers of displaced workers in the 1980s, and those who will be displaced as a result of the latest recession, create opportunities for higher education institutions to assist those who choose to rechannel their careers by obtaining further education. In order to accommodate these anticipated increases in students from older age groups, colleges and universities will need to continue to realign their services by increasing part-time degree offerings and providing increased flexibility in time, place, and content of programs offered.

Higher education institutions have an excellent opportunity to promote and encourage workers to enhance existing skills and to learn new ones before the workers face layoff and downsizing situations. The model used in France is both prescient and practical: employers are required to contribute to an education fund for their workers. This is an excellent example of investing in employment skill development.

Major Transformations in the Nature of Work

To anticipate changes in the work force and their effect on higher education, it is important to understand the changes taking place in the nature of work. Major transformations which are influencing not only the work force but also work as an entity include the transition to an information society, the growing tendency for individuals to have multiple careers, the need for

lifelong education, and the change in the traditional hierarchical corporate structure. These transformations create major implications, challenges, and opportunities for higher education in the 1990s.

The Information Society

In *Powershift*, futurist Alvin Toffler describes how the sources and determinants of power in the world have shifted throughout history. In earlier times, power was achieved through violence. Later, violence was replaced by wealth as the major determinant of power. Modern society is now undergoing a shift in which knowledge will replace wealth as the major determinant of power. Toffler observes that "the most important economic development of our lifetime has been the rise of a new system for creating wealth, based no longer on muscle but on the mind." Toffler is referring to the shift in the U.S. and world economies from manufacturing to services, and from an industrial society to an information society. This shift may cause more profound changes in the way Americans work and live than the shift from an agricultural society to an industrial society which took place over a century ago.

As Toffler indicates, the information society requires much different skills than the industrial society. In *The Age of Unreason*, Charles Handy points out that by 2000, 80 percent of all jobs in the U.S. will require cerebral skills rather than manual skills. Handy also emphasizes the rapid pace of change and discontinuity brought about by this new age of readily accessible information.

Based on interviews with senior executives of California's largest employers in banking, manufacturing, and telecommunications, the skills and attributes they will require of their future work force include: the ability to communicate; computer literacy; human interaction skills; and flexibility, or the ability to handle stressful situations and respond to a rapidly changing environment.

The increasing reliance on computer technology will continue to stretch the capabilities of the work force. Needs range from highly technical people—systems and computing language programmers—to workers whose primary occupation is not computing, but who nevertheless use computers constantly in their daily lives. These people will continually seek ways to upgrade their computer skills throughout their productive life spans.

Flatter Organizational Structures

The emergence of the information society is also causing major transformations in corporate

organization structures. Peter Drucker, Clark Professor of Social Science at Claremont College Graduate School, predicts that in 20 years, the typical large business will have fewer than half the layers of management than it does today. The old hierarchical structures included many layers of management necessary for the collection, processing, consolidation, interpretation, and monitoring of information. As technology makes information readily available throughout the corporation and society, this hierarchical structure becomes inefficient. Corporations, in search of a more flexible and efficient environment, are transforming themselves into flatter, leaner organizations built around the concepts of work teams and networks. Individual achievement and recognition is accomplished through cooperation and collaboration aimed at achieving common goals.

According to Tom Peters, best-selling author of *Thriving on Chaos*, the information society is characterized by "high information availability for all, efficient smaller-scale units, coalitions and alliances of many equal partners—and the virtual absence of hierarchy as we've known it for thousands of years."

Increasingly, corporations are contracting out for work as needed rather than maintaining a steady work force through both high-volume and low-volume work periods. This transition will create the impetus for more professionals with specialized skills to go into business for themselves.

As corporations become less hierarchical, they are eliminating layers of middle management. This evolution leaves many mid-career middle managers without jobs. In order to rejoin the work force, many middle managers will seek to rechannel their careers. A consequence of more flexible corporate structures is the loss of loyalty between employers and employees. Greater job shifting will cause greater self-reliance on the part of the individual, placing a premium on knowledge and survival skills.

Multiple Careers

In her book *When Giants Learn to Dance*, Rosabeth Moss Kanter identifies an elemental change in the nature of the corporate career. She observes that "climbing the career ladder is being replaced by hopping from job to job. Reliance on organizations to give shape to a career is being replaced by reliance on self." Kanter ascribes these changes to organizational restructuring, increased reliance on alliances with subcontractors versus permanent employees, and the encouragement of entrepreneurship and innovation.

Increasingly, individuals are developing career "portfolios" of several careers with many different organizations throughout their working lives. The traditional model of an employee who

remains with one corporation for an entire career is being replaced by a new model wherein individuals develop and market their skills through a sequence of jobs.

The Need for Lifelong Education

The information society is also characterized by rapid change. As information becomes universally available, decision making, research, communication, and analysis are all more inclusive, but also more complex. The pace of technological advancement escalates, demanding constant adaptation.

As the pace of change in any occupation increases, it becomes increasingly necessary for practitioners to engage in an ongoing learning process and periodically return to school to supplement their skills and knowledge with the latest advancements in their field. This rapid pace of change, combined with the growing tendency for individuals to engage in multiple careers throughout their working lives, causes many to predict that the concept of the sabbatical, a mainstay of the academic profession, will become increasingly popular in other professions.

Charles Handy predicts that as careers become more variegated, "some will want to interweave their careers with periods of study." He further predicts that "we may see an increasing number of formal sabbatical opportunities within universities and business schools to take advantage of this new market."

These changes are creating a fundamental transformation in higher education. Education is becoming an integral and recurring part of the work experience, no longer viewed as a discrete function performed prior to the beginning of one's career.

Emerging Role for Higher Education

It is apparent that all four of these major occupational transitions are interrelated. The information society is shaping flatter organization structures. As business enterprises reshape themselves to be more flexible and efficient, turbulence in the work force is created. As more businesses contract for work on a seasonal basis, or for specific functions and activities, rather than maintaining a full-time work force, the traditional corporate career ladder within one organization is replaced by greater movement among organizations. The rapid pace of change created by the information society, combined with the trend toward multiple careers, leads to the need for ongoing educational experiences throughout people's working lives. The following section explores these

interrelated transformations and shows how they help to define an emerging role for higher education. Among the emerging duties of institutions will be: to provide new entrants into the work force with the skills necessary to function in the information age; to give displaced workers and individuals in career transition the education needed to redirect their careers; and to provide formal sabbatical programs and other lifelong education programs for professionals.

Information Society

The majority of new entrants to the work force in the coming decade will not be prepared for the new jobs available in the information society. For example, women and minorities are projected to constitute 68 percent of all new entrants to the work force between 1988 and 2000, but many of them do not have the computer literacy and other technical skills required by most jobs in the information society. Colleges and universities have the opportunity to provide the skills that women and minorities will need in order to succeed in this new era of work.

Displaced Workers

As corporations adopt flatter organizational structures, many mid-career middle managers will lose their jobs. A good number of these managers will seek further education in order to rechannel their careers. These managers will pursue a variety of educational experiences, including professional certification in such areas as education, law, and medicine; or second degrees in such highly marketable areas as computer science, engineering, and health services. Colleges and universities can step in and provide these managers with the further education needed to rechannel their careers.

Many displaced workers will look for tailored programs aimed at their specific needs. They will expect a high level of personal attention, in a concentrated, focused learning environment. Frequently, they will have the financial resources from savings, employer severance allowances, or borrowing capacity to pay for the intensive learning experience.

Career Transition

Individuals will increasingly pursue multiple careers throughout their working lives. For example, one individual might work for a Fortune 500 corporation, go into business for herself, and

work on a contractual basis for several small companies, all in the course of her working life. In order to move smoothly between these different phases, many individuals will seek further education. Colleges and universities have the opportunity to provide individuals with the education needed to transition effectively.

Often a basic component of the multiple career path process is the personal and job-related stress that follows frequent and dramatic change. Higher education institutions have an excellent opportunity to offer training in human behavior, social sciences, and professional counseling; these fields are essential in order to successfully guide and support workers through times of stress and crisis.

People focused on career transition will frequently have the financial resources to afford the desired learning experiences. These individuals will be searching for educational experiences tailored to their specific interests, and ones that will yield optimal returns on their investments of time and energy.

Lifelong Education

The rapid pace of technological change and the tendency for individuals to engage in multiple careers throughout their working lives will make lifelong learning a necessity for most individuals in the work force. For some, lifelong learning will take the form of a periodic sabbatical for intensive study away from the work place. For others, educational opportunities may be offered in the work place. Many corporations have already developed contractual agreements with local institutions (frequently community colleges) to provide on-site educational services for their employees. Many of these programs lead to degrees or certificates.

As people become older and more successful, they have the desire, the time, and the financial resources to take advantage of learning opportunities that expand their intellectual horizons and stimulate their creativity. Tailored, personalized learning experiences focusing on the arts, international affairs, health sciences, psychology, and history will have special appeal to a growing older population—indeed, art appreciation seminars may replace aerobics classes as the "in" thing to do in the new decade.

Implications for Different Kinds of Institutions

Learning needs of adults are widely varied; not all educational needs are going to be served

by all types of institutions. Higher education institutions will tend toward offering learning opportunities best suited to their unique characteristics, i.e., mission, location, local market conditions. Institutions will continue the trend to differentiate themselves and stress their individual qualifications.

Below is a simplified and generalized set of trends and implications that may be expected for public four-year institutions, public two-year institutions, and private institutions.

Public Four-year Institutions

- Increasing part-time enrollment
- Increasing ethnic diversity and foreign enrollment
- Increasing female enrollment
- Greater demand for skill-building courses, such as communications, information technology, health services, and business
- Increased coordination with elementary and secondary education institutions
- Increased distance learning capabilities
- Increased contractual teaching relationships with businesses

Public Two-Year Institutions

- Increasing part-time enrollment
- Increasing ethnic diversity and foreign enrollment
- Increasing female enrollment
- Greater demand for skill-building courses, such as communications, information technology, health services, and business
- Greater demand for English as a second language
- Greater flexibility in course scheduling
- Increased need to serve students who have not graduated from high school
- Provide outreach services in the community
- Develop contract instruction programs with local employers

Private Institutions

- Continue to develop individual market niches in the higher education market
- Develop direct relationships with businesses for work force training
- Offer more certification and licensing programs

- Increased importance of "brand loyalty", i.e., the development of ongoing educational experiences for alumni
- Begin to offer "warranties" on achievement upon graduation, in response to a more competitive environment
- Increased collaboration and cooperation with other academic institutions and businesses
- Increased focus on foreign enrollment and overseas campuses and contractual relationships with foreign universities
- Develop "special" relationships with feeder schools (high schools and community colleges)

Conclusion

One cannot overemphasize the impact that the work force and demographic trends will have on colleges and universities. The many factors facing higher education—some of which are new, some old—are converging to change the nature and scope of America's institutions forever. These trends present higher education with a major challenge: to transform itself in order to meet the needs of a changing society. The trends are causing a paradigm shift in America's conceptualization of higher education, and place a new emphasis on the meaning and interpretation of educational quality.

Challenges

These trends do more than provide opportunities for higher education institutions; they will naturally lead to fundamental changes in the services they provide. According to Professor Robert Reich, of the John F. Kennedy School of Government, Harvard University, the new economy will require that institutions "push responsibility downward toward teachers and students; invite continuous, incremental innovation at all levels; ...and encourage flexibility".

Higher education is coming under accelerated pressure to help create a work force that makes the nation's economy more competitive internationally. According to Clark Kerr, "the push by national economic and political leaders for higher education to make a greater contribution to U.S. industrial competitiveness will also intensify, leading to more and better skills training and more and better research, particularly in applied areas".

These required changes in the nature of educational services present key challenges for those involved in higher education. Preparation of students for full participation in the future work force

will require considerable innovation. For example, a banking executive interviewed for this report suggested that in order to prepare students for work in a rapidly changing environment, a course be designed which constantly changes in expectations and agenda throughout the semester.

A Paradigm Shift

Higher education leaders and policy makers historically have looked at the nature of higher education in retrospective terms, i.e., what has happened, rather than what can be expected. The speed at which the work force and demographics are changing is causing the need to quickly but substantively rethink the nature of the higher education enterprise.

The work force and demographic trends are causing a paradigm shift in higher education; it is moving from its historic identity as a provider of a discrete learning experience for young people, to a new identity as a provider of lifelong education to adults engaged in the work force.

In the new paradigm higher education is being viewed as an opportunity—and increasingly, an essential one—to stay abreast of changing demands and shifts in society and the work place. The majority of higher education consumers are minorities and women who have been previously underrepresented in educational attainment and earning power in the work force. Attendance is becoming part-time, intermittent, and occurring over most of one's adult life. Academic objectives include self-actualization as well as career development.

The Emphasis on Quality

Along with this paradigm shift in higher education comes a new look at the quality of the service provided. Students have many alternatives for lifelong learning, including in-house programs developed by corporations, courses offered through video technology, and other unconventional alternatives to colleges and universities. Increased competition will force higher education institutions to emphasize the relationship between the value of the services they offer and their fees.

"Quality" education in this context refers to the perceived value as defined by the learner. Features such as ease of scheduling, transportation, location, and influence on job qualifications, promotions, bonuses, and salary increases help define the learner's concept of quality educational services. Students may look for guarantees that colleges and universities can meet their educational needs. In response, colleges and universities may begin to offer warranties on their services, and even go so far as to offer "money back guarantees" in which students pay tuition only upon evidence

of their acquiring the knowledge and skills that they sought upon enrollment.

The concept of warranties is already being proposed by some education administrators. Joseph Fernandez, chancellor of the New York City public school system, has proposed placing warranties on the students that New York's high schools graduate. Under the plan, if an employer found that a high school graduate could not read, write, or calculate proficiently, the employee could be returned to school within a year for remedial programs at no cost to the employer. Although this proposed plan is for secondary education, the concept is equally applicable to higher education.

Recommendations for Managing Higher Education

The demographic and work force influences in the 1990s continue to shape college a. ' university teaching, support services, and management. In many ways the adjustment happens naturally as the free market characteristics of supply and demand come together. For example, community colleges have offered learning instruction opportunities to employees under programs subsidized and sponsored by their employers.

As institutions adapt to take advantage of new education opportunities, four strategies are emerging that bear discussion.

Strategy One: Increase Quality of Services

In a free market environment, clients have the power to define quality and value. Starting with the premise that value of education services are measured by those who receive them, several specific actions are recommended:

- Include ongoing market demand research as part of the institution's planning process. Understand local labor market conditions. Look to status of work force preparedness, occupational demand shifts, and displaced worker population as key indicators of work force stability. Develop specific goals aimed at work force education and skill building, and measure accomplishments.
- Collaborate with employers to jointly sponsor and deliver learning programs. Understand and document the needs of employers. Develop programs tailored to, and financed by, employees and employers.

- Survey current students to better understand educational needs and goals. Run focus group discussions with students to explore ways to increase the value of the learning experience. Identify specific impediments limiting access to education, such as transportation, dependent care, and time constraints.
- Explore demand for individualized and tailored learning and counseling programs that would appeal to older students who are capable and willing to pay for the personal service.
- Create multicultural community task forces to study special educational needs of diverse populations.
- Investigate ways to repackage classes in a format more attractive to older students. Examples include certificate programs of achievement in the arts, international affairs, social sciences, and history. Expand use of executive management programs aimed at achieving increased technical, professional, and managerial skills.
- Study ways that warranties may be introduced into the academic program as a means of increasing value to students and employers.

The underlying motive of the above recommended actions is for educational institutions to become aggressively aware and knowledgeable of the educational needs of the employers and employees within their market. Once the needs are determined, decision makers must evaluate how to best meet the needs of the marketplace based on their institution's strengths. Collaborative programs with businesses and focused instruction tailored to the needs of the employees can then be developed and implemented. Educational services take on increased value when they are tailored to the particular needs of individual learners.

Strategy Two: Increase Use of Technology and Communications

This report describes the impact technology and communications trends are having on the economy and U.S. society. Higher education institutions are one of the many sectors undergoing fundamental change in these areas.

Recommended actions regarding technology and communications specifically focused on the education of the work force are:

- Increase the use of distance learning through use of teleconferencing, interactive television,

and video CDs, cassettes, and tapes.

- Implement electronic communications networks on campus that reduce paper flow and streamline transaction processing for such activities as registration, course scheduling, purchasing, payroll processing, and other financial transactions.
- Improve the quality of campus telephone systems to increase the effectiveness of service to clients, and to take advantage of increased productivity through better communications.
- Implement support systems that link all workers in the organization and provide improved useful management information to all employees.
- Implement market survey information systems that sample educational needs and satisfaction levels of current students and test the marketplace to assess new and emerging educational service needs.
- Improve and use cost information to better understand relationships of marginal costs and revenues of academic programs and support services. Use cost information as an important factor in determining which educational market opportunities to pursue and how to price them.

Historically, impediments to the advancement of technology and communication systems have been due to a lack of funding for development, start up, and training.

Frequently, higher education's investments in technology and communications have been underfunded, and insufficient professional, technical, managerial, and training resources have been allocated to the projects. A major cause for underfunding these projects is that they have to be digested as part of the ongoing operating budget. This puts them in severe competition with faculty salaries, rising utility costs, and other high-priority, fixed cost items.

Institutional leaders need to regard technology and communications development projects as capital investments, similar to construction and other plant related items. Costs can be amortized and debt financed, if necessary, with debt service costs then charged to the operating budget.

Strategy Three: Increase Labor Productivity and Efficiency

Changes in the work force regarding productivity improvements have far-reaching impact on colleges and universities. Higher education is not exempt from the changing work force demographics, organizational restructuring, and shifts in occupations.

Underlying the changes in the work force in the 1990s is the need to find increased labor productivity and worker efficiency. Recommendations for college and university managers in this area are to:

- Develop ongoing training programs aimed at upgrading skills of all institutional employees. Focus on reducing error rates, increasing accuracy, eliminating ambiguous policies and procedures, clarifying work rules, and reinforcing the importance of high-quality service.
- Develop crosstraining and multitask skill-building programs. Concentrate on organizing collaborative work groups and developing employees with a wide variety of skills.
- Provide adequate training and systems support, and then give more authority, responsibility, and accountability to the individuals in direct contact with clients—secretaries, clerks, receptionists, financial aid officers, purchasing agents.
- Provide adequate training and systems support, and then give more responsibility, authority, and accountability to the individuals making line decisions—hiring, purchasing, admitting, fund raising, financial controlling.
- Focus increased attention on retaining and serving existing clients through such programs as retention (students), career development (employees), and alumni relations (graduates and donors).

The underlying theme of the above recommendations is to move toward a performance-based management process that measures output results and is aimed at optimizing scarce labor and capital resources.

Strategy Four: Reduce Administrative and Support Costs

The final strategy is really the end result of the three described previously. Administrative costs need to be reduced for the same reasons that other business enterprises in America's economy are reducing overhead, eliminating unnecessary bureaucratic management levels, and downsizing operations: they are seeking to become more competitive and trying to increase the value/cost ratio of their goods and services.

Since the 1960s, most higher education institutions have steadily increased administrative and support services. The administrative "lattice" phenomenon described by Drs. William Massy and

Robert Zemsky in the *Policy Perspectives* series of the Pew Charitable Trusts describes administrative build-up that has been allowed to happen. The lattice "endlessly extend[s] itself in response to an environment of regulation and micro-management, of administration becoming a goal in itself, and of a commitment to consensus management that too often made higher education risk-averse."

Reducing administrative costs cannot be achieved unilaterally. Rather, cost reduction must be accomplished as the result of many other programmatic decisions. The following approach is recommended as one method of reducing administrative costs in a systematic manner:

- Examine and redefine the basic, minimum support services that must be provided to serve clients and achieve minimum regulatory compliance. Use client focus groups. Identify optional services that can be provided on a fee basis, and price accordingly.
- Implement an ongoing technological and communications development program aimed at consolidating transaction processing steps, implementing broadly accessed communication and decision support systems, and facilitating ongoing training and skill building.
- Restructure roles and responsibilities to place authority for decisions at the client level, eliminating multilevel approval processing.
- Reorganize administrative and support activities to be focused on the client, rather than on the process. Examples include consolidation of student services (admission, registration, financial aid, student billing, counseling and advising, and alumni relations) and business services (procurement, accounting, payroll, financial reporting) so that employees working in multifunctional teams are trained to carry out a multitude of activities.
- Contract services that are highly specialized or can be provided on a value-to-cost basis that is more economical than can be provided internally. Typical examples have included janitorial service, investment management, and food service. Other services to consider include financial aid administration, accounting, security, environmental health and safety, commodities purchasing, recruitment, and data processing.

For colleges and universities to reduce administrative support costs and, at the same time, increase the quality of services to clients is frequently seen as a nonsequitur. Many administrators have been trained to believe that improved service is achieved through expending more resources, i.e., hiring more people. As higher education moves through the 1990s, there will be many opportunities to see that improved services are often achieved through better use of fewer resources.

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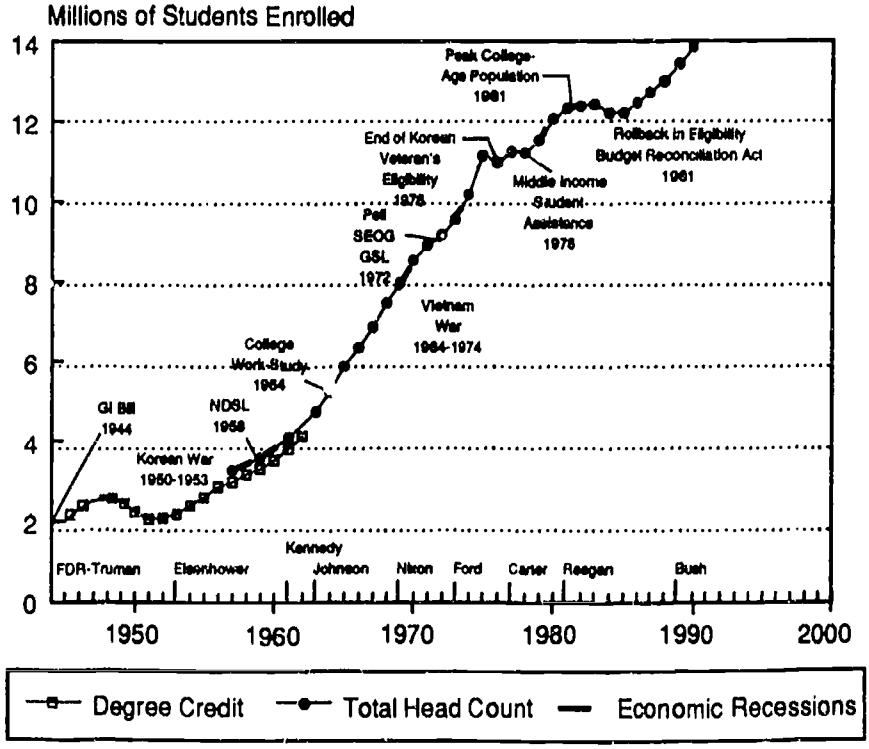
FIGURE 1

Change or Conflict in U.S. Universities and Colleges During The Twentieth Century

Decade	Change and/or Conflict
1900-1910	Minor
1910-1920	Major
1920-1930	Minor
1930-1940	Major
1940-1950	Major
1950-1960	Major
1960-1970	Transformational
1970-1980	Transformational
1980-1990	Minor
1990-2000	Major (anticipated)

FIGURE 2

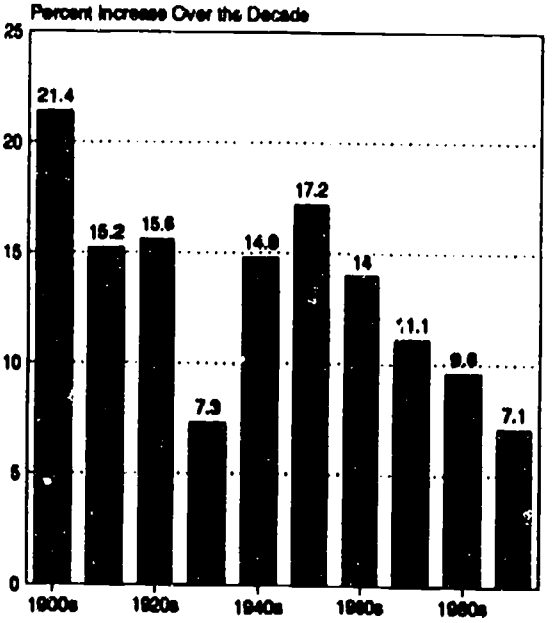
Chronology of Student Aid Programs, Economic Cycles, and Political Events That Have Affected College Enrollment



In the earliest years, the only enrollment data available are for students enrolled in degree credit programs. Total headcount enrollment includes both degree credit and non-degree credit enrollment.

Figure 3

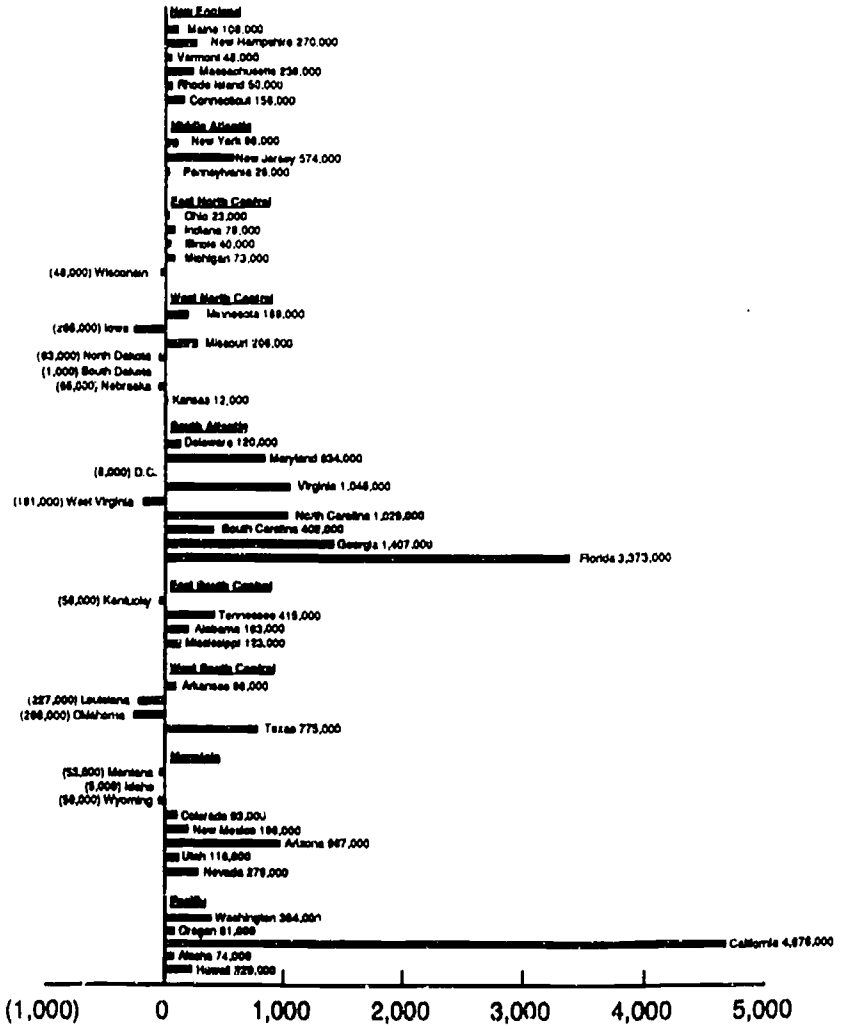
1990s Population Increase Projected to Be the Smallest Of Any Decade In the 20th Century



For additional information, see figure A-1 in appendix.

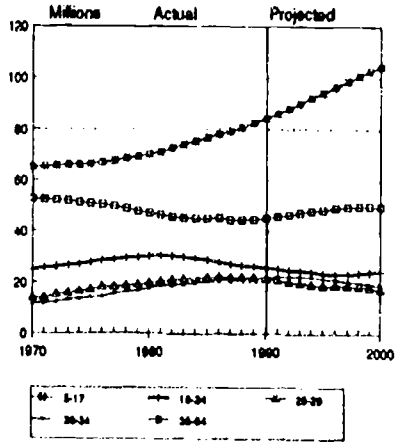
FIGURE 4

Projected Population Changes by State 1990 - 2000



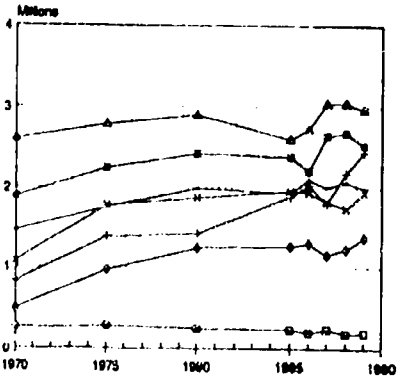
For additional information, see figure A-2 in appendix.

Figure 5
Trends in the Population,
By Age
1970-2000



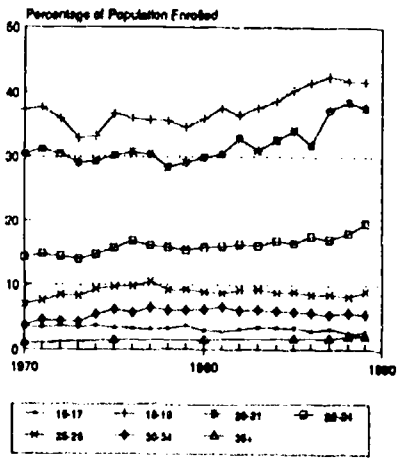
For additional information, see figure A-1 in appendix.

Figure 6
Trends in College Enrollment,
By Age



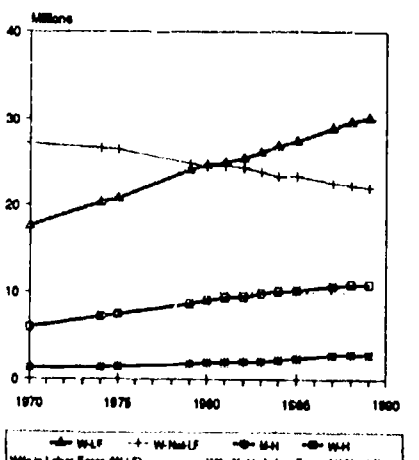
For additional information, see figure A-3 in appendix.

Figure 7
Trends in College-Going Rates,
By Age



For additional information, see figure A-4 in appendix.

Figure 8
Trends in Families
1970 - 1990



For additional information, see figure A-5 in appendix.

FIGURE 9

Composition of the Enrollment Change 1980-1989 (In Thousands)

Students	1980	1989 Estimate	1980-1989	Percent Increase	Percent Distribution of Increase
Total Headcount	12,097	13,487	1,390	11.5	100.0
Full-Time	7,098	7,683	585	8.2	42.1
Part-Time	4,999	5,804	805	16.1	57.9
Full-Time Equivalent	8,819	9,618	799	9.1	100.0
Men	5,874	6,175	301	5.1	21.7
Women	6,223	7,312	1,089	17.5	78.3
Public	9,457	10,557	1,100	11.6	79.1
Private	2,640	2,929	289	10.9	20.9

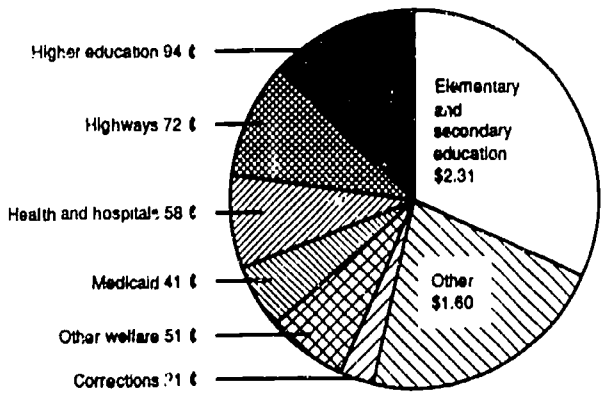
FIGURE 10

How the States Spend Their Money

State spending per $100 of personal income

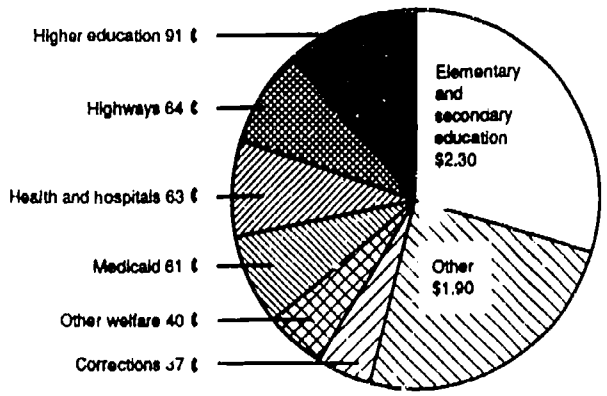
1979

Total was $7.28 per $100 of personal income



1989

Total was $7.80 per $100 of personal income



Note: Individual amounts were rounded, so totals will not be exact.

Figure 11
Trends in Enrollment, By Gender

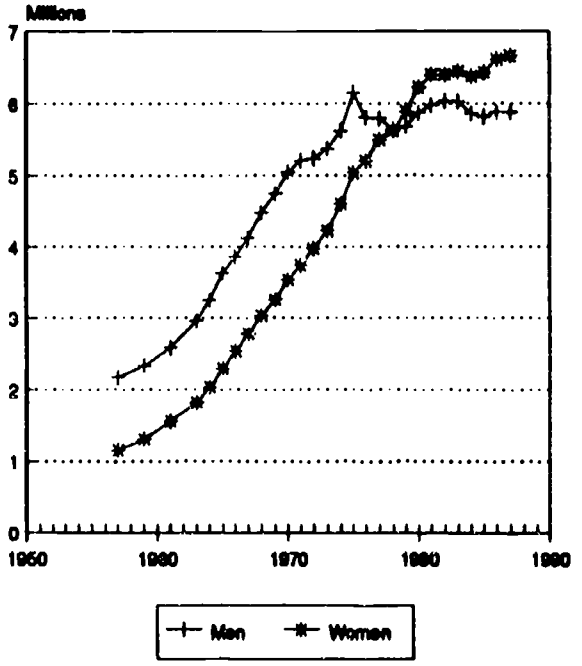
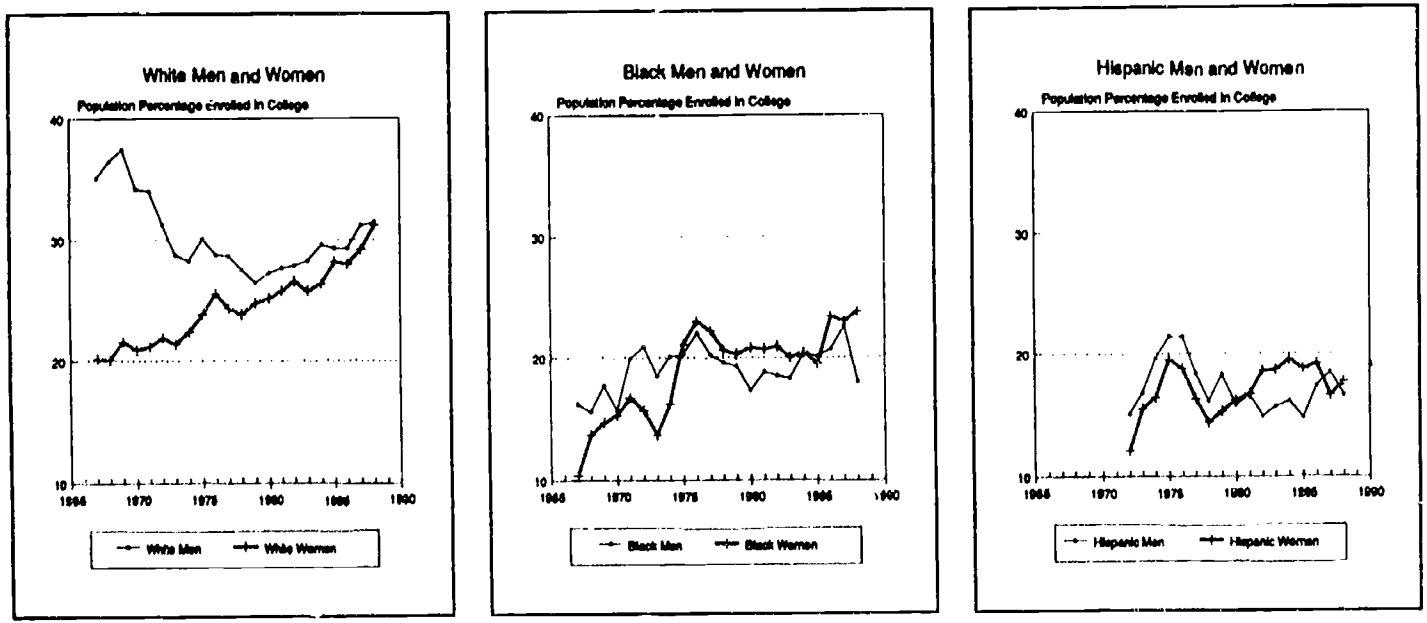


Figure 12

College-Going Rates, By Race and Gender



For additional information, see figure A-4 in Appendix.

FIGURE 13

Representation of Women in Degrees Conferred,
By Selected Area
1985-1986
(In Thousands)

Degree Area	Total	Men	Women	Percent Men	Percent Women
Bachelor's Degrees in Physical Sciences & Engineering					
Chemistry	10,116	6,483	3,633	64	36
Physics	4,056	3,467	589	85	15
Electrical Engineering	23,742	20,906	2,836	88	12
Civil Engineering	8,679	7,538	1,141	87	13
Bachelor's Degrees in Humanities & Social Sciences					
Education	87,221	20,986	66,235	24	76
English	27,576	9,231	18,345	33	67
Foreign Languages	10,102	2,784	7,318	28	72
Professional Degrees					
Law	37,041	22,293	14,748	60	40
Medicine	15,938	11,022	4,916	69	31
Dentistry	5,046	3,907	1,139	77	23

FIGURE 14

Net Change in the Population,
By Age and Race
1990 - 2000
(In Thousands)

Total 18-24	All Races	White	White Non-Hisp	Black Non-Hisp	Hispanic	Asian & Other
1990	25,795	21,174	18,787	3,797	2,387	827
2000	24,602	19,807	17,040	3,773	2,767	1,022
Net Change	(1,193)	(1,367)	(1,747)	(24)	380	195
Percent Change	(4.6)	(6.5)	(9.3)	(0.6)	15.9	23.6

Total 25-34	All Races	White	White Non-Hisp	Black Non-Hisp	Hispanic	Asian & Other
1990	43,529	36,288	32,660	5,860	4,628	1,381
2000	36,415	29,590	25,786	5,316	3,804	1,509
Net Change	(7,114)	(6,698)	(6,874)	(544)	(824)	128
Percent Change	(16.3)	(18.5)	(21.0)	(9.3)	(17.8)	9.3

Total 35-64	All Races	White	White Non-Hisp	Black Non-Hisp	Hispanic	Asian & Other
1990	84,304	72,822	67,183	8,919	5,639	2,563
2000	104,629	88,621	80,389	12,290	8,232	3,718
Net Change	20,325	15,799	13,206	3,371	2,593	1,155
Percent Change	24.1	21.7	19.7	37.8	46.0	45.1

FIGURE 15

Composition of the Enrollment Change, by Race 1980-1988 (In Thousands)

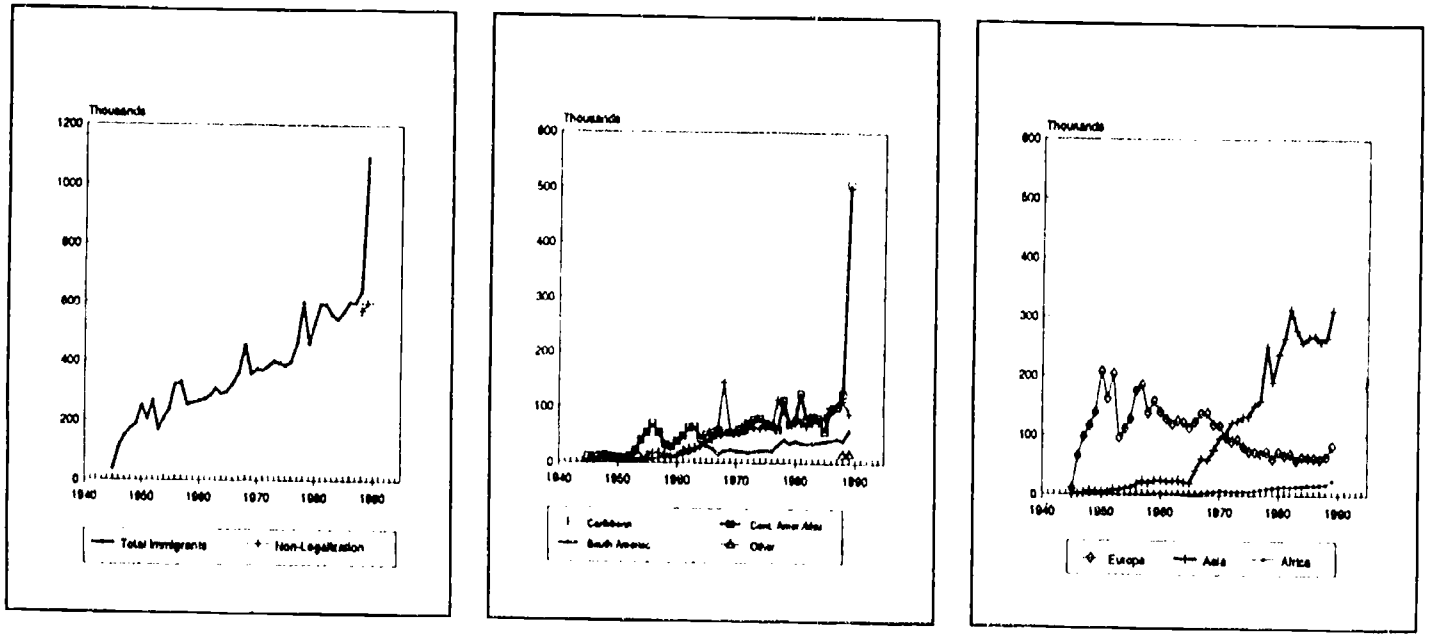
	1980	1988*	1980-1988	Percent Increase	Percent Distribution of Increase
Total Enrollment	12,087	13,043	956	7.9	100.0
White, Non-Hispanic	9,835	10,283	450	4.6	47.1
Total Minority	1,949	2,400	451	23.1	47.2
Black, Non-Hispanic	1,107	1,130	23	2.1	2.4
Hispanic	472	680	208	44.1	21.8
Asian or Pacific Islander	286	497	211	73.8	22.1
American Indian/ Alaskan Native	84	93	9	10.7	0.9
Nonresident Alien	305	361	56	18.4	5.9

* Preliminary data

Note: Details may not add to totals because of rounding.

Figure 16

Number of Immigrants to the U.S. 1945 - 1988

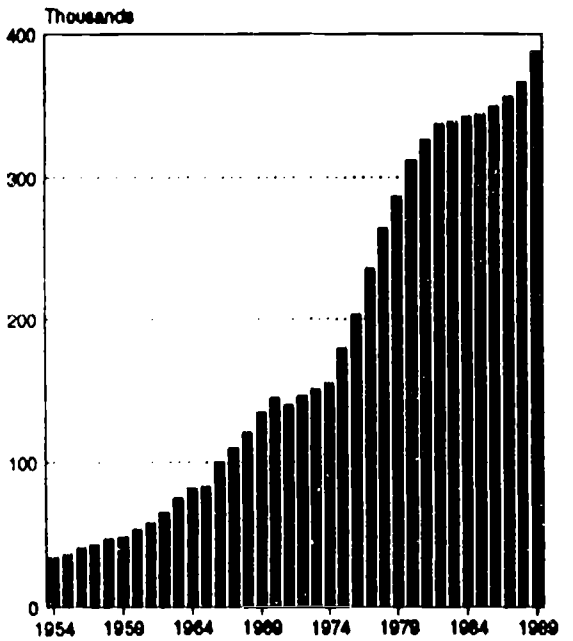


Note: Non-legalization represents what immigration population would have been without the Immigration Reform Control Act (IRCA).

For additional information, see figure A-6 in appendix.

Figure 17

Total Foreign Student Enrollment In U.S. Colleges and Universities
1954-55 to 1989-90



For additional information, see figure A-7 in appendix.

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FIGURE 18

Magnitude of the Nation's
Unmet Education and Training Needs
1990
(In Millions)

Total U.S. Labor Force
Estimate for January 1990: 125 Million

Work Force Group	Approximate Group Size	Percent Needing Training: Range	Calculated Magnitudes
Current work force:			
Upgrading skills of existing workers: 10% yearly of total	12	20-50	2-6
Underemployed: 10% of total	12	20-50	2-6
Unemployed	6	20-50	1-3
Dislocated workers	10	20-50	2-5
Reentrants to work force	6	20-50	1-3
New entrants to work force annually	4	20-33	1-1
Underprepared workers: high school dropouts	20	10-20	2-4
Women entering work force	9	10-33	1-3
Disabled people of working age	12	20-50	2-6
Immigrants	6	20-50	1-3
Total			15-40

Notes: The total includes double counting of people in more than one work force group. The purpose of this framework for calculating the order of magnitude of the training needs is simply to indicate that the numbers are potentially large. The framework is intended to serve as a rough starting point for developing more precise estimates.

FIGURE 19

Estimated Unmet Training Needs in 1989

Type of Training	Workers (in Millions)	Estimated Cost of Training (in $Billions)
New technology:		
Technical workers	9.3	$8.7
Skilled workers	6.8	6.5
Executive management/ supervisory	5.5	9.7
Customer service	11.4	5.4
Basic skills	16.6	15.1
Total	49.6	$45.4

Figure 20
Increase in the Labor Force

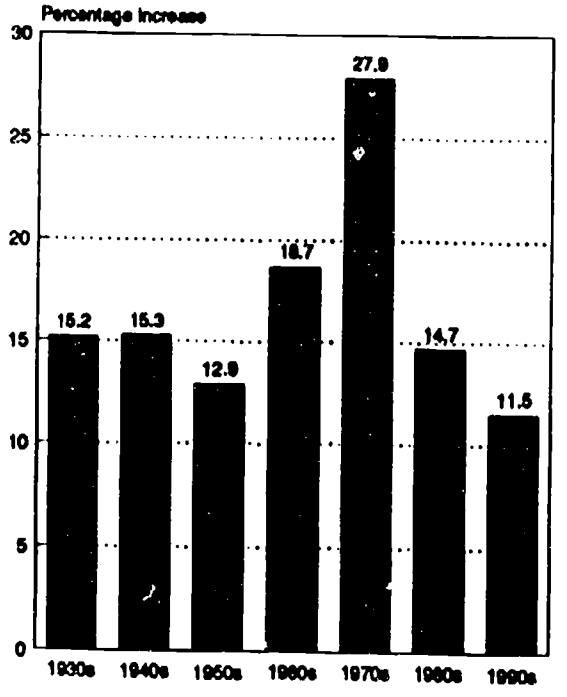


Figure 21A

Projected Growth of the U.S. Labor Force, By Race and Gender 1988-2000 (In Thousands)

	1988	New + Entrants	- Leavers:	Net New Entrants	= 2000
Total	121,669	42,832	23,371	19,461	141,130
White	96,420	28,597	19,393	9,204	105,624
Men	53,233	13,522	11,257	2,265	55,498
Women	43,188	15,075	8,136	6,939	50,127
Black	12,350	5,385	2,329	3,056	15,406
Men	6,390	2,423	1,121	1,302	7,692
Women	5,960	2,962	1,208	1,754	7,714
Hispanic	8,982	6,486	1,145	5,341	14,323
Men	5,409	3,558	681	2,877	8,286
Women	3,573	2,928	464	2,464	6,037
Asian	3,483	2,364	504	1,860	5,343
Men	1,896	1,232	282	950	2,846
Women	1,587	1,132	222	910	2,497

Note: New Entrants and Leavers were calculated from unrounded 1988 Current Population Survey data.

Figure 21B

Projected Growth of the U.S. Labor Force, By Race and Gender 1988-2000 (By Percentage)

	1988	New + Entrants	- Leavers:	Net New Entrants	= 2000
Total	100.0	100.0	100.0	100.0	100.0
White	79.3	66.8	82.6	47.2	74.8
Men	43.8	31.6	48.0	11.6	39.4
Women	35.5	35.2	34.6	35.6	35.4
Black	10.2	12.6	10.4	15.7	11.0
Men	5.1	5.7	5.2	6.7	5.3
Women	5.1	6.9	5.2	9.0	5.7
Hispanic	7.4	15.1	4.9	27.5	10.2
Men	4.5	8.3	2.9	14.8	5.9
Women	2.9	6.8	2.0	12.7	4.3
Asian	3.1	5.5	2.2	9.6	4.0
Men	1.7	2.9	1.2	4.9	2.1
Women	1.4	2.6	1.0	4.7	1.9

Figure 22

Employment Status of Workers Displaced Over Previous Five Years January 1990

	Thousands	Percent Distribution
Workers who lost jobs (full-time and part-time)	4,326	100.0
Left labor force	590	13.7
In labor force, but unemployed	607	14.0
Employed	3,129	72.3
Total who lost full-time wage and salary jobs and who were re-employed January 1990:	2,880	66.1
Employed part-time	279	6.4
Employed full-time	2,424 *	56.0 *
Earnings relative to those of last job:		
Earning 20 percent or more below	543	12.6
Earning below but within 20 percent	392	9.1
Earnings equal or above but within 20 percent	597	13.8
Earning 20 percent or more above	635	14.7
Self-employed	177	4.1

** Note: The total includes individuals who did not report earnings on the lost job.*

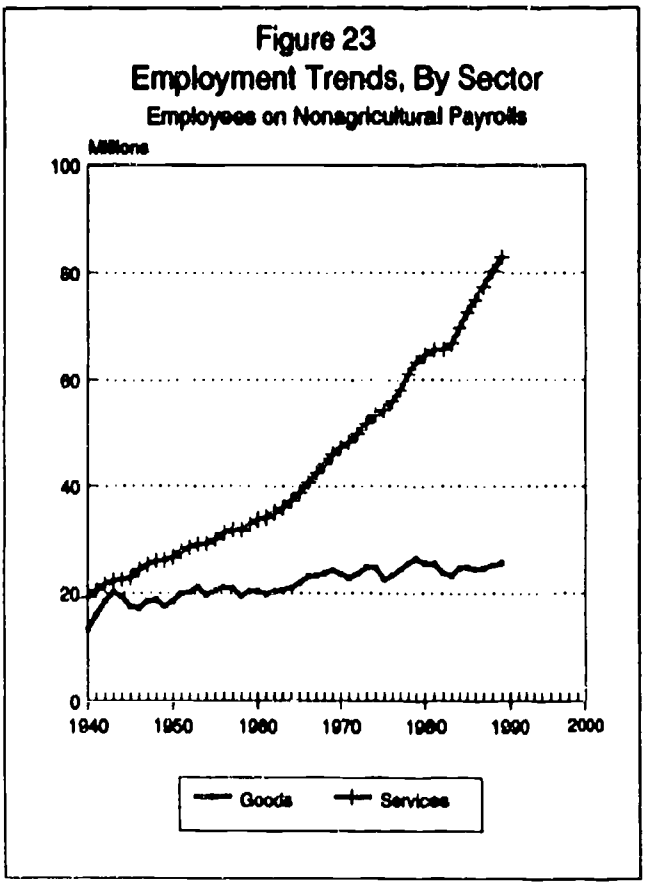


Figure 23
Employment Trends, By Sector
Employees on Nonagricultural Payrolls
Millions
100
80
60
40
20
0
1940
1950
1960
1970
1980
1990
2000
Goods
Services

Figure 24

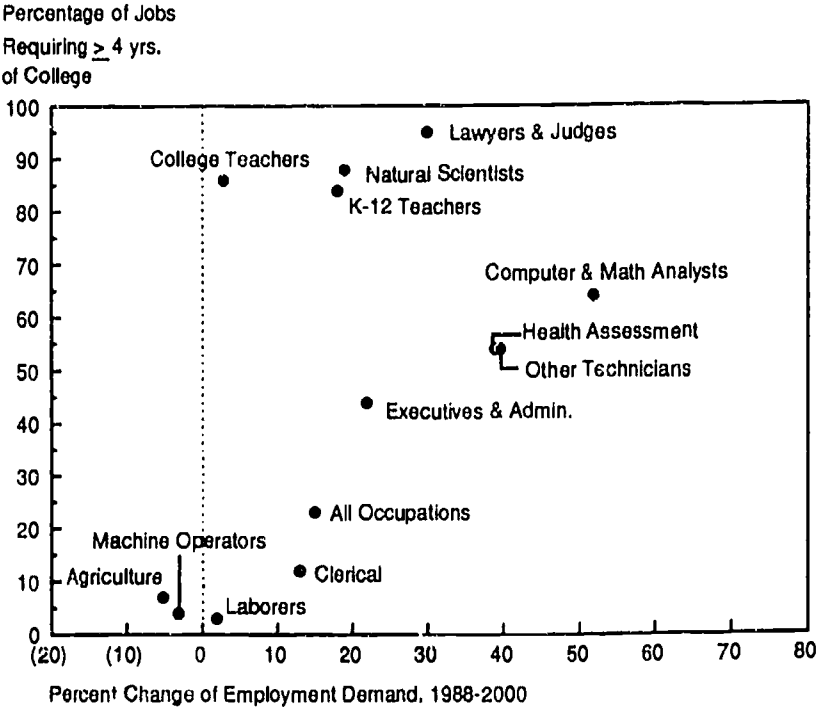
Projected Growth of Employment in Selected Occupations by Level of Educational Attainment

Occupation	Percent Change 1988-2000	Percent of Total Employment by Level of Attainment: Less Than High School	High School	1-3 Years of College	4 or More Years of College
Computer, math, analysts	52	0	12	24	64
Other technicians	39	1	18	27	54
Health assessment	38	2	8	35	56
Health technicians	34	3	35	40	22
Health service	34	23	51	22	5
Lawyers and judges	30	1	3	2	95
Computer operators	29	5	46	33	16
Personal service	27	19	53	22	7
Engineers	25	1	10	14	75
Health diagnosing	24	2	3	2	93
Other professional workers	24	3	16	19	82
Food preparation	23	37	42	17	4
Protective services	23	12	43	29	16
Executive, administrative	22	5	27	24	44
Marketing and sales	20	13	39	24	23
Building service, cleaning	20	41	46	10	3
Engineering technicians	22	4	36	39	22
Natural scientists	19	2	4	6	88
K-12 teachers	18	1	7	8	84
Construction trades	16	25	53	17	5
Other clerical	12	9	51	28	12
Mechanics	13	21	55	19	4
Machinery and vehicle operators	12	29	53	14	5
Clerical supervisors	12	4	45	26	24
Mail clerks, messengers	10	10	48	28	14
Secretaries	10	4	54	33	10
Precision production	3	23	52	18	8
College teachers	3	0	4	10	86
Laborers	2	37	47	13	3
Financial recordkeeping	1	5	54	28	13
Machine operators	(3)	34	52	11	4
Private household workers	(5)	50	34	12	4
Agricultural, forestry, fishery	(5)	36	44	12	7
All Occupations	15	16	40	21	23

Note: Details may not add to totals because of rounding.

FIGURE 25

Correlation Between Educational Attainment and Growth Rates of Selected Occupations



C:\WP\DEMOG\FOOTNOTE

THE IMPACT OF DEMOGRAPHIC AND WORKFORCE TRENDS
ON
HIGHER EDUCATION IN THE 1990s

Footnotes for the Figures:

Figure 1:

Source: Clark Kerr, "Higher Education Cannot Escape History: The 1990s," New Directions for Higher Education: An Agenda for the New Decade, edited by Larry W. Jones and Franz A. Nowotny, San Francisco: Jossey-Bass Inc., p. 12.

Figure 2:

Source: Carol Frances + Associates, based on enrollment data from the U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, Digest of Education Statistics: 1990, p. 167; and economic trend data from the U.S. Department of Commerce, Bureau of Economic Analysis, Business Cycle Developments.

Figure 3:

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Projection of the Population of the United States, by Age, Sex, and Race: 1988 to 2080, Series P-25, Number 1018 (January 1989), p. 29.

Figure 4:

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Projection of the Population of the States by Age, Sex, and Race: 1989-2010, Series P-25, Number 1053 (January 1990).

Figure 5:

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Projection of the Population of the United States, by Age, Sex, and Race: 1988 to 2080, Series P-25, Number 1018 (January 1989).

Figure 6:

Source: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, Digest of Education Statistics: 1990, p. 169.

Figure 7:

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Social and Economic Characteristics of Students: 1988 and 1987, Series P-20, Number 443, and earlier numbers including 319, 333, 346, 360, 362, 400, 392, 394, 400, and 429).

Figure 8:

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Consumer Income,
"Money Income and Poverty Status in the United States: 1989, p. 31.

Figure 9:

Source: U.S. Department of Education, Officer of Educational Research and Improvement, National Center for Education Statistics, Digest of Education Statistics: 1990, and National Higher Education Statistics: Fall 1989, Early Estimates (December 1990). Data Series: DR-IPEDS-89/90-1.

Figure 10:

Source: Center for the Study of the States.

Figure 11:

Source: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education

Statistics, Digest of Education Statistics: 1990, p. 169.

Figure 12:

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Social and Economic Characteristics of Students: 1988 and 1987, Series P-20, Number 443, and earlier numbers including 319, 333, 346, 360, 362, 400, 392, 394, 400, and 429).

Figure 13:

Source: Compiled from the Fact Book on Higher Education: 1989-90, American Council on Education, MacMillan, New York.

Figure 14:

Source: Carol Frances + Associates, based on data from the U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Projection of the Population of the United States, by Age, Sex, and Race: 1988 to 2080, Series P-25, Number 1018 (January 1989); and Number 995 for the Hispanic population.

Figure 15:

Source: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, Digest of Education Statistics: 1990, p. 199; and Trends in the Racial / Ethnic Enrollment in Higher Education: Fall 1978 Through Fall 1988, NCES 90-370 (June 1990).

Figure 16:

Source: U.S. Immigration and Naturalization Service, special computer runs.

Figure 17:

Source: Institute for International Education, Open Doors, Annual issues, New York, New York.

Figure 18:

Source: Carol Frances + Associates, first published in Productive America: Two-Year Colleges Unite to Improve Productivity in the Nation's Workforce, National Council for Occupational Education and American Association of Community and Junior Colleges, January 1990, Report 2, p. 7.

Figure 19:

Source: Anthony Carnevale, American Society for Training and Development.

Figure 20:

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment, Hours, and Earnings: United States, 1909-90, Bulletin 2370 (March 1991).

Figure 21:

Source: U.S. Department of Labor, Bureau of Labor Statistics, Office of Employment Projections, Monthly Labor Review, November 1989.

Figure 22:

Source: U.S. Department of Labor, Bureau of Labor Statistics, News, USDL 90-364 (July 17, 1990), Tables 6-7.

Figure 23:

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment, Hours, and Earnings: United States, 1909-90, Bulletin 2370 (March 1991).

Figure 24:

Source: George Silverstri and John Lukasiewicz, "Projections of Occupational Employment, 1988-2000," U.S. Department of Labor, Monthly Labor Review, November 1989.

Figure 25:

Source: Based on data from George Silverstri and John Lukasiewicz, "Projections of Occupational Employment, 1988-2000," U.S. Department of Labor, Monthly Labor Review, November 1989.

Figure A-1

Total Population, Including Armed Forces Overseas (In Thousands)

July 1	Total	0-4	5-17	18-19	20-21	18-21	22-24	18-24	25-29	30-34	35-64	65 +
1970	205,052	17,166	52,596	7,509	7,209	14,718	9,993	24,711	13,736	11,587	65,149	20,107
1971	207,661	17,247	52,564	7,714	7,350	15,064	10,810	25,874	14,041	11,917	65,460	20,561
1972	209,896	17,101	52,319	7,924	7,593	15,517	10,560	26,077	15,240	12,383	65,757	21,020
1973	211,909	16,851	51,914	8,114	7,796	15,910	10,725	26,635	15,786	13,153	66,045	21,525
1974	213,854	16,487	51,500	8,258	8,004	16,262	10,972	27,234	16,521	13,704	66,348	22,061
1975	215,973	16,121	51,045	8,479	8,196	16,675	11,331	28,006	17,280	14,191	66,632	22,696
1976	218,035	15,617	50,635	8,659	8,338	16,995	11,649	28,644	18,274	14,485	67,101	23,276
1977	220,239	15,564	49,899	8,674	8,550	17,224	11,949	29,173	18,277	15,721	67,713	23,892
1978	222,585	15,735	49,039	8,676	8,760	17,406	12,216	29,622	18,683	16,280	68,723	24,502
1979	225,055	16,063	48,043	8,751	8,754	17,505	12,542	30,047	19,178	17,025	69,566	25,134
1980	227,757	16,458	47,238	8,766	8,765	17,531	12,019	30,350	19,804	17,822	70,383	25,704
1981	230,136	16,931	46,354	8,607	8,825	17,432	12,996	30,428	20,306	18,853	71,029	26,236
1982	232,520	17,298	45,655	8,476	8,807	17,283	12,999	30,282	20,865	18,878	72,716	26,827
1983	234,799	17,650	45,129	8,243	8,648	16,891	13,053	29,944	21,321	19,281	74,046	27,428
1984	237,001	17,830	44,943	7,855	8,514	16,369	13,021	29,390	21,660	19,769	75,436	27,973
1985	239,283	18,017	44,975	7,535	8,278	15,813	12,936	28,749	21,891	20,348	76,770	28,536
1986	241,596	18,128	45,143	7,360	7,892	15,252	12,721	27,973	22,136	20,848	78,195	29,173
1987	243,084	18,886	44,595	7,247	7,463	14,710	12,535	27,245	22,151	20,941	79,381	29,925
1988	245,302	19,029	44,818	7,445	7,264	14,709	12,075	26,784	22,088	21,341	80,918	30,529
1989	247,498	19,142	44,683	7,555	7,273	14,828	11,547	26,375	21,925	21,895	82,563	31,115
1990	249,657	19,198	45,139	7,214	7,470	14,684	11,110	25,794	21,522	22,007	84,300	31,697
1991	251,767	19,192	45,741	6,754	7,580	14,334	11,003	25,337	20,826	22,333	86,117	32,217
1992	253,817	19,124	46,487	6,523	7,240	13,763	11,117	24,880	20,229	22,319	88,089	32,688
1993	255,800	18,998	47,169	6,482	6,782	13,264	11,319	24,583	19,573	22,257	90,090	33,129
1994	257,714	18,823	47,907	6,503	6,551	13,054	11,085	24,139	19,059	22,097	92,182	33,507
1995	259,559	18,615	48,517	6,560	6,509	13,069	10,633	23,702	18,822	21,898	94,317	33,888
1996	261,339	18,390	49,111	6,660	6,531	13,191	10,059	23,250	18,826	21,007	96,561	34,193
1997	263,060	18,166	49,529	6,786	6,587	13,373	9,905	23,278	18,603	20,414	98,680	34,389
1998	264,731	17,957	49,695	7,129	6,688	13,817	9,810	23,627	18,348	19,763	100,754	34,586
1999	266,360	17,774	49,780	7,371	6,814	14,185	9,942	24,127	17,886	19,254	102,804	34,737
2000	267,955	17,626	49,764	7,456	7,156	14,612	9,988	24,600	17,396	19,019	104,627	34,921
Projected												
2005	275,677	17,449	48,533	7,868	7,761	15,629	11,352	26,981	17,403	17,606	111,477	36,227
2010	283,238	17,974	46,870	7,798	7,931	15,729	11,926	27,655	19,362	17,616	114,568	39,195
2015	290,406	18,443	46,683	7,354	7,553	14,907	11,730	26,637	20,102	19,564	114,180	44,796

Source U S Department of Commerce, Bureau of the Census, Current Population Reports, Projection of the Population of the United States, by Age, Sex, and Race: 1988 to 2080, Series P-25, Number 1018 (January 1989)

Figure A-2
State Population Projections
1980-2000

	Population in Thousands			Increase in Thousands		Percent Increase	
	1980	1990	2000	1980-1990	1990-2000	1980-1990	1990-2000
United States	226,546	249,891	267,748	23,345	17,857	10.3	7.1
New England							
Maine	1,125	1,236	1,344	111	108	9.9	8.7
New Hampshire	921	1,140	1,410	219	270	23.8	23.7
Vermont	511	571	619	60	48	11.7	8.4
Massachusetts	5,737	5,921	6,156	184	236	3.2	4.0
Rhode Island	947	998	1,048	51	50	5.4	5.0
Connecticut	3,107	3,266	3,422	159	156	5.1	4.8
Middle Atlantic							
New York	17,558	17,868	17,966	310	98	1.8	0.5
New Jersey	7,365	7,808	8,382	443	574	6.0	7.4
Pennsylvania	11,864	12,043	12,069	179	26	1.5	0.2
East North Central							
Ohio	10,978	10,907	10,930	109	23	1.0	0.2
Indiana	5,490	5,617	5,696	127	79	2.3	1.4
Illinois	11,426	11,682	11,722	256	40	2.2	0.3
Michigan	9,262	9,292	9,365	30	73	0.3	0.8
Wisconsin	4,706	4,892	4,844	186	(48)	4.0	(1.0)
West North Central							
Minnesota	4,076	4,377	4,566	301	189	7.4	4.3
Iowa	2,914	2,814	2,549	(100)	(265)	(3.4)	(9.4)
Missouri	4,917	5,207	5,473	290	266	5.9	5.1
North Dakota	653	658	596	5	(62)	0.8	(9.4)
South Dakota	691	716	715	25	(1)	3.6	(0.1)
Nebraska	1,570	1,604	1,539	34	(65)	2.2	(4.1)
Kansas	2,364	2,522	2,534	158	12	6.7	0.5

Figure A-2
State Population Projections
1980-2000
(continued)

	Population in Thousands			Increase in Thousands		Percent Increase	
	1980	1990	2000	1980-1990	1990-2000	1980-1990	1990-2000
South Atlantic							
Delaware	594	682	802	88	120	14.8	17.6
Maryland	4,217	4,774	5,608	557	834	13.2	17.5
District of Columbia	638	603	595	(35)	(8)	(5.5)	(1.3)
Virginia	5,347	6,229	7,275	882	1,046	16.5	16.8
West Virginia	1,950	1,842	1,651	(108)	(191)	(5.5)	(10.4)
North Carolina	5,882	6,588	7,717	806	1,029	13.7	15.4
South Carolina	3,122	3,560	3,962	438	402	14.0	11.3
Georgia	5,463	6,598	8,006	1,135	1,407	20.8	21.3
Florida	9,746	12,942	16,315	3,196	3,373	32.8	26.1
East South Central							
Kentucky	3,661	3,745	3,689	84	(56)	2.3	(1.5)
Tennessee	4,591	5,009	5,424	418	415	9.1	8.3
Alabama	3,894	4,165	4,358	271	193	7.0	4.6
Mississippi	2,521	2,649	2,772	128	123	5.1	4.6
West South Central							
Arkansas	2,286	2,421	2,509	135	88	5.9	3.6
Louisiana	4,206	4,368	4,141	162	(227)	3.9	(5.2)
Oklahoma	3,025	3,190	2,924	165	(266)	5.5	(8.3)
Texas	14,229	17,053	17,828	2,824	775	19.8	4.5
Mountain							
Montana	787	797	744	10	(53)	1.3	(6.6)
Idaho	944	1,013	1,008	69	(5)	7.3	(0.5)
Wyoming	469	468	409	(1)	(59)	(0.2)	(12.6)
Colorado	2,890	3,331	3,424	441	93	15.3	2.8
New Mexico	1,303	1,539	1,735	236	196	18.1	12.7
Arizona	2,718	3,666	4,633	948	967	34.9	26.4
Utah	1,461	1,729	1,845	268	116	18.3	6.7
Nevada	800	1,130	1,409	330	279	41.3	24.7
Pacific							
Washington	4,132	4,797	5,191	665	394	16.1	8.2
Oregon	2,633	2,822	2,903	189	81	7.2	2.9
California	23,668	29,287	33,963	5,619	4,676	23.7	16.0
Alaska	402	525	599	123	74	30.6	14.1
Hawaii	965	1,133	1,362	168	229	17.4	20.2

Source: 1980 1980 Census, PC80-S1-7, Total Persons

1990 U.S. Department of Commerce, Bureau of the Census, Current Population Reports,
Projection of the Population of the United States, by Age, Sex, and Race: 1988 to 2080,
Series P-25, Number 1053 (January 1990)

Figure A-3

College Enrollment, By Age
(In Thousands)

	1970	1975	1980	1985	1986	1987	1988
Total	8,581	11,185	12,097	12,247	12,505	12,719	13,116
14-17	259	278	247	235	200	239	182
18-19	2,600	2,786	2,901	2,600	2,727	3,045	3,046
20-21	1,880	2,243	2,423	2,383	2,206	2,642	2,681
22-24	1,457	1,754	1,989	1,933	2,100	2,006	2,064
25-29	1,074	1,774	1,871	1,953	1,941	1,826	1,735
30-34	487	967	1,243	1,261	1,301	1,159	1,228
35+	823	1,383	1,422	1,885	2,030	1,802	2,179
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
14-17	3.0	2.5	2.0	1.9	1.6	1.9	1.4
18-19	30.3	24.9	24.0	21.2	21.8	23.9	23.2
20-21	21.9	20.1	20.0	19.5	17.6	20.8	20.4
22-24	17.0	15.7	16.4	15.8	16.8	15.8	15.7
25-29	12.5	15.9	15.5	15.9	15.5	14.4	13.2
30-34	5.7	8.6	10.3	10.3	10.4	9.1	9.4
35+	9.6	12.4	11.8	15.4	16.2	14.2	16.6
18-21	52.2	45.0	44.0	40.7	39.4	44.7	43.7
18-24	69.2	60.6	60.5	56.5	56.2	60.5	59.4

Source: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, Digest of Education Statistics, 1990, p. 169
1987-1988, USDC, Bureau of the Census, P-20, Number 443, pp. 107, 34.

Figure A-4

College-Going Rates
By Age, Race, and Gender

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
All													
14-15	0.1	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2		
16-17	3.3	3.2	3.3	3.7	3	2.8	3.2	3.5	3.4	3.4	2.8	3.2	2.5
18-19	36	35.7	35.6	34.6	35.9	37.5	36.5	37.6	36.6	40.4	41.5	42.5	41.8
20-21	30.7	30.4	28.4	29.1	29.9	30.4	32.9	31	32.6	34.1	31.6	37.3	36.5
22-24	16.8	16.1	15.8	15.4	15.8	15.9	16.3	16.1	16.8	16.5	17.5	17.1	16
25-29	9.8	10.5	9.2	9.3	6.9	8.7	9.2	9.3	8.6	9	8.5	8.6	8.2
30-34	5.7	6.5	6.1	6.1	6.2	6.6	6.1	6.2	6	5.9	5.7	5.5	5.7
35-44												3.8	4.5
45-54												1.5	2
55+												0.3	0.3
White Men													
14-15	0.1			0.3	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	
16-17	2.4	2.5	2.5	2.9	2.3	2.4	2.9	2.8	2.4	3.6	2.4	3.1	1.6
18-19	36.7	37.5	36.4	34.6	36.2	37.5	36	37.2	40.2	40	43	43.4	40.1
20-21	32.9	33.7	31.3	31.3	32.9	31.9	35.7	35	35.3	36.3	32.9	40.8	40
22-24	20.2	18.9	18.8	17.5	17.7	18.7	17.7	18.7	19.9	18.7	18.4	18.2	20.8
25-29	12.7	12.3	10.8	10.3	9.3	8.9	9.8	10.1	9.1	9.3	9.3	8.3	7.7
30-34	6.3	6.6	8.1	5.7	5.5	5.8	5.3	5.3	5.4	5.4	5.2	4.9	5.2
35-44												2.9	3.2
45-54												0.8	1.1
55+												0.2	0.2
White Women													
14-15	0	0.1		0.1	0.1		0.1	0.1	0.1	0.1	0.2		
16-17	4.2	3.8	4	4.3	3.9	3.4	3.8	4.1	4.6	3.7	3.5	3.3	3.1
18-19	37.5	36.8	37.3	37	38.4	40.1	40.4	43.3	42.6	45.7	43.7	44.4	48.1
20-21	30.1	27.8	26.4	28.9	28.8	31.4	32.8	29.3	31.6	34	32.3	36.4	39.2
22-24	13.6	13	12.8	13.5	14.4	12.9	14.1	13.2	13.8	14.6	15.9	15.9	16.2
25-29	6.8	8.4	7.8	8.7	8.4	7.6	8.7	8.3	8.6	8.7	7.8	8.2	8.2
30-34	4.8	5.8	5.7	5.4	6.8	7.3	6.5	6.7	6.5	6.6	6.1	6.2	6.1
35-44												4.8	5.8
45-54												2.2	3
55+												0.4	0.3

Figure A-4

College-Going Rates
By Age, Race, and Gender

(continued)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Black Men													
14-15										0.8			
16-17	1.9	3.1	2.3	2.1	2.4	1.2	1.7	2.2	2.9	1	1.8	2.3	1.1
18-19	24.2	18.1	23.1	22.1	19.6	24.8	22.7	17.3	21.3	23.3	23.4	30.8	21.1
20-21	24.8	25.6	23.1	24	21.7	18.8	18.1	21.5	25	28	22.8	26.7	20
22-24	17.7	17.8	14	13.5	12.4	14.4	15.7	16.8	18.4	11.9	15.8	14.1	14.3
25-29	11	14.3	9.4	8	9.9	10.8	8.4	8.2	8.5	5.5	6.6	6.3	6.2
30-34	8.8	9.2	7.3	6.1	6.6	6.5	5.6	6.7	6.2	3.9	5.5	3.2	4.1
35-44												2.6	2.9
45-54												1.8	1.1
55+												0.1	0.3
Black Women													
14-15	0.2					0.3	0.2		0.3	0.2	0.3		
16-17	3.8	3.2	4.3	5.3	2.8	3.9	2	3.5	4.2	1.9	1.4	3.5	4.8
18-19	32.6	31.1	27.2	29.4	31.9	29.2	25.1	27.6	27	24.9	34.7	34.4	31.7
20-21	25	26.5	23.7	20.3	21.8	23.2	25.2	22.4	24.2	23.1	23	25.9	34.3
22-24	13.9	11.9	13.3	13.7	12.6	13.1	15.3	13.1	13.6	13.5	16.7	14	11.9
25-29	7.9	10.2	7.8	6.9	7.1	8	7.8	6.4	5.9	8.3	7	8.3	7.7
30-34	6.3	6.5	7.5	6.9	5.9	6.8	6.1	7.4	5.5	5.6	5.6	6.1	6.7
35-44												3.6	4.8
45-54												1.1	2.3
55+												0.2	0.2

Figure A-4

College-Going Rates
By Age, Race, and Gender

(continued)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Hispanic Men													
14-15							0.2				0.6		
16-17	1.3	2.3	2.5	3.3	0.6	1.7	1.5	3.7	0.8	2.9	1.4	0.8	2.8
18-19	26.7	22.5	24.1	26.1	22.1	19.8	17.3	15.3	16.9	16.2	26.6	22.9	20.5
20-21	19.4	20.1	13.8	18.8	18.8	21.2	18.4	19.5	24.1	19.4	16.4	26.5	19
22-24	17.3	13.6	12.5	12.4	8.8	10.2	10.8	12.7	11	12.3	11.7	11.4	12.5
25-29	10.4	12.4	9.5	7.9	6.2	7.5	7.1	10.2	6.6	7.9	7.7	7.4	4.5
30-34	5.6	5.8	3.5	5.6	5.6	5.8	3.6	2.8	4.6	4	3.1	4.6	3.2
35-44												1.7	2.5
45-54													0.6
55+													0.6
Hispanic Women													
14-15													
16-17	3.6	3.3	3.4	4	2.8	3.2	3.6	2.5	1.1	1.8	1.6	1.7	1.3
18-19	26.9	25.2	21.7	22.9	23.8	22.5	30.7	30.4	30.2	27.8	27.3	20.6	34.7
20-21	19.3	20.6	14.3	18.8	14.4	16.8	21.5	21	26.3	25.2	20.8	18.8	10
22-24	12.1	5.7	9.2	7.6	12.1	12.1	9.7	9.3	9	9.7	12.5	12.9	10.9
25-29	4.2	4.9	5.5	6	5.1	7.1	6.4	5.4	6.7	4.3	6.2	5.9	6.7
30-34	2.4	4.7	3.4	5.7	3.8	2.8	4.4	3.6	4.9	6.7	5.3	3.3	4.9
35-44												3.1	3
45-54												1.2	0.5
55+												0.1	0.6

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Social and Economic Characteristics of Students: 1988 and 1987, Series P-20, Number 443, and earlier numbers including 319, 333, 346, 360, 382, 392, 394, 400, and 429.

Figure A-5

Trends in the Distribution of Families

By Type of Family
(In Thousands)

Year	All Families	Married Couples			Male Householder, No Wife Present	Female Householder, No Husband Present
		All Couples	Wife in the Paid Labor Force	Wife Not in Paid Labor Force		
1967	50,111					
1968	50,823					
1969	51,586					
	51,948	44,739	17,568	27,174	1,258	5,950
1970	52,227					
1971	53,296					
1972	54,373					
1973	55,053					
1974	55,698	47,069	20,404	26,665	1,399	7,230
1975	56,245	47,318	20,833	26,486	1,444	7,482
1976	56,710					
1977	57,215					
1978	57,804					
1979	59,550	49,112	24,187	24,925	1,733	8,705
1980	60,309	49,294	24,752	24,542	1,933	9,082
1981	61,019	49,630	25,002	24,628	1,986	9,403
1982	61,393	49,908	25,480	24,428	2,016	9,469
1983	62,015	50,090	26,177	23,913	2,030	9,878
1984	62,706	50,350	26,938	23,412	2,228	10,129
1985	63,558	50,933	27,489	23,445	2,414	10,211
1986	64,491					
1987	65,204	51,675	29,010	22,664	2,834	10,696
1988	65,837	52,100	29,713	22,387	2,847	10,890
1989	66,090	52,317	30,188	22,129	2,884	10,890
Percent Change:						
1969-89	27.2	16.9	71.8	-18.6	129.3	83.0
Percent Distribution:						
1969	100.0	86.1	33.8	52.3	2.4	11.5
1989	100.0	79.2	45.7	33.5	4.4	16.5

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Consumer Income, Money Income and Poverty Status in the United States, p. 31

Figure A-6
Number of Immigrants
1945 - 1988

Year	Europe	Asia	Africa	Caribbean	Central America & Mexico	South America	Other	Total	Non legalization
1945	10,093	623	267	4,668	9,850	1,326	11,292	38,119	
1946	64,798	2,000	1,098	4,911	8,976	1,755	25,183	108,721	
1947	96,874	4,089	849	6,323	11,245	2,421	25,491	147,292	
1948	115,705	7,671	840	7,024	11,614	2,768	24,948	170,570	
1949	138,356	6,300	737	6,550	10,470	2,639	23,265	188,317	
1950	206,420	4,742	689	6,104	8,992	2,777	19,463	249,187	
1951	161,065	5,278	700	5,573	8,342	2,724	22,035	205,717	
1952	202,749	9,563	740	6,738	12,242	3,902	29,586	265,520	
1953	96,082	8,124	922	8,886	21,510	4,691	30,219	170,434	
1954	110,944	12,034	1,187	9,008	40,944	5,523	28,537	208,177	
1955	127,286	12,337	1,186	12,513	54,455	5,599	24,414	237,790	
1956	175,119	17,974	1,441	19,030	70,028	6,846	31,187	321,625	
1957	184,656	23,561	1,673	18,063	54,934	9,002	34,978	326,867	
1958	137,796	20,382	2,040	16,773	33,285	11,039	31,950	253,265	
1959	157,733	24,602	2,631	12,224	28,869	9,792	24,835	260,686	
1960	138,785	24,956	2,319	14,059	39,345	13,048	32,886	265,398	
1961	126,979	22,299	1,980	22,266	48,449	15,470	33,901	271,344	
1962	118,778	23,019	1,931	26,484	63,696	17,592	32,236	283,736	
1963	124,677	25,021	2,639	27,617	65,528	22,919	37,859	306,260	
1964	122,104	21,845	2,887	29,969	44,467	31,102	39,874	292,248	
1965	113,424	20,683	3,383	37,592	50,392	30,962	40,261	296,697	
1966	123,469	41,432	3,137	43,820	54,821	25,836	30,525	323,040	
1967	137,301	61,446	4,236	65,278	51,080	16,517	26,114	361,972	
1968	137,754	58,989	5,078	145,762	54,426	21,967	30,472	454,448	
1969	118,028	75,679	5,876	59,401	54,316	23,928	21,351	358,579	
1970	116,039	94,883	8,110	61,406	53,821	21,973	17,089	373,326	
1971	96,498	103,459	6,772	68,189	58,733	20,702	16,125	370,478	
1972	89,993	121,058	6,612	61,373	72,150	19,359	14,140	384,665	
1973	92,870	124,160	6,655	64,769	78,983	20,335	12,291	400,063	
1974	81,212	130,662	6,782	62,959	80,823	22,307	10,716	394,861	
1975	73,996	132,469	5,729	67,430	71,901	22,984	10,685	386,194	
1976	72,411	149,881	7,723	66,839	67,776	22,699	11,284	398,613	
1977	70,010	157,759	10,155	114,011	60,564	32,954	16,862	462,315	
1978	73,198	249,776	11,524	91,361	112,520	41,764	21,299	601,442	
1979	60,645	189,293	12,838	74,074	69,643	35,344	18,311	460,348	
1980	72,121	236,097	13,981	73,296	77,648	39,717	17,779	530,639	
1981	63,695	264,343	15,029	73,301	125,777	35,913	15,542	596,600	
1982	69,174	313,291	14,314	67,379	79,732	35,448	14,793	594,131	
1983	58,867	277,701	15,084	73,308	83,680	36,087	15,038	559,763	
1984	64,076	256,273	15,540	74,265	81,645	37,460	14,644	543,903	
1985	63,043	264,691	17,117	83,281	57,379	39,058	45,440	570,009	
1986	62,512	268,248	17,463	101,632	94,913	41,874	15,066	601,708	
1987	61,174	257,684	17,724	102,899	101,647	44,385	16,003	601,516	
1988	64,797	264,465	18,882	112,357	125,214	41,007	16,303	643,025	574,024
1989	82,891	312,149	25,166	88,932	506,206	58,926	16,654	1,090,924	598,724

Note: Non-legalization represents what immigration population would have been without the Immigration Reform Control Act

Source: U.S. Immigration and Naturalization Service, special computer runs.

Figure A-7
Total Foreign Student Enrollment
1955 - 1988

Academic Year	IIE Foreign Student Enrollment	USED Non-Resident Alien
1954-55	34,000	
1955-56	36,000	
1956-57	41,000	
1957-58	43,000	
1958-59	47,000	
1959-60	48,000	
1960-61	53,000	
1961-62	58,000	
1962-63	65,000	
1963-64	75,000	
1964-65	82,000	
1965-66	83,000	
1966-67	100,000	
1967-68	110,000	
1968-69	121,000	
1969-70	135,000	
1970-71	145,000	
1971-72	140,000	
1972-73	146,000	
1973-74	151,000	
1974-75	155,000	
1975-76	179,344	
1976-77	203,068	219,000
1977-78	235,509	
1978-79	263,938	253,000
1979-80	286,343	
1980-81	311,882	305,000
1981-82	326,299	
1982-83	336,985	331,000
1983-84	338,894	
1984-85	342,113	335,000
1985-86	343,777	
1986-87	349,609	345,000
1987-88	356,187	
1988-89	366,350	361,000
1989-90	387,850	

Sources: Institute for International Education,
Open Doors, Annual Issues, New York, New York

Elizabeth Sutton, Director of Research
212-984-5348.

U.S. Department of Education, Office of Educational Research and Improvement, Digest of Educational Statistics: 1989, p. 192; and unpublished data.

Chairman FORD. And I thank all of the members of the panel for a fine presentation. To start off, I'll turn to Mr. Coleman.

Mr. COLEMAN. Thank you, Mr. Chairman. Again, excellent testimony. Mr. Carnevale, I'm taking your testimony and reading it word for word because I think it really merits that. You've explored a lot of topics that you didn't talk about in your oral presentation, and just looking at it, it looks very good.

Mr. Packer, I think one of the things that I gleaned from your executive summary of your Workforce 2000 is something that a lot of others have touched on. And I'll quote, "Without substantial adjustments, blacks and Hispanics will have a smaller fraction of the jobs in the year 2000 than they have today while their share of those seeking work will have risen."

And I think we have to ask why and how we can respond to that statement. Do you have any, other than the statement, as to how and why this phenomena exists and what can be done? And, very frankly, I think there are criticisms about making things so race specific in some cases, but indeed the statistics drive some of this to a conclusion that there are reasons to have to look at it sometimes in that fashion. Do you have any answers?

Mr. PACKER. Let me try to explain, Mr. Coleman, how we began to get to those numbers. We took a look at the distribution by race in existing jobs and then the projections of what will happen to those jobs. Minorities tend to be in jobs that will be growing at a slow rate and the majority population are in the jobs, such as computer science and mathematical analysis, that will grow at the high rate.

So that if the patterns of employment remain the same and the economy grows, the minorities less well educated will find themselves further behind the majority. We see that in educational terms by the figures that have been quoted by two of my colleagues here today.

Those with only a high school education are falling behind. They are on a very rapid down escalator. I think the high school graduate male with one to five years experience has, since 1979, lost 18 percent in real wages. So it's not a matter of realizing the American dream; they're losing the dream that they have.

And that's the situation. Not that college graduates have done so very well, but they have, at least, improved their status while the high school graduates have fallen behind. And since the access questions that have been raised before are the reality, that means minorities, especially young, especially less well educated, are not in a good situation.

So the solution clearly has to be to improve the educational access and the quality of education for those who have not been served well before in the past.

Mr. COLEMAN. And, of course, one of the predicates upon which the Higher Education Act is based is access. And so we, obviously, I think Ms. Frances may have stated that through the years where actually the percentage is lower in minorities in some cases. Is that what you said?

Ms. FRANCES. What I meant to say is that the gap between the white and the minority college going rate has widened, even though it may have increased for the minorities.

Mr. COLEMAN. Okay. So they've both increased, but at a widening disproportion.

Ms. FRANCES. Fine. We did have absolute declines in black and Hispanic early in the 1980s, and those have been partially made up.

Mr. COLEMAN. May I ask you if you have the expertise to divide out on page nine in your chart here that shows percent of students employed by age, I guess the good news is the work ethic is alive and well through this chart. It certainly shows that it is. And I wonder if you could divide that out by income/race, if possible, further.

Ms. FRANCES. Not from these sorts of data.

Mr. COLEMAN. You can not? So we don't know the driving reasons behind these rates. For example, there may be----

Ms. FRANCES. Well, I have talked with counsels to the committee about the capability of generating this information over time. It is possible. I originally did work like that for Stanford Research Institute to get trends in college going rates by income adjusted for the effects of inflation over time. It's possible to do it, but I don't have it here.

Mr. COLEMAN. And, Mr. Hughes, one of your conclusions is broader cultural diversity. And I want to ask you a little bit about your implications here. You stated, for example, that we're educating maybe 600 percent more foreign students in our colleges than we were, you know, 28 and 30 years ago.

The implications are that people are coming over here and buying a first rate college education; and I think the other implication is that they're going home and competing with us and doing quite well.

I think we have to appreciate the diversity and what the positive aspects of having people of other nationalities is, and it's a constructive one. And at the same time, it's becoming somewhat of an issue when we have suggestions that we ought to be focusing student—serving foreign student markets, realign services to target culturally diverse groups and seek collaboration with foreign universities. And then I note in the press that there are efforts, and there have been, that some countries are buying into U.S. universities like so much of a conglomerate corporation.

And would you address those? I'm a little concerned that maybe we're going off to try to serve and attract students from other countries when it's pretty obvious that our own people are having a difficult time here. How do you square all that?

Mr. HUGHES. I think a lot of it has to do with the simple laws of a free market society, free enterprise, and laws of supply and demand. There's no doubt, as we move to a global economy and reduced barriers and improved communications, that the United States higher education system, which is recognized, probably, as the crown jewel of all higher education in the world, there's going to be a natural tendency for United States to draw in students from around the world into our institutions. That's sort of a natural economic condition.

At the same time, and those students come sort of naturally to the universities in this country. And I think from a perspective of

the universities, again, economically, they will serve those students because they're there paying money and the like.

I think the issues that this panel is addressing is the lack of the pipeline, the problems in the pipeline, that there's more access to foreign students coming into this country than there are actually bringing the students up domestically and getting them to the point where our higher education institutions can serve them adequately.

And it's those issues are barriers of access to our own domestic students that are the handicap, rather than the more easy process of meeting the demands of an international society.

Mr. COLEMAN. I think one of the concerns that I would have, and I don't disagree with you, and the other argument is these people are paying full tuition, probably, and therefore are making it easier for aid to go to American needy students and so forth.

But that if there is a conclusion out there that there are American students, perhaps minorities in some cases, that are not getting access through this system, if we're going to adapt the system to be more, as you indicate, focused on serving the needs of serving foreign students, I think that they're going to see this as even more disengaged from their real life experiences than it is now. And that's something that should be factored in.

Mr. HUGHES. Mr. Coleman, I completely agree with you on the public policy issues surrounding foreign students. What I was trying to describe as sort of the natural economic phenomena that are going on, that there's certainly public policy issues involved in it.

Mr. COLEMAN. I don't want to take any more time. We have a lot of people to ask questions. So, Mr. Chairman, with Ms. Frances.

Ms. FRANCES. I served on the board of an institution that had a very significant proportion of foreign students in their student population, and what we discovered was that they went home and formed companies and came back and bought goods in America and it increased the economic relationships significantly. They also went home and became the prime ministers of their countries.

So that there was much more contact than just the—there are many more objectives than just the educational objectives.

Mr. COLEMAN. I don't want any of my remarks to be interpreted as that I don't think that's good. As I said, I prefaced it by saying I think there's some very positive things, and that's obviously one of them.

But I don't want the tail to be wagging the dog here for other reasons, basically. Thank you.

Chairman FORD. It just occurred to me that maybe some of these statistics about the increasing number of foreign students are the reason why I suddenly started getting a remarkable number of contacts that say, "Why are you wasting our money educating foreign students in our colleges when my kid can't go to the University of Michigan?"

Someplace out there, there is a growing suspicion that we're somehow stimulating this increase in foreign students coming into the country with American taxpayers' money. And for our own preservation of the programs, I hope that when you have the opportunity, you will point out to them that this is one of the few

Federal statutes that prohibits anybody except an American citizen from participating.

And I mean it really does prohibit them, specifically and narrowly in a way that no other Federal program limits itself to American citizens.

I think that this might be an appropriate panel to help us with another problem we have in trying to formulate the debate on educational issues today. I hear an awful lot of emphasis on what percentage of our people are graduating from high school. And the suggestion in a lot of the rhetoric that we're hearing about what we ought to be doing to improve education and the educational product in this country rotates around the fact that 25 percent, or approximately 25 percent of the people in school now are not going to graduate from high school.

I search back in my own memory and realize that at the time I graduated from high school, the very fact that I graduated already put me in the top 25 percent of the population of the country.

So I've gone back to look at it and I discovered that when we went into World War II, of all the people over the age of 25 in this country, only 24 percent had four years of high school. We started World War II with 24 percent of our population as what might be presumed to be high school graduates or equivalent.

By 1960, we had that all the way up to 41 percent. And then something started happening in the sixties. By 1970, it got up to 55 percent, and by 1975, it got to 62 percent. In 1980, it was up to 68 percent. By 1982, it was up to 71 percent. By 1985 it was up to 73.9 percent. By 1986, it was 74.7. By March of 1987, it was 75.6 percent. In March of 1988, it was 76.2. By March of 1989, it was 76.8.

Looking at the trend that those numbers indicate, it looks like we've had a phenomenally successful three decades of improvement in education. But I don't believe that because what that really exposes to me is that we're using the wrong definition of what an education is and we're too willing to accept the idea that the percentages of people finishing high school are relevant to the needs of this country.

Now, when I looked at these numbers going into World War II, it was actually when the 1940 numbers were developed, my first year in high school, neither my mother nor my father had graduated from high school. They were more typical than atypical of the population, all white, that I grew up with in the suburbs of Detroit.

But the requirements for employment were such that they were adequately equipped, because they were literate, they were adequately equipped for the kind of employment that "working people" did in those days.

And I now look at the population in the same area and see that a high school education is not enough to get the new jobs that are available in that area. The good paying automobile jobs are disappearing like water in the sand. We took a group of Congressmen to Detroit last weekend, some of you may have noticed, to visit the auto plants to give them a flavor of how dramatically that industry has changed in the last decade.

More dramatically than we could describe to them, we showed them how far it was between workers on an assembly line today. When I worked on an assembly line at the end of the war while

going to college, you bumped into the person on your right during a part of the dance as you followed the moving line, and you bumped into the person on your left. But you were shoulder to shoulder, literally, all day long.

Now, it's 50 to 75 feet between workers on a line, and in between, there are machines doing things that used to be done by people. They were oohing and aahing about the nice attitude that the work force had in the Cadillac plant until one of the UAW people pointed out to me that nobody that they saw had less than 15 years experience in an automobile plant.

In other words, to be working today making a Cadillac or a Toronado in the new, and you saw it on television, Poletown plant, which was a joint venture by the city of Detroit, Amtrack, General Motors, the State of Michigan and others, to keep some employment within the city of Detroit, you have to have 15 years seniority. So that's a brand new plant that up to this point is producing no new jobs; people transferred into that plant with their seniority. And all this effort to create new employment goes out the window because by the time the plant was finished, it requires a degree of sophistication and fewer people than would have been employed in the past in that industry. So it's all wasted effort.

We spin our wheels over and over because it seems to me that we define what it is that we need too much on the basis of what we used to need.

And I would like to know from the Project 2000 how much emphasis, if any, did you put on the President's goal that 90 percent of the people in this country graduate from high school by the year 2000?

Mr. PACKER. Well, that is one of the goals, but not foremost. I think our foremost goal is what you spoke to, to be sure that people come out with the skills they're going to have to have past the year 2000. And we think that will reduce the dropout rate.

Chairman FORD. We know that the President is going to be disappointed, don't we, because the children that are in school now who should be graduating in the year 2000 are already there and have been in the public schools for almost three years. They're in their third year now, I believe.

And we know what their characteristics are and we know what the performance rate of those characteristics are. So, statistically, we know that 11 million kids now in school are not going to graduate. And we know that that means that there are still going to be 25 percent of that class of the year 2000 that isn't going to make it unless something happens, unless something very dramatic happens.

Does that comport with what you've found?

Mr. PACKER. Well, I think that's correct. We didn't investigate that particular issue, but you're quite right that something dramatic must happen. Now, a large proportion of that 25 percent will get their high school diploma or equivalency later.

Chairman FORD. Later.

Mr. PACKER. Sometime later. And that's part of the postsecondary situation. But I think the first step towards reducing the dropout rate is to answer that kid who says, "Why do I have to learn this stuff? I'll never use it." And we have to be sure, a, that he or

she will use it, and, secondly, that he or she understands that there's a relationship between earning and learning.

And that it's necessary; it's not a bunch of junk. It's not an algebra question about two trains crossing in the night that never, ever, comes up once you get finished with school. But it's an algebra question about how do I work on a line in the new GM or Ford line, about make or buy decisions, and that they will use.

And I think once you move from learning irrelevancies just because they happen to be on a old multiple choice test to learning stuff that everybody can see will be useful to making a decent living, the dropout rate will diminish, and not until then.

Chairman FORD. Well, in my own lifetime, it was possible to get a job that turned into a very fine middle class lifestyle for a family in an automobile plant or a steel mill and be totally illiterate. There is no such job available anymore, and being functionally literate for an industrial job today may mean that you have to be computer literate.

Mr. PACKER. That's right.

Chairman FORD. Mr. Dingell and I have members of the United Steel Workers who are computer programmers in a steel mill that operates almost all of its functions through computers and has to have people who are equipped to instantly respond to any difficulty that occurs.

The whole thing changes so fast that I find the people living in the middle of it do not understand how much more their children are going to need to get the same kind of job or have the same kind of lifestyle that they had.

The auto or steel worker's child who does not go on and get some additional education that's relevant to the jobs that are going to be available, is not going to be able to afford for his children or her children what their daddy did on a steel worker's job.

And it's very, very hard to get people to accept it. And when people here in Washington, and particularly the previous President, keep talking as if that artificial goal of the number of people who graduate from high school represents success or failure in our education system generally was used as a whip to beat up on education.

"So, you see, education is failing in this country because 25 percent of the people aren't getting through high school." So what? Seventy five percent of the people who went to fight World War II didn't get through high school, and we won. But that was adequate to the time, and nobody wants to talk in this town, none of us as politicians, surely, about what's adequate to the time.

I think what you people have done is indicate, as clearly as anybody I've listened to, that we've really got to be thinking. If we purport here to make policy for the future, we've really got to be thinking of where that moving target is moving to and forget what we've been taking for granted in the past about what's adequate in an educational opportunity and in educational need.

Mr. PACKER. This afternoon, Mr. Chairman, we will discuss how we allow people in communities around the country to come to the conclusion that you just stated, how we encourage them to do their own research in their own community to find out what jobs really require so they can compare those requirements to what the

schools are teaching, with the hope that empowered in that fashion, American employers and American parents will demand that schools do prepare people not for yesterday, not for yesterday, not for World War II, but for Desert Storm, and be able to equip them for the jobs of tomorrow, not the ones that are, as you say, disappearing very, very rapidly as water in the sand.

Chairman FORD. Incidentally, it recently occurred to me that we probably never fought any kind of war or military engagement in the history of this country with the relatively high level of education in our people than we had in Desert Storm. The non-high school graduate was virtually nonexistent in the Gulf because the nature of the all volunteer army and the nature of the reserve, the way you get into and stay in the reserve, is that you have to have education, in most cases, beyond high school.

And we never, ever, sent into combat before a wholly educated, certified 12 years of education fighting force until Desert Storm, and hardly anybody recognizes the wonderful, heroic success we had there as being in some part attributable to our success in educating more people than we did in the past.

Mr. PACKER. Including the postsecondary education that they got in the armed forces that allowed them to do the job they did.

Chairman FORD. Thank you. Mr. Gunderson.

Mr. GUNDERSON. Thank you very much, Mr. Chairman. I'm going to begin by saying thank you, Mr. Chairman, for holding this hearing. I really believe that this is probably the most important hearing we will have on the entire reauthorization process of the Higher Education Act.

start tomorrow morning by speaking to the Wisconsin School Financial Aid Administrators, and I have to tell you that you are going to be quoted and requoted and requoted time and time again. So I hope you don't have any good plagiarism attorneys because we're going to use the information you've shared with this committee. It's now at least partly our copyright, and I think it's essential. You've all done a tremendous service, and I mean that very, very sincerely.

I also want to say to those in the audience I hope whatever association you are representing or monitoring this hearing for, that you intend to bring pertinent data to this committee in future testimony. I hope you take the information and the demographics that have been given to us today and you use that to mold your testimony. Because if you don't, I, for one, am going to throw it back at you.

This is really the last reauthorization to determine what the work force and the competency of the work force of this country looks like as we go into the 21st century. And we better understand, as you all have shown us, that there are major changes and challenges to preparing that work force. And if we don't redesign higher education to meet that goal, then we will have failed and failed miserably in this reauthorization process.

Nothing is more evident in that regard than the statistics you all have shown us about the increases in minorities and the increases in the nontraditional students. And, unfortunately, as some of your evidence suggests, nothing is more obvious under the present struc-

ture and financing of student financial aid , then the fact that we don't respond to those populations.

I have to tell you all just a brief story, then I'm going to open it up for questions. In the last reauthorization, we provided funding for—we created a Title I for nontraditional students for the university system to develop their programs. We created in the Pell grants a process by which we would allow less than half-time students to become eligible for Pell grants.

Neither of those programs have received a dime's worth of funding since the last reauthorization. Part of the reason is because there was not one higher education community in this country that ever went before the Appropriations Committee and asked for a dime for the nontraditional student, not once because I checked. And it's an indication of the infrastructure problem we have internally here within the higher education establishment.

All right, enough of the sermon. What I want to ask each of you is based on the information you have presented to us today, designed for this committee, what do you believe the priorities of the Higher Education Act reauthorization, particularly Title IV, the student financial assistance aspects, ought to be?

Mr. CARNEVALE. I guess I'm at the end so I'll go first.

Mr. GUNDERSON. Sure.

Mr. CARNEVALE. There is a move afoot in most institutional reform in the United States that began in American manufacturing. And I think whether it's ultimately going to wind its way to higher education, and that Mr. Ford was alluding to in part. That is, through most of the history of American manufacturing, what we've done is produce high quantities, high volumes at low prices. It was a quantity standard, essentially, in terms of what the output was, in terms of what the outcome of the organization's efforts were.

At some point in time, probably in the early 1970s, that stopped working because new standards emerged, most prominently quality, but a variety of others, including time and variety and customer service and so on.

In the public sector, a similar history obtains, and that is, especially, really, in the public sector, what we've guaranteed for a couple centuries now in terms of public services is access. We've worked very hard to increase access to education, elementary and secondary first, and I think lately, the last 20 years, higher education, access to representation in courts and so on.

But we've never focused on in the public sector is outcomes. We focus on access to public services, but not the outcomes of those services. We guarantee an education; that is, we guarantee access to a certain number of years of schooling, but we don't guarantee an education. In much the same way that an American manufacturing firm guaranteed that you could get a car and that it would be reasonably priced, but really didn't guarantee quality, good customer service, speedy innovations introduced into the car, and so on.

Well, in the private economy, as a result of intensified competition, these new standards have emerged. In the public sector in education, in elementary and secondary education, access is pretty

good now. Almost 80 percent of American kids now graduate from high school.

The issue is no longer the access, the number of kids who graduate; it's the outcome. What we're concerned about it elementary and secondary education is that the outcom is not good enough.

In the case of higher education, I think in short order the same set of issues are going to arise, and even if they don't in this reauthorization. And that is the outcome of the education, not simply access to it.

We're still talking access in higher education; it's still a big issue. And it's really, I think, the issue in this authorization.

But the next issue, the one that will come up either now or very soon, is outcomes. And it started already in the sense that people are worrying about what we get for our money in higher education. That's the beginning. It was the beginning in manufacturing, and it was the beginning in elementary and secondary reform.

And so I think, and this is more an idea than a legislative proposal, it's time to begin to focus both on access and outcomes in a much more aggressive way than we have in the past.

And the second point that is more legislative in content is most of what Mr. Ford and others have talked about in terms of the need for more postsecondary education is really both a need for more graduates from four year schools, but a lot of what we're talking about, the examples we're using, are people who need high school plus two years or high school plus some formal employer training; that is, the assembly line worker, the nonsupervisory worker, and the bank who used to be the bank teller but is now a customer service representative who works with flexible computer technology who has to be able to customize the product and a much greater variety of product than he or she used to; who has to operate in a system where everyone uses the same data pool, and if they don't input data or use it correctly they pollute the pool.

Those people need more than a high school education is where we are. And it may be that what we can afford and what they need in the immediate term is high school plus a few years or high school plus an employer based training.

It is that part of the population, the non-college bound, that require—that where the immediate need, I think, is for postsecondary education of some kind. And so that whole two year system, that apprenticeship structure out there, a whole set of things that are part of our postsecondary system, but not the elite part of our postsecondary system, deserves much greater attention now.

The examples of Germany and Japan and other nations that have built much more highly structured work based learning systems, I suppose you could call them, come to mind. So while we need more four year graduates, I think that in this authorization instead of only focusing on default rates for two year schools, we need to think seriously about building a quality technical education system, two year learning education system, for people in front line services, banks and other service organizations and so on.

And through historical inattention to those institutions is really troublesome, I think, at the moment.

Mr. PACKER. I'd like to emphasize what Tony has just expressed, the emphasis on quality. It would be wonderful to bring educators

into the better automobile companies and have them understand what total quality management means.

Like one story that I had, I went to a large school district and I said to an adult educator, "If we could reduce through technology the time it takes students to reach a certain level from four months to three months, you could get, therefore, a third more students through with the same number of teachers, the same facility, we increase the productivity of the school system by a third and reduce the time a student is required to get to a certain level."

They said they weren't the least bit interested. They get paid for daily attendance. To get them through faster, you just have to hand out more notebooks. No interest whatsoever in improving the productivity of the institution and serving more students, which are on a waiting line for that particular school, and saving the time of the student.

So I would say the most important thing that educators have to understand is that cost doesn't mean anything until you divide it by a unit; that is, it's not the cost of automobiles, it's the cost per automobile. And they don't know what to divide through by. They get as much credit for having somebody who's going to drop out or learn nothing.

The financial flow to the institution based on seat time is destructive to a drive for quality because there's no output measure, as Tony has suggested. Now, what we're trying to do in SCANS is to try to get to an output measure, but then you've got to change the accounting system. I know you've dealt with it in this ability to benefit approach to the Pell grants, but in general, the emphasis on quality first, quality second, quality third, that the automobile industry and the successful manufacturing industries in this country have gone to is crucial.

Now, part of that is staying close to your customer, and the customer for most school systems is going to be an employer. But most education systems think their customer is the next education system. You learn this is eighth grade so you can get to ninth grade. You learn this in twelfth so you can get to higher education. You learn that in higher education so you can go to post graduate.

But they don't know what the damn customer looks like. The testimony stated that the average teacher does not know what's required by business, and that's partially business' responsibility to say what it is they want, but educators have to listen.

So I think quality and understanding what the customer requires is an important element. And it's the things that have made American manufacturing competitive, those lessons have to be transferred to the university system, quality outcomes, the things Tony has discussed. Thank you.

Ms. FRANCES. Continuing our focus on quality, I think we have something else to learn from the private sector, which is a concept that they've developed of total quality control. They define total quality control as the cost of doing it right the first time plus the cost of fixing it if you don't do it right the first time.

And I think a lot of what's going on in our education is that we haven't done it right in the first place early on, and we just pass the student through the system without assuring that we've achieved the standards required.

A second consideration with respect to preparing for the work force is that students today are going to need more science and math. And people successful in science and math are those students who have taken more courses in science and math. But there is an enormous difference by race and gender of which youngsters have taken those courses.

So I think we need some early help, some early counseling to make sure that people are adequately prepared in those areas.

You asked specifically with respect to student financial aid. I think college work study should be explored for the enormous potential is has for effectively linking education in the work force. And one innovative way to use this is to help college students become tutors for youngsters who need help in getting through the elementary system. That helps the elementary student; it helps the older student who learns by teaching. And they won't have so much debt.

And also, there's some possibility for the private sector to help provide the matching funds for the college work study.

And may I say, Congressman Gunderson, that I'm very, very interested in your remarks about concern for nontraditional students. And there is one educational association, the Association of Urban Universities, that has made a guiding principle to find adequate resources for the nontraditional students that those universities serve. So I'm sure they'll be back to talk with you more.

Mr. GUNDERSON. Tell them to come and see me.

Ms. FRANCES. Okay.

Mr. HUGHES. I completely agree with your focus of looking at access as it relates directly to student aid issues. Let me make three comments and be very brief.

The first one is an anecdote. I'll give you an anecdote that maybe we can extrapolate to the population. One of my clients is a Los Angeles community college district, and we worked with them in one of the inner city campuses. And they're doing a market analysis how we draw in disadvantaged individuals in that community to get them into the system.

And one of the populations that was most prevalent was the following individual: It would be a black woman, single head of household, one, two, three children, who would work all day long and come to classes in the evening, taking less than six units and receiving no financial aid for that accomplishment. And she would be trying to get—the travel agent program was one of the big things they would have there—technical programs in programming and the like.

One of the characteristics we saw was a failure to complete rate in excess of 70 percent. So they would come for the first term and we wouldn't see them for the second term, and then we may not see them for another year when they would come back. And so you can see what these individuals were doing is that they were only able to come in and out at some kind of rate and pace that was fitting the hardship situation.

If we can capture that individual, that population set, who are really committed to bringing themselves up through the economic market place, than anything we can do with the financial aid program to stimulate that we should. That's the first point.

The second point is relative to student aid, and is that as we look at creating student aid programs, there are really three pieces to the puzzle. There are the institutions who has got what's called the production function; there is the student learner that's trying to upgrade skills; and then there is the business community. And it really is a three legged stool, or the formula involves all three.

And we just have not looked closely enough at the interrelationships of the business needs with regard to student financial aid.

That leads to the third issue, and that is I don't see anything wrong with foregoing student aid obligations to this kind of individual. If we go back to my first case. As she continues into the work force, for each year that she works to forego or forgive any portion of financial aid that we have given her in some kind of equitable fashion.

So we need to increase accountability and responsibility on both the part of the institution, the business community, and the student. And the financial aid may be an excellent instrument for doing that. Thank you.

Mr. GUNDERSON. Thank you, Mr. Chairman.

Mr. GAYDOS. [presiding]. We have some severe budget limitations, as you well know. And along those lines, I would like to ask you all of your cumulative opinions and the statistics available to you, how much money are employers currently spending to train employees for this so-called increased productivity.

And we hear so much about informed competition, which opens up an awful lot of other questions as to this country's standing in the competitive international field. And would you have some statistics for the committee, anybody?

Mr. CARNEVALE. I have lots of them. I'll just give you the summary ones. Employers in the United States spend about $30 billion per year either providing or buying training for their employees. Now, that's formal training that are prescribed courses of instruction.

By estimate of economists, there's another 180 or so in informal OJT that goes on. But the $30 is what we're really talking about, the formalized courses of instruction. Of that $30 billion, let me give you some indication where it goes.

Mr. GAYDOS. Does that include tuition reimbursement?

Mr. CARNEVALE. Tuition reimbursement is probably about $300 million of that $30 billion. It's a fairly small piece. It's really something, in truth, that is done more for the employee than it is for the organization for which they work. It is the sort of leadership organizations in employer training provide tuition assistance as a benefit, in many cases, to their employees.

Mr. GAYDOS. Does that include also those mini-courses they have; for instance, before a miner goes down underground he must have access to a certain training program? That's all included in there?

Mr. CARNEVALE. That's all in there. What it is—let me give you—there is a curriculum and a structure, and it is that people get trained at work for three or four reasons. One, you get trained because of your status in the organization, and that includes, and I'll give you the words that are used in the business world, executive training development training. That's the stuff for the fat cats who go to Hawaii and get trained.

Mr. GAYDOS. You say Hawaii?

Mr. CARNEVALE. Hawaii. Then there's management training, which is for the middle managers. And then there's supervisory, which is for supervisors. They tend to be noncollege people. That's probably, in total, about 20 to 30 percent of all the training, those three pieces.

Then you've got people who get trained because they bump up against technology in one way or another. And that's training of scientists, engineers, technicians, craft workers, apprentices, skilled training, teaching people how to use a computer, and then data processing, which is always a separate training system, and then safety training, which is the training of your miner.

Then there's a third category of training which has to do with your relationship to the customer, what business people call sales and marketing training. And that ranges from the training of a cashier to the training of a salesperson.

And then these days you've got these new kinds of training that I would call strategic. And that is, for instance, if you've got a total quality management system you'll tend to have a quality management or quality training system that ranges from training the managers to training the line operators on process control.

And then, incidentally, in all of that, basic skills training, which is basic education, is probably about eight tenths of one percent of that total training system, or somewhere around $200 to $300 million a year. It's a very small piece of that system.

Mr. GAYDOS. So we're talking about a rather substantial system out there that is functioning?

Mr. CARNEVALE. Not really. The other piece of the story is it's $30 billion dollars. It is relatively evenly distributed between college and noncollege trainees. The system itself looks nice when you look at it, but the truth if only about 15 percent of American workers ever get any training from their employer.

The system that operates is decent quality, and the training is reasonably high quality and distributed well. But it's a small system. It's about 15 percent of workers in total, so it's about 1.4 percent of payroll in the United States gets spent on training. In the best companies, you're talking about six to eight percent of payroll.

So, nationally, it's a small system located in large institutions, generally.

Mr. GAYDOS. Do we have any projections as to whether there's going to be any substantial increases in this area?

Mr. CARNEVALE. Yes. We know that. Substantial, no. We know that the rate of increase in employer based training roughly follows the rate of increase in the size of the work force plus a little bit more, which is due largely to the technology factor more than anything else. The piece that's growing the fastest is technical training.

Mr. GAYDOS. Would you be recommending or advising some type of changes in the Internal Revenue Code which would allow reimbursement or a set-off to encourage increases there? It's hands on training and we have so many problems with—let me give you an example. Nine out of ten graduates from liberal arts come before

me and other people and say, "I've got an education and I can't do a damn thing with it."

I'm even thinking, practically, about whether or not we should go to the liberal arts people, those colleges, and say, "Hey, how about changing your curriculum to include some of these other items that will be more practical in the field?" And it works both ways.

Mr. CARNEVALE. To answer your question, and I smiled when you said that because it's very hard to get anything in the tax code these days. There's really not much money there either. But the two Secretary of Labor commissions——

Mr. GAYDOS. The war is over. We should have more, you know. But go ahead.

Mr. CARNEVALE. Two commissions headed by or launched by the Secretary of Labor, the MIT Commission on Industrial Productivity, the America's Choice Commission that Arnie referred to, and a variety of others, have for some time recommended that we have some kind of tax incentive for human capital, namely, to build a more level playing field between machine investments incentives in the tax code and human investments.

The proposal that is always tossed about is one in which you give some kind of a tax credit for some proportion of the costs of new training, in much the same way we built the R&D tax credit. That idea has been tossed around quite favorably, really, for quite some time. There are different versions of it.

Other nations already have it, the French, the Irish, Scandinavian nations; Australia instituted such a system about, I think, only about several months ago. We don't have such a system. The difficulty, of course, is—there are different versions, incidentally.

One version, the French version is at one extreme. It is a system in which you, if you don't expend up to one percent of your payroll in your company on training, you will then return the residual to the government, and the government, then, spends that on training. That's a penalty system, so-called.

Then there are the more clean systems where employers are simply given a tax credit for training. Incidentally, 30 percent of the training employers do, they buy from outside their own organization, about $10 billion worth every year. And most of that goes to postsecondary institutions.

And so if you increase the amount of training done in employer organizations, you're building a market and a linkage to education institutions for this kind of training as well. We think it's a good idea. We wish that the Nation had the money and could afford it.

Mr. GAYDOS. Yes, Mr. Packer.

Mr. PACKER. Mr. Chairman, if, in fact, you could specify the outputs, if the work we're doing on the Commission and the President's proposal for industry based certificates were available, and you paid for getting those certificates or for competence somehow measured, then a number of things could be done.

Take the woman that Scott Hughes referred to, whose logistical problem coming to downtown L.A. keeps her from coming to school. Let's say you could via technology and traveling teachers, or some other means, solve her logistics problem and get her certif-

icate without forcing her to drive through L.A., then her situation would be solved.

You can't do that today because she has to have her body in the class room in that regard. Similarly, with the statistics that Tony spoke of, Tony knows better than I, but it's some few thousand companies out of a much greater number that spend 80 or 90 percent of all that training money here in the United States. It's the big companies.

So somebody working for the small firm doesn't have that opportunity. Again, if getting that certificate through a community college was what got paid for, then you could begin to deal with what's the most difficult training problem—a small company that can not mount a training program on its own.

The focus on inputs, on how many dollars spent, how many kids there, just prevents the kind of revolution that is needed. I mean, we can not change the automobile factory, change every other aspect of the American economy, and think schools can still operate with teachers standing in front of 30 kids lecturing them about a bunch of facts to be repeated back on a multiple choice test and then come to you and say, "I've got all this education, but I really can't do anything except fill out multiple choice tests." I don't know how many of those come up.

Mr. GAYDOS. I want to get to Mr. Andrews and Ms. Mink so I'll ask one final question hurriedly. What about our career schools out there? What kind of a future do you foresee for them? They have in place some pretty good institutions. I've visited them personally.

Do you see them expanding? Do you see them playing a bigger role? What is their future?

Mr. CARNEVALE. I've had a personal experience with this, and that is that I worked in the other body for a number of years, as did Arnie, on the budget committee, and every year we went to the floor and tried to eliminate vocational education. And then I went back into the world and worked with American companies and was astounded to discover that they like vocational education, postsecondary vocational education, a great deal.

From their point of view, the American career education occupational education system is the big success story since the 1950s, from their point of view. It is a system that deals with that other half of the graduating high school class. It gives them high school plus some more specific kinds of learning.

The role of the quintessential change in the employment structure of the United States, I think, quite clearly is one more and more higher education. But the greatest increases are coming at that high school plus two year level; that is, the technician in the manufacturing work place, the technologist in health care, the customer service person in the bank, people who now require more than a high school degree and some training, at least in the case of manufacturing and health care that is technical in content.

It is that system that will supply us with those people. In the United States we put a lot of money in elementary and secondary education, a lot less than other industrial nations. We put more money in four year schools than virtually all other industrial nations, and our quality is very high.

The missing pieces, it seems to me, in the United States are that, for want of a better term, that high school plus two-year system, because it need not be high school plus two years in some rigid fashion, and an expansion in our learning system in the work place itself, an employer based learning system, I think one of the real difficulties we have is that without a learning system in the work place itself, we build more and more work organizations that don't use learning or learned workers effectively, which disables us in terms of our ability to build linkages back to education in general.

And we don't have a system that, a transitional structure between higher education and the employer that is basically an occupational learning system that is really very strong, as the Germans do, as the Japanese do, and the Australians now, and many other nations in the world. I think the role of that system has been important and will grow greatly in importance.

One last thing about that. In manufacturing we see quite clearly—we do a lot of work with auto companies and other institutions—that what's happening on the factory floor is that the old five-person working team—a machine operator, a maintenance person who is oftentimes a craft worker, a materials handler who moves parts and pieces, a laborer who did heavy lifting, and some kind a supervisor—and Mr. Ford's analogy is a brilliant way of putting it. I had never thought of it that way.

But what's happening is that those five people who work shoulder to shoulder are being reduced to one person who works with a great deal more technology, a more flexible technology. But that technician has the responsibilities of all five of those people, and many more responsibilities nowadays because he or she now has to produce customized work and great variety at very high quality, and do it very fast and productively. And it is that person that, one person, ultimately, I think, and it's down to about three now on that team, I think it will be one eventually, which people are increasingly calling after the Germans the Supertech, is the person that our high school plus two year or whatever that system, that apprenticeship structure, that work related learning system is going to have to produce for us in manufacturing.

And in similar fashion in health care and services we see that same set of occupations emerging very rapidly, that we need an institutional structure to create those folks.

Mr. GAYDOS. I enjoy your explanation, and before I call Mr. Andrews, our educators are here in the room, probably not very cognizant of a very important meeting that took place this morning and has been taking place here on the hill. We're talking about fast track legislation on international trade, which touches our whole educational problem that we have. You gentlemen know it.

So I think you point me in the right direction because we're having a terrible problem with that aspect. And it's going to come up for a vote very shortly, and it's going to have much significance as far as how it's going to impact upon what we're talking about here today in this room.

I'm sorry to say a lot of our educators aren't interested in that area. And, of course, maybe they shouldn't be because they have their own problems. But that is going to affect what we're talking about so pointedly and so importantly.

Let me call Mr. Andrews.

Mr. ANDREWS. Thank you very much, Mr. Chairman. Let me again thank the chair for the quality of this hearing, and all the panelists. I think you've given us an outstanding context that I hope provides the context for all the future hearings and the debate.

My only regret is that I wish somehow we could have worked sex and violence into the hearing somehow so we'd get some national television coverage, because I think what you're talking about is so much more important than most of what we'll see on the evening news tonight. You certainly won't see me after I said that, will we?

Mr. SAWYER. Well, there's all kinds of luck.

That's right. Mr. Sawyer points out there's all kinds of luck, I guess.

Mr. Carnevale, if I could ask you and then ask the others, your notion of new competitive standards and output based analysis of education seems to me to imply another issue. And that is, that whether we're going to redefine what a school means in the new economy and the new society. Or, perhaps, more precisely, are we going to relocate where education takes place outside the bounds of what we would traditionally think of as a school.

I have two questions for you, and I would ask the others to jump in if they wish. The first question is that given the fact that most government dollars from the Federal Government that go into training and education do go into what we traditionally think of as a school of some sort. Do you think we should alter that process and broaden, through this reauthorization, the kinds of institutions that can receive Pell grants and guaranteed student loans and other Federal dollars?

And, secondly, if so, what kinds of parameters should we place on these newer institutions or alternative institutions that would receive those dollars?

Mr. CARNEVALE. I think that ultimately, when revenues are available for these sorts of things, that we need to build some kind of a learning system in the work place. If we don't do that, we won't ever, I think, be able to build some linkages between learning at work and learning in schools, first of all.

I think in dealing with employers, probably the best way to encourage employers themselves to build their learning systems is through the tax code as a matter of the instruments available to us to deal with an enormously complex private economy. The traditional instruments are regulation and tax policy. Regulation, I think, is impolitic at the moment; that is, I think it's doubtful that we'll ever in the near time horizon enact law that imposes training requirements on employers, and we probably shouldn't.

Some kind of a tax incentive is a good idea, I think, on that side of the policy system, that economic policy system. We should impose standards for any kind of training that is done and paid for with Federal dollars. And I would argue that the National Governors Association, for instance, has been in the process of building those standards for a couple of years now. And I think the standards, as far as they've gotten, it's reasonably high quality.

Twenty three states now have such provisions, where they give direct subsidies to employers for training. Personally, I think that

is not the most effective way to do it; you should never pay for the first and last dollar of anything done in the private economy. You should just give incentives and insure that employers have an interest in going further.

In terms of Pell grants and things of that sort, I think it would be wise to expand the use of those and their accessibility in other learning environments, but again, only so long as you imposed outcome standards. It seems to me that that's the critical issue and the way to control the quality of the education or training or whatever you want to call it that would be provided in that case.

But I do think that in the long haul what will eventually happen is that we are going to build some kind of a human capital incentive in the private economy, and that we're going to build a much more robust occupational learning system. The Department of Labor and the Department of Education and others have been playing with these ideas, trying to build an American variant, really, of those systems for quite some time.

Chairman FORD. Would the gentleman yield?

Mr. ANDREWS. Yes.

Chairman FORD. Actually, we've got quite a bit of experience in this, haven't we? The Labor Department has been funding the retraining of people. I'm familiar in my area with projects that are joint agreements between the UAW and the Big Three, and they take two forms. In the case, for example, of the General Motors hydromatic, where they make transmissions for 28 different automobiles around the world in my district. And I like to remind people that all the Rolls Royce transmission are made in Michigan, not by skilled Englishmen on the other side of the pond.

But they decided that they were going to come into the world of robotics, and they looked around and said, "Can we take people who are computer literate and turn them into machinists, or would it be easier to make our machinists computer literate?"

And so they chose the second way of doing it. There's a much smaller work force than there used to be because there's an awful lot of robotics and cybernetics at work. But they contracted with community colleges, two community colleges, to actually send their people to school to learn skills that they never, ever thought they would have to have as a skilled machinist.

And it's worked out for them. It took several years for them to work out the kinks. But you now have advocates out there who—as a matter of fact, one of the people working for General Motors who helped set up the program ended up leaving, taking his retirement from General Motors and going into education full time because he became fascinated with this wave of the future. He's John Lynch, and I think Secretary Dole put him—was he on your commission?

Mr. PACKER. I don't think so.

Chairman FORD. She put him on one of these study commissions on retraining. The point is that we're already doing some of this, and we ought to be able to look at it and see if it's worth to encourage more of it.

There's a second type of training going on in what are referred to as a give-back contract that auto employees have had to accept in the last three generations of contracts, lowering wage expectations in return for something. And one of the somethings that they

got for the lower wages was training opportunities and education opportunities.

And, as a matter of fact, if you are on layoff in some automobile plants with the hope of someday coming back, in order to collect your SUB benefits, which is a fund that pays the difference between unemployment compensation and a 40-hour work week, as a condition of collecting those you have to go to school and work on getting a new skill, not improve the skills for the job you have, but, for example, to improve literacy or to improve your math or science skills, whatever it might be.

And that gets funded jointly by employees and employers, and partly by the state or the community, the institutions involved. And the education product they're looking for is a better educated person who, in the event they can't come back or don't come back, will be able to grow into new employment.

So industry people are not sitting around waiting for something to happen. They've been doing things, and it doesn't seem that very many people here give credit to the fact that there is a deep well of concern out there that's evidenced by their actions, as well as their words.

And I think we should realize that we can look at some programs that have been going long enough to tell us whether it works, what works and what doesn't work. And we can discover that people who aren't educators are doing a pretty good job of educating. Fiscal necessity makes them try to get the end product.

You were talking about results measured on what you get as an end product, not what kind of a certificate you get. They're not so much interested in the certificate as building a bank of skills with their work force.

I thank the gentleman.

Mr. ANDREWS. Thank you, Chairman. I thank the panel very much.

Chairman FORD. Mrs. Mink.

Mrs. MINK. Thank you very much. I also want to join in expressing my appreciation to the Chair for organizing this introduction to our consideration in reauthorizing the Higher Education Act by placing the focus of our efforts in the coming months on the proper perspective of what our challenges are in the Congress insofar as meeting the needs of the educational community.

Mr. Hughes' oral presentation is something that struck me as significant where he mentioned that a majority of higher education consumers are minorities and women who have been previously underrepresented in educational attainment and earning power in the work force.

Now, I assume that in the years ahead this problem is going to be even more seriously exacerbated than what it is today. My question goes to that particular statement in terms of numbers. Do we have any numbers in the research that you have undertaken that could give us a way of evaluating what this exactly means when you say the majority of our higher education consumers fall into this category? What are the numbers in relationship to other groups of people that are in this community?

Mr. HUGHES. I'm going to let my colleague, Dr. Frances, respond.

Ms. FRANCES. About 53 percent of current enrollment in higher education is women, I believe.

Mrs. MINK. And when you add the minorities?

Ms. FRANCES. I've got the number here and I need to look it up for you to be sure.

Mrs. MINK. If you could present that to the committee.

Ms. FRANCES. Yes.

Mrs. MINK. Now, if that is the current figure, then in terms of the future, how do you see that being affected?

Mr. HUGHES. Let me just continue the comment with regard to the women as Carol is looking on the minorities.

Referring back to when I graduated from college in 1965, 60 percent of all the attendees of higher education in that year were men and 40 percent were women. And that's a tremendous underrepresentation of women in the higher education system.

Since that period of time, women have streamed back into higher education, frequently on a part-time basis, to pick up educational skills that they weren't able to acquire up to point now where, as Carol says, there's maybe 53 or 54 percent of the attendees of our higher education systems are women.

Now, the issue is in the rest of this decade, will we continue to see women continue to be a bigger percentage of the work force? And our sense is that they're still underrepresented, particularly at the graduate and professional levels, and that those individuals, older women who did not have opportunities for education when they were younger, the baby boomer generation, will continue to come back into the higher education system. And that number, which is now 54 percent, could continue to rise up closer to 60 percent, where the men were back in 1965.

Chairman FORD. Does that number you just gave us, 53 percent, is that of all students or full-time students?

Ms. FRANCES. All students by head count.

Chairman FORD. Doesn't that change very dramatically when you look at full-time students?

Mrs. MINK. That was my next question, Mr. Chairman.

Chairman FORD. Mrs. Mink and I came on this committee together in 1965, and we've been thinking so much alike all these years that we ask each other's questions.

Mrs. MINK. And that is exactly my next point what the Chairman has hit upon. While we can see the overall campus as slightly changing, and now, assuming a balance between the males and females, the really more interesting question is when you look at the less than full-time, how does that break out in terms of gender?

Ms. FRANCES. We are preparing details for the Association of Urban Universities to respond precisely to that question, and we'll have the answers for you in a couple of days if we can bring them up.

Then, also, there's some information in Figure 14 of a compendium that we've produced. And as of 1988, the last year for which we have data, the total enrollment was 13 million, of which 2.4 million was minority, comprised of 1.1 million black, non-Hispanic, .7 million Hispanic, .5 million Asian and Pacific Islander; and only 93,000 American Indians. Nonresident alien was .4 million.

Mrs. MINK. This is the full-time student?

Ms. FRANCES. Again, head count.

Mrs. MINK. Pardon?

Ms. FRANCES. It's head count.

Mrs. MINK. The full——

Ms. FRANCES. [continuing] total.

Mrs. MINK. Well, I'm interested in the less than full-time student responding to the general testimony of the panel that what is happening in the work force is the changing requirements, the greater necessity for more technical skills in various way, as prompted by, I assume, women who otherwise could have immediately gone into the work force now finding it necessary to go back, perhaps on a part-time basis, to become better skilled to go back into the work force, as well as minorities trying to improve themselves beyond where they are today and looking ahead to what their potential skills might eventually lead them to.

That this would mean that many of them would be in attendance at an institution of higher learning on a less than full-time basis. And if this is the mark of what is happening in the higher education community, then, wouldn't this change necessarily mean a change in our emphasis in the Higher Education bill to accommodate the changing scene and requirements for education by the people who already are in the work force or who are in immediate need for certain skills to get into the work force.

Ms. FRANCES. You're absolutely correct. You have made the foundation statement.

Mrs. MINK. So how do we go about generating the thinking of the higher education community, to accommodate to this necessity. As I see it we must gain their support in redrafting the Higher Education bill so that it is truly a postsecondary work force—business—economic—strategic document in which the Federal Government is playing a role?

Ms. FRANCES. Could I observe that we started out historically with a low tuition policy, where education was available to many who could proceed, and we have evolved into a high tuition offset with targeted need based student aid.

Well, what happens is that the older people don't participate in those programs very much. And, consequently, the high tuition they don't have the offset of the student financial aid. So it seems to me we have to look both at tuition policy and aid policy in developing programs to serve those people.

Mrs. MINK. Yes.

Mr. PACKER. Let me suggest a somewhat different approach, not necessarily contradictory, but complementary here. The President, in his statement, says that business and labor will be asked to adopt a strategy to establish job related skill standards built around core proficiencies.

If aid was targeted and attached to attaining those core proficiencies or the job specific skill standards, then many of the problems you have addressed would disappear. The part-time older worker would get credit to get something. It wouldn't make, you know, much difference if they were a full-time student or not in a curricula developed by educators that lead to a degree based upon things that were required 100 years ago.

Mrs. MINK. But the current policy in the Congress is that the less than full-time student gets no aid whatsoever, despite what the law has written. The monies have not been available. And it is because there is this underriding prejudice against the part-timer that exists in the current higher education community, as well as here in the Congress.

And our burden to turn that around, to make the aid available, and how to explain and articulate this changing dimension in the higher education so that there is a common understanding that it is not the case of the four-year student that is the primary priority target, but that under current requirements we have to take into account all of the students, irrespective of the number of credits they're able to take if they, as you say, fit into the mold of some requirement in terms of our economy. And I don't know how to express that.

Mr. CARNEVALE. One thing I would add to that is that in the case of employer based training and in almost all education, one sees quite clearly there's a basic distinction between males and females. And it shows up in surveys. When one asks men and women what they think the most important attribute is of a good worker, women say competence; men say loyalty.

Women show that behavior by being more acquisitive of human capital development, whether it's education training or whatever, than men do. And that's showing up in all the higher education numbers. It shows up in all our numbers on work place training. Women fight to be trained, men don't.

Mrs. MINK. That's probably why we don't have tax credits.

Mr. CARNEVALE. So there is an issue, and it extends to this high school plus two-year system as well, as we've been organized for a long time to give men occupational education. That is, if you want to be an electrician, a mill wright, a carpenter, a pipe fitter, although increasingly you better want to be an electrician.

But we've had systems in place, apprenticeship structures, two-year schools, and so on. The only place we've built an occupational learning system for women, really, and I'm thinking this off the top of my head, is in health care; that is, technologists in health care and technicians of various kinds, a fair share of whom are female. I don't know the numbers specifically.

We've built that structure, but we have as yet not extended the notion of apprenticeship or learning/work kinds of learning systems into dominantly female occupations; i.e., in the service economy, in the banks. There is a beginning in that respect; that is, you can go to a junior college in New Jersey nowadays and get a degree that is a one-year degree, I think it is, in customer—it's financial services customer service, really.

And that degree is sought after by employers and paid well. But part of our difficulty is we haven't built an occupational learning system that tracks into female occupations, even though more and more nowadays the skill requirements in those occupations justify an occupational learning system. There are a whole variety of reasons why that's difficult to do.

And so I would agree with you that there is a missing piece from the perspective of American females that skill requirements are

going up and they're not being afforded the opportunity to meet them.

The other thing I would add is that, again, it seems to me the problem we keep talking about here with higher education, which is a fine system—it's the best one in the world. We should always remember that.

But in this case, Arnie talked a bit about quality as an outcome standard. This is customization and variety, the ability that American private employers have had to learn. They used to make one car for everybody; the old joke about the Model T Ford is you could get them in any color you wanted as long as it was black.

But, you know, the notion that you as an institution have to serve and tailor your product or service to your customer and be sensitive to your customer. That notion has yet to invade, I would say, the whole domain of public services, education probably being the first place where we're beginning to do that, more so than in trash pick-up and in other arenas, for instance.

Mr. HUGHES. Let me speak specifically to your question about the women part-timers that one of the comments in our background material is that of the 6.9 million women in higher education in 1988, 46 percent of them were part-timers. That's a huge number.

Mrs. MINK. Well, that is my concern that we have not really been attentive to this moving direction of people in the higher education being part-timers and being women. Although we speak of a necessity for equalization, one of the things we've failed to do is to accommodate our financial assistance program to be attentive to that change.

So I'm hoping that in this rewrite that we will put great emphasis on what has happened on our campuses and remove this unconscionable distinction on full-time, part-time.

Mr. HUGHES. Let me go back to our young lady in Los Angeles who is a single mother with two or three children going in the evenings part-time to get a travel agent's certificate. I said that she was dropping out. She would go a term and then drop out and then not come back for a year, and that the dropout rate was 70 percent for people who come the first semester and not be back the second semester.

The thing that astounded me in that analysis study was that the institution didn't know that that kind of persistence, or lack of persistence pattern was taking place in their market. And that was a specific objective of their mission. It wasn't until we did the research—there's no accountability from the institution's perspective to have any responsibility to make sure that that young woman gets through the system and accomplishes what her educational goal is.

Mrs. MINK. Well, I think one of the deficits for the part-timer, which is most often a night student, is that there is no faculty at night, or counsellors at night, or people that can advise or keep any statistics. And so these people become lost in the system and nobody misses them.

Mr. HUGHES. There's no support system.

Mrs. MINK. And I think that's a real tragedy that has to be, kind of, built into our new perspective or responsibility of our government in terms of these new students that have been neglected.

So I really applaud your effort in raising the awareness of this committee and of the Congress to our new responsibilities towards this new market.

I have one last question, Mr. Chairman. I don't know if I characterize work/study quite appropriately for the whole system, but my understanding of work/study has always been that this was an institutional requirement to find jobs on campus and the match it up with worthy needy students.

Is that a proper characterization? If it is, then, why can't we take this work/study concept and translate this into a partnership with private industry so that the work place encompasses half of the formula?

And then the other part of it would be the study and the continuing education which is required as a result of a person being in the work place, but not fully participating because of lack of skills and all these other difficulties. So if we could somehow change the notion of work/study to being a partnership with business and with the educational institution and combine the Federal system's program in that respect, it would seem to me that we could target a very large segment of those on campus who would need that kind of assistance from their employers, as well as from the government.

Ms. FRANCES. I think that's an excellent idea. Some of the concerns of those looking at the dollars have been that they don't want to subsidize the industry when they think that the businesses could pay for it anyway.

So I think we'd have to be very careful to make sure that we had appropriate standards and appropriate controls, but it would seem to me to be an ideal vehicle for strengthening the relationship and the pipeline.

And then there are also some public service opportunities as well—tutors, if the students could be tutors for younger students I think that would help the pipeline also.

Mrs. MINK. Thank you very much, Mr. Chairman.

Chairman FORD. I'd observe apropos to that last exchange, that what the gentle lady is describing is called co-op education. And the foremost institution of that kind is Northeastern University in Boston, where over 90 percent of the people going through everything from their law school to their engineering school are employed by companies that are using the skills as fast as they acquire them and giving them additional skills to what they're learning in school, and paying them a paycheck so that they can go to school.

We tried to replicate that as a part of the Higher Education Act a number of years ago, and it's still on the books. But there's one thing missing: We never could figure out a way to subsidize the wage and we found that not a whole lot of employers and a whole lot of the country are willing to commit themselves to use their own money in a co-op type program.

The success that they've had in the Boston area is not duplicated any place that I'm aware of in the United States to any degree at all.

Also, I see somebody here smiling so broadly that if he smiles any more he's going to break his face. I would remind Mrs. Mink that when President Johnson sent us his message in 1965 to pass the Higher Education bill, part of his explanation for the need of the bill was that we should make sure that every student should be able to proceed as far as he was capable of proceeding without barriers caused by economics.

And you won't find any gender neutral reference any place in the President's message then or when he signed the legislation. The college student that we were talking about in 1965 was always "he." By 1976, however, this committee sounded an alarm, or at least tried to get people's attention, and I see in the room the person who was the counsel to this committee when the report for the 1976 reauthorization came out.

It said, "From the committee's hearings, seminars and discussion, there has begun to emerge a constantly clearer recognition that when the law and policies talk about the student, there is an inarticulated major premise that the student is a young person between the ages of 18 and 22, just out of secondary school, not yet having made a choice of career, or at least having just begun to prepare for that career, and that he is prepared to spend four or even more years in the full time pursuit of skills and knowledge and an educational credential which will enable him to make a good living and to know a good life.

"None of the above, it would seem, are true as they once were. The typical student is no longer young, no longer full time, no longer just out of high school, no longer a stranger to the world of work, no longer necessarily seeking either a set of skills or an educational credential, and to be certain, he is no longer overwhelmingly 'he.' "

That was written in this committee's report reporting the legislation in 1976 when my friend from Michigan, Mr. O'Hara, was chairman of the committee and his genius of a counsel, who probably wrote this language, sitting back there—he's been working on us ever since.

Fifteen years ago this committee said it recognized that the country was changing very rapidly around us, and we'd better pay attention to it. Now, here we are 15 years later reinventing the wheel. We're rediscovering over and over again what good-thinking people on this committee were trying to say that far back.

I hope that 15 years from now we won't have another panel teaching a whole new set of Congressmen the same lesson over again. There is, in fact, underway a very dramatic change. It occurred to me—I want to be sure of the dates—sometime in the early 1970s we put Title IX in the Higher Education Act.

And we said a very simple thing to the American schools. "Quit telling people what they ought to aspire to because of their sex." It got us into all kinds of trouble. You remember that the right wing said we were trying to get unisex bathrooms in the high schools and we were trying to eliminate a cappella choirs and father and son banquets and all kind of nonsense like that.

The truth of the matter is that the education community woke up. And then I saw a study done by the Carnegie Foundation of the first 10 years of experience after the passage of that legislation. And they had a graph that jumps right off the page at you. It shows the change in the male/female ratio of graduate degrees over that ensuing period of time, with a very dramatic increase in the female portion of graduate degrees in law, engineering, dentistry, architecture, business administration, and similar relatively high-paid occupations.

It shows a concurrent drop in the number of graduate degrees by females in education because one half of the population had suddenly started making career decisions, the same way the other half had been making them from the beginning of time. How much does it pay? What kind of life satisfaction am I going to have measured in compensation?

It showed that we now, for occupations like nursing and teaching that formerly had a lock on the best and the brightest of our young women, now have to compete with all the other professions. So there's good news and bad news on that graph. The good news was that it worked, that more women were, in fact, going into the professions where they had not trod very often in the past, but as some expense to the professions where we had them locked in and could take advantage of them in teaching and nursing.

Every place you turn you see this very dramatic change taking place. When I say to people that the Labor Department tells us that between now and the year 2000 less than 20 percent of the new job entrants are going to look like me and my kids, they don't want to believe it. Where are the rest of them going to come from? Well, most of them are going to be women, and the rest of them are going to be people we call minorities.

And that's not something that's going to happen way out in the future; it's something that's already in the cards. It's already in the mix of the people of this country.

And what you folks have done here is given us—I hope we have had the suggestion from that end of the table, that what you've put together in your prepared statements and your testimony here today is such a good seminary from an educational point of view that we ought to print the proceedings of this hearing as a separate print and make it available to everybody in the Congress and others as well.

Because it gives a real foundation to anybody that claims that they're going to sit down and think their way through the policy for the next few decades, what our policy in education ought to be. You give us the right kind of a starting point. I appreciate the cooperation you've given and the obvious effort that went into the prepared statements that you've provided us for the record here today.

And I can assure you that this is a very good foundation upon which to build the work of the committee in reauthorization. Thank you so much for coming.

Now, we have another panel. I would like to welcome Mr. Stephen Trachtenberg, President, George Washington University, Dr. Eugene Deloatch, Dean of Engineering at Morgan State University, and Mr. Ken Lay, IBM Director of International Education.

STATEMENTS OF STEPHEN TRACHTENBERG, PRESIDENT, GEORGE WASHINGTON UNIVERSITY; EUGENE DeLOATCH, DEAN OF ENGINEERING, MORGAN STATE UNIVERSITY; KEN LAY, IBM DIRECTOR OF INTERNATIONAL EDUCATION

Mr. TRACHTENBERG. Mr. Chairman, my name is Stephen Trachtenberg. I'm the President of George Washington University, and I drive a Lincoln.

Chairman FORD. Good American.

Mr. TRACHTENBERG. Yes, sir.

Chairman FORD. One of the few cars still made in Detroit.

Mr. TRACHTENBERG. I must confess that in listening to the first panel, I was overtaken by an immense case of humility, not an everyday occurrence in my life. And I just have decided that I'm going to submit the documents that I've prepared to the clerk and set aside the remarks I was going to make, and just speak to a couple of the more trenchant points that I think the first panel raised.

In his questions to one of the panelists, Congressman Coleman asked about foreign students attending American universities. George Washington University, as you're probably aware, is one of the leading educators of international students in the United States.

And I think one of the statements that's made by the interest in American higher education by international students has to do with the fact that Made in the U.S.A., when it comes to higher education is still considered an extraordinarily good brand.

To the extent that one looks at this as an export industry, I think higher education one area of our economy that is booming. The question that I think must be looked at, though, from two points of view, one has to do from the area of foreign policy. Do we, in fact, want to continue to use higher education as an instrument to foreign policy; and, if so, do we want to have some national perspective on that?

Because my sense is that presently you've got, surely, 50 different policies in the various states in the union and individual independent institutions making their plans totally autonomously.

And the second issue, of course, is that's it's fine to have an export industry in which the service or the good that you export results in a profit. If, in fact, we are exporting a product or a service that we are subsidizing, either with private dollars or through philanthropy or through tax dollars, and we don't mean to be doing that, then it may be useful to take a look at that.

My own sense is that we do mean to be doing it, precisely because we think that the graduates of our universities will go back to their homelands and that somehow their relationship with the United States, and more particularly with American companies, will be enhanced.

But I do think that the question is a fascinating one, and one which has not historically been looked at from a comprehensive and integrated point of view.

The second issue that was going through the conversation really had to do with what America wants from its colleges and universities. We've recently witnessed some unhappy excitement over indi-

rect costs for research done at some of our universities, and the whole question of the overhead rate.

In a manner of speaking, there's a quality of discomfort in the university community because, to some extent, the universities though they were doing what the government, and indeed, what Americans wanted of them through university research, and in a sense, perceived the overhead rate as one mechanism of supporting the university at large.

Implicit in all this is the tension that we have seen in the last couple of years between the mission of research and the mission of teaching, and a confusion on the part of many faculty in this country, and indeed, in university administrators as well, when they are, as they see it, picked on for not being sufficiently attentive to teaching.

But the current literature and the media these days constantly address us with concerns about the quality of teaching. And yet, university professors have been reinforced, surely since the end of the Second World War, not for their teaching, but rewarded for their scholarship. And a great deal of that reward has come through Federal grants and Federal appropriations, and we've created a system in which universities and faculty are tropistic And as plants lean towards water and light, professors and universities lean in the direction of money. And for good cause; they've got bills to pay.

And on that point, I think the biggest question that runs through all of this discussion is: What do we want to pay for and how are we going to pay for it?

I spend the greater part of my waking hours during the day trying to figure out how to cover the $500 million operating budget of George Washington University. If we were an independent corporation, we would be considered a small Fortune 500 company. We do it in the District of Columbia; we do it without any state aid because we haven't got a state.

And we are, in large measure, tuition driven. And whatever we need in excess of that either comes through philanthropy or through our modest endowment, and through the overhead that we get on research.

Let me give you just one sense of how much more daunting maintaining George Washington University—and I think it's a reasonable example for many institutions in this country—has been in the last couple of years.

I came to GW in 1988. In the last few years, our financial aid to undergraduates has gone from $8 million when I came in 1988, next year it will be approximately $26 million. Now, that's an immense growth, much of it self-generated; that is to say, not coming from any Federal appropriation, generated either through philanthropy or what I call the Robin Hood Technique, which is we take it from the wealthier students and we give it to the poorer students.

We have, as a result of that, been able to reach out to a broader socioeconomic constituency, to a more diverse racial constituency. But the capacity of an institution like mine to do that in perpetuity, I think, is limited, particularly as we face into the demographic challenges of the next several years, in which we're going to see a

shrinking pool of potential students and a pool of students who are increasingly minorities, many of whom have not the capacity to attend an institution like ours.

Let me give you an example of what I mean by that. At the medical school, George Washington University Medical School, this year has a class which is more than 50 percent women. We're doing virtuous and good things in rectifying the balance of genders in the medical profession.

On the other hand, our tuition approaches $23,000 a year. Now, that $23,000 a year, I assure you, does not cover the actual cost of educating the medical student. And yet, we are seeing more and more students who are coming to us from the undergraduate experience freighted with that. Now comes the medical school or law school or Ph.D. programs unable to continue to carry any more debt, making career choices increasingly not on the basis of what their aptitude is or what they would like to be, but, rather, on how they're going to pay their bills.

At our law school, almost 50 percent of the students are women. I think that running through all this conversation is going to be some real focus on how we're going to address the need for new professors in the years to come, new Ph.D.s, and particularly women and minorities in the sciences and in engineering.

A major issue confronting all of American universities today is race. And at George Washington University, we're one of the institutions increasingly trying to deal with racial problems. We'd like to have more black faculty; we'd like to have more Hispanic faculty. And yet, if we look at the data, the pool of such persons that we can recruit from is modest. And that's scandalous.

And I expect that the dean will have something to say on that subject because unless we can graduate more blacks and more Hispanics with Ph.D.s in chemistry and in physics and in mathematics and in engineering, I fear not only for American higher education but, indeed, for our Nation at large.

Now, I fear that I've gone off on a distraction of my own rather than address the three questions that were put to me in your letter, and for that I apologize, although I did deal with them somewhat in the materials which I provided the committee earlier.

And I thank you for indulging me.

[The prepared statement of Stephen Trachtenberg follows:]

The George Washington University
WASHINGTON DC

THE PRESIDENT

TESTIMONY BEFORE THE

SUBCOMMITTEE ON POSTSECONDARY EDUCATION

COMMITTEE ON EDUCATION AND LABOR

UNITED STATES HOUSE OF REPRESENTATIVES

MAY 2, 1991

PRESENTED BY:

PRESIDENT STEPHEN JOEL TRACHTENBERG

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, D.C.

2121 EYE STREET, N.W. • WASHINGTON, DC 20052 • (202) 994-6500 • FAX (202) 994-0664

GOOD MORNING, MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE. I AM STEPHEN JOEL TRACHTENBERG, PRESIDENT OF THE GEORGE WASHINGTON UNIVERSITY, LOCATED JUST DOWN THE STREET ABOUT FOUR BLOCKS FROM THE WHITE HOUSE IN OUR CITY'S HISTORIC FOGGY BOTTOM NEIGHBORHOOD. I AM HONORED TO BE HERE TODAY, SPEAKING ON BEHALF OF THE REAUTHORIZATION OF THE HIGHER EDUCATION ACT OF 1965. IN 1965 I WAS WORKING IN WASHINGTON ON THE STAFF OF THEN INDIANA CONGRESSMAN JOHN BRADEMAS AND WAS A WITNESS TO THE BIRTH OF THE ORIGINAL HIGHER EDUCATION ACT. YOU WILL RECALL THE UNCERTAINTY OF ITS FUNDING IN THE MID 60'S AS HIGHER EDUCATION BEGAN TO STRUGGLE FOLLOWING THE SHATTERING OF THE CAMELOT DREAM AND THE AWAKENING OF OUR CAMPUSES TO A SERIES OF PROBLEMS ABROAD. AS THE FUNDING FOR PROGRAMS COVERED BY THE ACT GREW, I BEGAN MY CAREER IN HIGHER EDUCATION WHICH NOW SPANS A QUARTER OF A CENTURY. HAVING BEEN A WITNESS TO AND PARTICIPANT IN THE CREATIVE STRUGGLES TO PROVIDE FINANCIAL AID PACKAGING THAT STRETCHED FEDERAL AND INSTITUTIONAL DOLLARS TO HELP THOUSANDS OF STUDENTS ACHIEVE THEIR EDUCATIONAL ASPIRATIONS, I HOPE I HAVE SOME STANDING TO COMMENT ON SOME OF THE ISSUES YOU ARE STUDYING TODAY.

IN HIS LETTER TO ME, CHAIRMAN FORD INDICATED HIS DESIRE TO HAVE ME SPEAK TO ISSUES RELEVANT TO THE REAUTHORIZATION OF THE

HIGHER EDUCATION ACT OF 1965. SPECIFICALLY:

1) WHAT IS THE NATURE OF THE PROSPECTIVE COLLEGE STUDENT POOL CURRENTLY IN THE EDUCATION PIPELINE?

2) WHAT ARE THE REQUIREMENTS FACING TOMORROW'S WORK FORCE, AND

3) WHAT ARE THE CHALLENGES TO HIGHER EDUCATION TO EFFECTIVELY DEAL WITH THE STUDENTS IN THE PIPELINE AND PREPARE THEM FOR THE WORK FORCE?

1) POST SECONDARY INSTITUTIONS OF HIGHER EDUCATION, SUCH AS THE GEORGE WASHINGTON UNIVERSITY, WILL BE SERVING A DIFFERENT STUDENT BODY IN THE FUTURE. THOSE STUDENTS ELIGIBLE TO ATTEND OUR INSTITUTION WILL BE DIFFERENT FROM THOSE WE SERVED IN THE FIFTIES, SIXTIES OR EVEN TODAY. WE HAVE KNOWN FOR SOME TIME OF SIGNIFICANT INCREASES IN CERTAIN POPULATIONS, ESPECIALLY IN THE MINORITY POPULATIONS, WOMEN AND OLDER STUDENTS, AND OF DECREASES IN THE MORE TRADITIONAL WHITE MALE GROUP. THERE IS NO DOUBT THAT THESE CHANGES WILL DRAMATICALLY ALTER THE FACE OF HIGHER EDUCATION AND, AS IS OFTEN SUGGESTED, WILL CHALLENGE ALL OF

US AS WE STRIVE TO MAINTAIN THE SIGNIFICANT ROLE OUR INSTITUTIONS HAVE PLAYED IN THE PAST OF PROVIDING THE EMPLOYEES AND RESEARCH RESULTS FORMING THE FOUNDATIONS OF OUR ECONOMY.

THE YOUNG PEOPLE IN THE PIPELINE WILL REQUIRE MORE ASSISTANCE FROM ALL OF US AS THEY PREPARE FOR THE WORK PLACE. THE PERCENTAGE OF AFRICAN-AMERICAN, HISPANIC, ASIAN AND NATIVE AMERICAN HIGH SCHOOL GRADUATES ENROLLING IN COLLEGE IN THE 1980'S DECLINED ALARMINGLY EVEN THOUGH THE ACTUAL NUMBER OF THOSE ELIGIBLE GRADUATES INCREASED. WHILE THERE ARE A HOST OF REASONS BEING GIVEN FOR THIS DECREASE IN PERCENTAGE OF ELIGIBLE ENROLLEES PURSUING FURTHER EDUCATION, MY OWN SENSE OF WHAT IS HAPPENING IS THAT IN SPITE OF OUR EFFORTS TO PROMOTE HIGHER EDUCATION OPPORTUNITIES AND TO IMPROVE ACCESS WE MUST DO MORE, DO IT BETTER AND IN A MORE COORDINATED MANNER. AS THE ADVISORY COMMITTEE ON STUDENT FINANCIAL ASSISTANCE SUGGESTS WE MUST LEARN MORE ABOUT THE GROUPS WE HOPE TO SERVE AND THE IMPACT OF THE CURRENT PROGRAMS ON THESE GROUPS. IT IS IMPERATIVE THAT WE STRENGTHEN EVEN MORE THE PARTNERSHIP BETWEEN THE FEDERAL GOVERNMENT AND OUR COLLEGES AND UNIVERSITIES IN THEIR TASK THROUGH A REAUTHORIZATION OF

THE HIGHER EDUCATION ACT.

2) THE SECOND QUESTION I WAS ASKED TO ADDRESS CONCERNS WHAT WE KNOW ABOUT THE REQUIREMENTS FOR THE WORK FORCE IN THE FUTURE. AS THE PRESIDENT OF AN INTERNATIONAL UNIVERSITY IN ONE OF THE WORLD'S MOST IMPORTANT CAPITALS, I WATCH THE GROWTH OF A GLOBAL ECONOMY. THE INTERACTION OF STUDENTS AND PROFESSORS BETWEEN AND AMONG CULTURES HELP TO DEFINE THE FUTURE FOR ME ON A DAILY BASIS. THE WORK FORCE OF TOMORROW MUST BE PREPARED TO MEET THE CHALLENGES AS OUTLINED IN THE U.S. DEPT. OF LABOR EMPLOYMENT AND TRAINING ADMINISTRATOR'S 1987 STUDY, WORK FORCE 2000. THIS STUDY INDICATES THAT NEW JOBS IN OUR ECONOMY WILL DEMAND HIGHER SKILLS LEVELS THAN JOBS OF TODAY, THAT WORKERS WILL BE REQUIRED TO IMPROVE THEIR OUTPUT IN AREAS SUCH AS HEALTH CARE, EDUCATION AND GOVERNMENT, THAT THE GROWTH OF THE ECONOMIES OF OTHER NATIONS WILL PLAY AN INCREASINGLY IMPORTANT ROLE, THAT THE AGE OF THE WORK FORCE WILL BE INCREASING, THAT A LARGER PERCENTAGE OF THE WORK FORCE WILL BE WOMEN, AND THAT MORE BLACK AND HISPANIC WORKERS WILL NEED TO BE MORE FULLY INTEGRATED INTO THE WORK FORCE. AND TO ENSURE THAT THESE GOALS ARE ACCOMPLISHED, THE REPORT POINTS OUT, THE EDUCATIONAL PREPARATION OF ALL

WORKERS MUST BE IMPROVED AND THE STANDARDS OF OUR EDUCATIONAL SYSTEM MUST BE RAISED.

NOT ONLY IS IT CRITICAL THAT COLLEGES AND UNIVERSITIES CONTINUE TO WORK IN PARTNERSHIP WITH THE FEDERAL GOVERNMENT TO IMPROVE ACCESS TO THE DISADVANTAGED AND AT RISK POPULATIONS, BUT WE MUST CONTINUE TO GIVE LEADERSHIP TO PROVIDE RETRAINING AS THE WORK FORCE AGES AND THE DEMANDS OF INDUSTRY CHANGE. THAT REQUIRES AN ACCELERATION IN EDUCATIONAL STANDARDS INCLUDING MORE STUDY, MORE TESTING, MORE EXPERIENTIAL LEARNING OPPORTUNITIES, BROADER BASED LIBERAL ARTS PROGRAMS AND INCENTIVES FOR THE SCIENCE, TECHNICAL AND MATHEMATICAL AREAS. AND ALL OF THIS IN AN ATMOSPHERE WHERE INTERNATIONAL AND CULTURAL DIVERSITY IS ENCOURAGED AND CHERISHED AS AN INTEGRAL PART OF HIGHER EDUCATION.

3) THE THIRD QUESTION POSED INQUIRED ABOUT THE EFFECT OF THE CHALLENGES ON HIGHER EDUCATION AND HOW WE WILL COPE WITH THOSE CHALLENGES. THE CHALLENGES TO HIGHER EDUCATION AS WE DEAL WITH THE STUDENTS IN THE PIPELINE AND PREPARE THEM

FOR THE WORK FORCE WILL BE TO CAREFULLY BALANCE ISSUES OF PROGRAM QUALITY AND ENHANCEMENT WITH SCHOLARSHIP MONIES, OUR PHYSICAL PLANT'S DEFERRED MAINTENANCE, FACULTY AND STAFF SALARY COMPETITIVENESS, OUR CAMPUSES CAPITAL NEEDS AND THE MIX AND QUALITY OF THE STUDENT BODY. AN INSTITUTION LIKE GEORGE WASHINGTON UNIVERSITY IS AN ENORMOUSLY COMPLEX ORGANIZATION. WHILE AT THE VERY HEART OF THE INSTITUTION IS ITS CLASSROOM INSTRUCTION, THE INFRASTRUCTURE REQUIRED TO SUPPORT THAT TEACHING IS OF SUCH MAGNITUDE THAT OUR BUDGET COMPARES FAVORABLY WITH FORTUNE 500 COMPANIES. A UNIVERSITY LIKE OURS NEEDS PARTNERS TO HELP OUR DOLLARS STRETCH FURTHER AND TO BRING HIGHER VISIBILITY TO OUR EFFORTS TO ATTRACT DISADVANTAGED AND AT RISK STUDENTS.

THE GEORGE WASHINGTON UNIVERSITY, AT LAST COUNT, HAS THIRTY-SIX PRE-COLLEGE PROGRAMS THROUGH ITS SCHOOLS AND COLLEGES AND MEDICAL CENTER. THROUGH PROGRAMS SUCH AS THESE, INCLUDING SOME AT THE GRADE SCHOOL LEVEL, WE ARE ATTEMPTING TO HELP STUDENTS IN THE PIPELINE LEARN ABOUT ACCESS TO HIGHER EDUCATION AND THE OPPORTUNITIES REPRESENTED BY THE PROGRAMS SUPPORTED THROUGH THE HIGHER EDUCATION ACT OF 1965.

IN CONCLUSION, I WISH TO STRESS THAT THE MONIES PROVIDED BY THE ACT ARE CRITICAL TO THE EDUCATION OF A GREAT NUMBER OF STUDENTS WHO WOULD NOT OTHERWISE BE ABLE TO ATTEND OUR INSTITUTION. IN ADDITION TO ASSISTING STUDENTS AND INSTITUTIONS WITH UPWARD BOUND, TALENT SEARCH, CHALLENGE GRANTS, COLLEGE FACILITIES LOANS, THE LITERACY CORPS, VETERANS EDUCATION OUTREACH, COOPERATIVE EDUCATION, LANGUAGE RESOURCE CENTERS, INTERNATIONAL RESEARCH AND FOREIGN LANGUAGE STUDIES, THE ACT ALSO PROVIDES TRAINING AND LEADERSHIP GRANTS CRITICAL TO STRENGTHENING THE PERSONNEL OF THE EDUCATIONAL INFRASTRUCTURE OF OUR NATION. TODAY, THE HIGHER EDUCATION ACT OF 1965 SUPPORTS A WIDE RANGE OF PROGRAMS CRITICAL TO OUR WORK FORCE. IN PARTICULAR, THE FINANCIAL AID AVAILABLE TO INSTITUTIONS HAS GROWN TO ALMOST $20 BILLION. THOSE FUNDS ENABLE LOW AND MIDDLE INCOME FAMILIES TO HAVE ACCESS TO EDUCATION AND A FUTURE VASTLY DIFFERENT THAN THE GREAT MAJORITY OF THE REST OF OUR WORLD'S POPULATION.

THANK YOU FOR THE OPPORTUNITY TO VISIT WITH YOU TODAY. I WOULD BE PLEASED TO ANSWER ANY QUESTIONS THAT THE COMMITTEE MIGHT HAVE. IN ADDITION TO THIS TESTIMONY THAT I HAVE READ TO YOU, I HAVE PROVIDED THE COMMITTEE WITH SOME ADDITIONAL MATERIALS I KNOW YOU WILL FIND OF INTEREST.

Background Testimony
Stephen Joel Trachtenberg, president
The George Washington University
May 2, 1991
Subcommittee on Postsecondary Education of the House Education and Labor Committee

The Higher Education Act is the cornerstone of our nation's commitment to educational opportunity. Since its original passage in 1965, the act has supplied a hefty portion of the money that students of all ages, colors, creeds and backgrounds need to attain some form of postsecondary education at America's colleges, universities and trade and technical schools. The act's Title IV financial assistance programs have grown dramatically over the years—from $200 million in 1965-66 to more than $18 billion in 1988-89.

We live in a country whose residents are rapidly changing. Here are just a few telling statistics. Only 15 percent of the new entrants to the labor force over the next 13 years will be native white males, compared to 47 percent in that category today. By the year 2000, black, Hispanic, Asian-American and American Indian workers will comprise one-third of the net additions to the U.S. labor force. More women will be employed, representing almost two-thirds of the workers entering the job market. And the average American worker will sport more and more gray hairs. As the baby boom matures, the average age of the workforce will climb from 36 today to 39 by the year 2000. The number of young workers age 16-24 will drop by almost 2 million or 8 percent.

Amidst these population shifts, *Workforce 2000*, a major study commissioned in 1987 by the U.S. Department of Labor Employment and Training Administration, determined that the jobs U.S. workers were doing were changing, too—another trend sure to continue into the next century.

As America's mills, mines and factories close their doors, the country's fastest growing jobs, says *Workforce 2000*, will be in professional, technical and sales fields requiring the highest education. Very few new jobs will be created for people who cannot read, follow directions or use mathematics. Occupations, in general, will require more education. Only 4 percent of the jobs in 2000 will be open to those with a high school diploma, compared to 18 percent today. The new technical jobs also require more

scientists, engineers and computers science professionals—fields where the United States falls drastically behind its global competitors. The most successful American workers of the next century also will speak several languages and possess a working knowledge of other countries.

Where do U.S. colleges, universities, junior colleges and technical schools fit into this demographic and workplace evolution? Institutions of postsecondary education, which traditionally mirror any and all social trends, already are providing a clear reflection of the changing America. Between 1980-88, for example, the make-up of college students changed to include more women, more part-time, more minority and more non-resident alien students compared to the traditional full-time white male. The number of women jumped 13 percent, compared to a 2 percent increase for men; part-time students rose 12 percent, compared to a 5 percent rise for full-time students; and minorities increased 23 percent over a 4.5 percent increase for whites.

But while the actual numbers of black, Hispanic, Asian and American Indian students have increased, over the 1980s there was actually a *smaller* percentage of black and Hispanic high school graduates enrolling in college compared to the mid-1970s. The enrolled-in-college participation rate for blacks, for example, dropped from 33 percent in 1976 to 28 percent in 1988. The decline was especially dramatic for black men. In July 1989, the American Council on Education found that black males, who made up 4,3 percent of college enrollment in 1976, had dropped to 3.5 percent in 1986.

These statistics are particularly troubling, given past progress and the documented need for a well-educated pool of American workers. Over the next 20 years, the indisputable fact is that our business people, our computer operators, our physicists, our engineers, our health care providers and all of the professionals needed to run our new service-oriented economy will be drawn more than ever before from the growing ranks of America's blacks, Hispanics and Asian-Americans. And our institutions of higher education—no, better yet, our entire education system—had better start doing a better job of getting them schooled and trained.

What can we do? Well, first, we need to be doing more to provide access to postsecondary education to America's minorities. The Higher Education Act's Title IV student aid funds have opened numerous doors, but there's still so far to go for the students providing tomorrow's workplace person-power. Authorizing the availability of funds is not enough. We must ensure that minority students are academically prepared

for post-secondary study and have the information and support they need to apply for college funds. Educators and policy makers need to get involved early on in a student's academic career, not just at the point when he or she is trying to figure out how to apply for college.

GW, for example, is doing its part for early-intervention, particularly in the equally important area of preparing more students for math and science careers. This summer, for example, local science and math teachers will team up with GW scientists in a special National Science Foundation program targeted at improving the quality of local math and science teaching. To make our efforts work at the postsecondary level, students need to come to us with an improved math and science awareness, one that's fed and cultivated from elementary school on.

We also need to make the process of applying for student financial aid less complex for at-risk students and their families—some of whom have very little exposure or faith in academia's red tape. Also called for is a reevaluation of our career services and guidance programs, with the goal of restructuring the system to direct students to future jobs and careers. The educational system should not be producing only one-dimensional students, however. Tomorrow's multifaceted marketplace needs well-rounded workers versed in Chaucer, French *and* computer programming.

Reaching students earlier on with academic and career counseling also could lead to experiential education programs in high school and in college to expose students to the job market and to give them valuable work experience. At GW and other universities nationwide, cooperative education programs place students in for-credit jobs that capitalize on lessons learned in class.

For more than 25 years, The Higher Education Act has provided funding so that colleges and universities will be more accessible to nontraditional and multicultural students. Today, that access takes on even more varied definitions, says Carol B Aslanian, director of adult learning services for the College Board. Psychological access, explains Aslanian, may be the most important kind. "The potential student has to believe that she belongs in college, that the college will accept her, that she has the intelligence to succeed, that her skills are not too rusty, that she can get good advice . . . ." But, adds Aslanian, "a person who has every other kind of access still may not enroll because he or she is in a minority with respect to race or language or nationality."

America's traditional minorities are fast becoming the key to America's future success. It is my job—it is our job—to give blacks, Hispanics, women and older Americans the access they need as early as possible to the best education this country has to offer. The Higher Education Act was a giant step in the right direction in 1965. Let's continue its good work well into the year 2000.

More detailed demographic and workplace reports supporting this testimony are attached.

Demographic Trends

- The largest proportion of college students is currently 35 years and older (33 percent are between 35-44 years of age). This population will increase to 41 percent by 2001.

- Between 1980-88, the composition of college students changed to include more women, more part-time, more minority and more non-resident alien students, compared to the traditional full-time white male. During this eight-year span, the number of women students increased 13 percent, compared to a mere 2-percent increase in male students; the number of part-time students increased 12 percent, compared to 5 percent for full-time students; and the number of minorities increased 23 percent, compared to only 4.5 percent for the white population.

- While the actual numbers of black, Hispanic, Asian and American Indian students attending college has increased, there was a smaller percentage of black and Hispanic high school graduates enrolling in college in the 1980s compared to the mid-70s. The enrolled-in-college participation rate for blacks dropped from 33 percent in 1976 to 28 percent in 1988. For Hispanics, the college participation rate declined from 36 percent to 31 percent.

- It is projected that by the year 2000, black, Hispanic, Asian American and American Indian workers will comprise one-third of the net additions to the U.S. labor force. However, despite progress in the overall educational attainment of these groups, blacks, Hispanics and American Indians are still underrepresented at all levels of postsecondary education.

How The Higher Education Act Can Support a Changing Population

The Higher Education Act provides funding for colleges and universities to become more accessible to the nontraditional and multicultural student. The following trends, discussed in a talk, "Back from the Future," presented by Carol B. Aslanian of the College Board, justify the merits of the act.

- Geographic access. Adult learners who are place-bound choose colleges by location. This means that the classroom has to be near enough so that getting to it does not take too much time away from one's other demands.

- Logistical access. Classes need to be offered at a time convenient for students. Included in logistical access is the number of trips it takes to get advised, registered, paid and started in class, as well as having a safe parking place, access to a quick dinner before class and advisors available when classes are offered.

- Financial access. For the traditional 18-year-old student, the cost of going to college includes tuition, room and board. The main cost for an adult student is what economists call the "opportunity cost"—the money you could make if you were not sitting in class or driving to get there. Thus, the best way for an adult to get education is to go to school part-time.

- Cultural access. Given all other access, a student may not enroll because he or she is in a minority with respect to race or language or nationality and may not feel comfortable on a college campus.

Employment Trends

Employment and recruitment date and trends monitored by GW's Career and Cooperative Education Center support many of the programs and initiatives included in the Higher Education Act. In particular, programs for Student Support (e.g., Education Opportunity Centers), Institutional Development (e.g., The Endowment Challenge Grant), Incentive Programs (e.g., Cooperative Education) and International Education (e.g., International Research and Studies) are specifically responding to the changing needs of the American workforce.

The U.S. Department of Labor Employment and Training Administration funded a grant to the Hudson Institute for a major study entitled, ***Workforce 2000: Work and Workers for the 21st Century***. Published in 1987, ***Workforce 2000*** analyzes the work place of the future and identifies many of the challenges that America must address relative to changing demographics, a fluctuating labor market and rapidly enhanced technology. It has become the benchmark for career centers nationwide, as they develop and offer insights to the future employment picture.

At GW's Career and Cooperative Education Center, our daily interaction with employers of college graduates supports much of what was published in Workforce 2000. The following trends in the employment scene, with their implications for the support of the Higher Education Act, are derived from ***Workforce 2000***, daily interaction with employers and analysis of various publications received by the center.

- By the year 2000, service industries will create most new jobs, and those jobs will demand much higher level of skills than jobs from the previous century. Some sources indicate that 40 percent of all new jobs will require a college degree or an associate degree, and an additional 30 percent of new jobs will require some other form of postsecondary education.

- Combined with the declining university enrollments, decreasing numbers of 18-24 year olds, and diversity and globalization of the workforce, the labor market demands experiential education to enhance students' job readiness; early outreach programs to pre-postsecondary students, particularly those in the new and growing demographic minority groups; and the continued education of nontraditional students.

- As the traditional college graduate market shrinks, recruiters will be vying for women, minorities, disabled workers and nontraditional, older, more experienced candidates.

- American corporations continue to face shortages of scientists and engineers. Unless the growing numbers of women and minorities can be recruited into these fields, the shortages will become even greater.

- The decline in the number of young workers in the labor force can offer the older, more experienced workforce some stability. However, older workers are less mobile and less likely to undertake retraining without continuing education incentives.

- Non-whites will make up 29 percent of new candidates for the labor force by the year 2000. The mixed analysis of this fact is that the growing potential share of the workforce

for these workers is not compatible with their diminishing pursuit of the technical, science and mathematical fields that the job market will demand.

- The fastest-growing jobs are in the professional, technical and sales fields, and those jobs require the highest education and skill levels.

- With fewer new workers available in the labor market, employers' demands for highly qualified blacks and Hispanics will be insatiable. Minority candidates must be recruited early through incentive programs, supported throughout their education with retention programs and provided supplemental activities such as experiential learning.

- If American corporations are to maintain and increase their world leadership, educational standards must be accelerated to include more study, more standard testing, more experiential learning, broader-based liberal arts programs and incentives for the science, technical and mathematical areas. Furthermore, emphasis on international and cultural diversity must be a component of higher education in the future.

Chairman FORD. Without objection, the prepared statements of each of the witnesses today will be inserted into the record immediately preceding their oral testimony.

Mr. Deloatch.

Mr. DELOATCH. Thank you, Mr. Chairman and members of the subcommittee. My name is Eugene Deloatch, and I am Dean of the School of Engineering at Morgan State University, which is located in Baltimore, Maryland. And I'm here today on behalf of the American Society for Engineering Education, better known as ASEE.

As a member and a subcommittee chairman of the ASEE Engineering Dean's Council Task Force, which is chaired by Ted Bickford, Dean at Michigan State, this task force has been created to implement recommendations from two major reports that we have recently completed, one on the engineering student pipeline, and one on the engineering faculty pipeline.

I thank you for this opportunity to testify on the reauthorization of the Higher Education Act.

While there are a number of issues we could discuss this morning or today, I would like to focus my remarks on the need to diversify the engineering student pipeline. This is an area where the Higher Education Act can have the most impact on improving engineering education. I also believe that the strategies which we advocate have the potential to impact science disciplines as well.

As the United States grows more reliant on technology for its economic health and its national security, our need for quality engineering talent is increasing. We could spend some time debating whether there is going to be shortfall or not in the future, but the fact is that unless this Nation continues to educate a steady stream of engineers, we will continue to fall behind our competitors in the international market place.

Moreover, it has become increasingly clear that our engineers must have more than just technical expertise. They must understand the social and economic context in which technology is employed.

At the same time that the Nation's need to sustain the pipeline in engineering is there, we're on a collision course with demographics. Engineering has traditionally drawn on a pool of white males. In fact, I heard earlier today that 44 percent of the work force in this country is white male; however, when we look at the science and technical work force in this country, 77 percent of that work force is white male.

By the year 2000, more than 25 percent of the college age population will be black and Hispanic, yet underrepresented minorities in 1990 were only 10 percent of the undergraduate enrollment in engineering. Women make up more than half of the U.S. population, and they were only 16.5 percent of the engineering enrollment.

Clearly, we have a great deal of catching up to do if we are to maintain the strength and the viability of our pipeline.

Our dual challenge is to find ways of attracting nontraditional students to engineering and keeping them in the pipeline. About 35 percent of all engineering students who enter college never receive the degrees which they go after. This figure rises to a staggering 65 percent for underrepresented minorities.

There are many ongoing efforts within engineering communities addressing these issues. Program support certainly comes from the National Science Foundation, NASA, Department of Energy and other Federal agencies. But one of the more ambitious support efforts is the Engineering Education Coalitions, which is funded by the National Science Foundation, and which they have made a long term commitment to major consortia of universities with the aim of making revolutionary changes in the engineering curriculum and in the engineering development and retention.

It is also noteworthy that the President's Office on Science and Technology Policy this year began an effort to coordinate science, math and engineering education program across all Federal agencies. This will, hopefully, foster greater cooperation among the agencies, particularly the Department of Education and the National Science Foundation.

There are several ways in which the Department of Education helps address engineering pipeline issues through the Higher Education Act. The most important strategy for increasing the number of minority students in the pipeline and keeping them in school is to improve student financial aid and refocus assistance on grants as opposed to loans.

Many students from low income backgrounds are forced to take out loans for their college education. Even with these loans, many find it necessary to work long hours while attempting to do full-time engineering studies.

A recent study of the National Academy Action Council for Minorities in Engineering found that at one institution with a high minority enrollment, some 70 percent of the full-time students had jobs. There were working an average of 20 hours a week. This is very difficult for students to remain in school to study engineering and achieve their potential.

At my own institution, a predominantly minority urban university, more than 85 percent of all the students require some form of financial assistance. Along with student aid, the retention of minority students in engineering can benefit greatly from targeted support programs at their universities, especially those which focus the development of effective study skills and on making improvements in the educational environment.

I think we're all aware of the California Mesa program in which students participate in the program of coordinated academic support. The results have been extremely impressive. Students in these program, in many cases, outperform non-Mesa students academically, and have a retention rate comparable to the national average of all engineering students.

The Higher Education Act supports programs of this type, and along with many efforts under titles like Title III, aid to developing institutions, and we clearly should continue to do so.

I guess the one other thing that's very important is the faculty pipeline. Just as teachers are key to education it pre-college level, so are faculty key to improvements in collegiate instruction. We have seen a chronic shortage in engineering faculty in the 1980s. Although the problem has lessened in the past few years, it is expected to worsen in the mid 1990s, when 25 percent of the engineering faculty will become eligible for retirement.

And as our undergraduates, we also need to attract far more women and minorities into this field, women at the graduate level. Women currently make up four percent of the engineering faculty in this country, and underrepresented minorities fare even worse.

An important way to attract students into graduate education and faculty careers is providing undergraduates with university research experience. For this reason, the Department of Education's current program for awarding grants to institutions to encourage minority participation in graduate education is particularly important. We urge that it be sustained.

Another proven means of attracting students into graduate programs is traineeships such as the Department's graduate traineeships in areas of national need. Traineeships are a complement to graduate fellowships because fellowships are awarded directly to the individuals. Students can take them to the schools of their choice, and often tend to cluster at relative few universities.

Traineeships, on the other hand, are awarded to institutions and enable a broader array of schools to offer graduate support, and they motivate faculty members to actively recruit and mentor students.

We believe the Department's traineeship programs should be sustained as a separate activity and not consolidated with other programs into a broad graduate program.

In sum, we believe the Higher Education Act plays a vital role in fostering diversity and quality in the engineering pipeline. Through reauthorization of the act, this role should be improved and sustained. I thank you for this opportunity to present our views.

[The prepared statement of Eugene M. Deloatch follows:]

Statement

of the

American Society for Engineering Education

On Reauthorization of the

Higher Education Act

Presented By

Dr. Eugene M. Deloatch, Dean of Engineering
Morgan State University

To The

Postsecondary Education Subcommittee

House Education and Labor Committee

May 2, 1991

Mr. Chairman and Members of the Subcommittee:

My name is Eugene Deloatch. I am dean of engineering at Morgan State University in Baltimore, Maryland and I am here today on behalf of the American Society for Engineering Education (ASEE). I am a member of the ASEE Engineering Deans Council task force that has been created to implement recommendations from our two reports on the engineering student and the engineering faculty "pipelines." Thank you for this opportunity to testify on reauthorization of the Higher Education Act.

While there are a number of issues we could discuss this morning, I would like to focus my remarks on two things: the need to diversify the engineering student pipeline and the need to expand our students' experiences in the working world. These are areas where the Higher Education Act can have the most impact on improving engineering education. I also believe that strategies that apply to engineering apply to the science disciplines, as well.

As the United States grows more reliant on technology for its economic health and national security, our need for quality engineering talent is increasing. One could debate how great or small the projections of "shortage" will be, but the fact is that

unless the nation continues to educate a steady stream of engineers, we will continue to fall behind our competitors in the international marketplace. Moreover, it is becoming increasingly clear that our engineers must have more than just technical expertise: they must understand the social and economic contexts in which technology is employed.

The nation's need to sustain the pipeline in engineering is on a collision course with demographics. Engineering has traditionally drawn on the pool of white male, college-age students for its programs. But by the year 2000 more than 25 percent of the college-age population will be Black or Hispanic. Yet under-represented minorities in 1990 were only 10 percent of the undergraduate enrollment in engineering. Women, who make up more than half of the U.S. population were only 16.5 percent of enrollment. (Those percentages drop further at the graduate level where under-represented minorities constitute 3.8% of the total and women 14%.) Clearly, we have a great deal of catching up to do if we hope to maintain the pipeline.

Our dual challenge is to find ways of attracting non-traditional students to engineering, and keeping them in engineering programs. About 35 percent of those who enter college intending to study engineering never receive an engineering degree. This figure rises to a staggering 65 percent for under-represented minority students.

There are many ongoing efforts within the engineering community addressing these issues. Program support is coming from the National Science Foundation, NASA, the Department of Energy and other federal agencies. One of the more ambitious efforts is the Engineering Education Coalitions in which NSF has committed long-term funding to major consortia of universities, with the aim of making revolutionary changes in engineering curriculum and in student development and retention. It is also noteworthy that the president's Office of Science and Technology Policy (OSTP) this year began an effort to coordinate mathematics, science and engineering education programs across all federal agencies. This will hopefully foster greater cooperation among the agencies, particularly between the Department of Education and the National Science Foundation.

There are several ways the Department of Education helps address engineering pipeline issues through the Higher Education Act.

Teacher Scholarships. Since the engineering pipeline really begins at the precollege level, it is important to encourage more talented students interested in technical fields--particularly women and under-represented minorities--to become teachers. One way is to increase the number of high-visibility teacher scholarships. Another alternative is to create an undergraduate traineeship program in teaching. Since it would be institution-

based, a traineeship program would involve the school and, most importantly, the faculty in recruiting and mentoring student candidates.

Student Financial Aid. The most important strategy for increasing the number of minority students in the pipeline and keeping them in school is to improve student financial aid and re-focus assistance on grants rather than loans. Many students from low-income backgrounds are forced to take out loans for their college educations. Even with these loans, many find it necessary to work long hours while attempting to take full engineering course loads. A recent study by the National Action Council for Minorities in Engineering (NACME) found that at one institution with a high minority enrollment some 70% of full-time students had jobs. They were working an average of 20 hours a week. This makes it very difficult for these students to remain in school and achieve their potential. At my own institution, a predominantly minority, urban university, more than 85 percent of all students require some form of financial assistance.

Institutional Support. Along with student aid, the retention of minority students in engineering can benefit greatly from targeted support programs at their institutions, especially those which focus on the development of effective study skills and on making improvements in the educational environment. California has a highly successful program across several schools

called the Minority Engineering Program, or M-E-P, in which minority students participate in a program of coordinated academic support. The results have been impressive: students in these programs outperform non-MEP students academically and have a retention rate comparable to the national average of all engineering students. We would like to see additional funding to broaden support for this type of program under the Higher Education Act.

Cooperative Education. Another valuable way to attract and retain students in engineering is cooperative education, also funded through the Higher Education Act. Cooperative education allows a student to alternate classroom study with paid and supervised work experience. This provides students with several advantages, including financial assistance regardless of economic background--which is especially valuable for middle-income students--and the ability to make contacts in industry. This latter benefit has been especially helpful for women students. Since less than one-third of U.S. higher education institutions participate in cooperative education, there is considerable room for growth.

Educating Students For the Working World. There is a broad-based movement within the engineering community to widen the curriculum and reduce the lock-step nature of engineering study. Students need an expansive view of the world, including

the political and economic implications of their work. In the international arena, there should be more opportunities for engineering schools to interact with the existing international studies centers, as well as incentives for the international business centers to work with others, such as the engineering schools. There should also be greater opportunities for engineering students to study abroad and for engineering fa ulty to collaborate with their international colleagues.

The Faculty Pipeline. Just as teachers are key to education at the precollege level, so are faculty key to improvements in collegiate instruction. We have seen a chronic shortage of engineering faculty in the 1980s. Although the problem has lessened in the past few years, it is expected to worsen again in the mid-1990s when 25 percent of the engineering faculty are eligible to retire. And as with our undergraduates, we also need to attract far more women and under-represented minority students to the field. Women currently make up only 4 percent of engineering faculty and ethnic minorities make up about 12 percent. (The ASEE faculty survey does not separate out from the broad "minority" category those faculty from under-represented minority groups.)

An important way to attract students into graduate education and faculty careers is providing undergraduates with university research experience. For that reason, the Department of

Education's current program for awarding grants to institutions to encourage minority participation in graduate education is particularly important. We urge that it be sustained.

Another proven means of attracting students into graduate programs is traineeships, such as the Department's Graduate Traineeships in Areas of National Need. Traineeships are a complement to graduate fellowships. Because fellowships are awarded directly to individuals, students can take them to the school of their choice and often tend to cluster at relatively few universities. Traineeships, on the other hand, are awarded to institutions. They enable a broader array of schools to offer graduate support and they motivate faculty members to actively recruit and mentor the students. We believe the Department's traineeship program should be sustained as a separate activity and not be consolidated with other programs into one broad graduate program.

In sum, we believe the Higher Education Act plays a vital role in fostering diversity and quality in the engineering pipeline. Through reauthorization of the Act this role should be improved and sustained.

Thank you for this opportunity to present our views.

STATEMENT ATTACHMENT

Postsecondary Education Subcommittee Hearing-5/2/91
American Society for Engineering Education

ENGINEERING DEANS' COUNCIL
PIPELINE IMPLEMENTATION COMMITTEE[1]

Gateway to Pluralism: Recruitment and Retention

Theodore A. Bickart
Dean of Engineering
Michigan State University

Often are heard the cries: Engineering faculty shortages are upon us! There is a paucity of engineering graduate students! Engineers will soon be in short supply! Is there really a problem? What is the problem? This report considers these issues in the context of the human resources in the engineering pipeline. It sets forth fifteen actions to sustain our nation's engineering human resources, diverse in gender and ethnicity. Each action is within the sphere of influence and control of the engineering deans. In addition, eight tasks are identified by the Pipeline Implementation Committee of the Engineering Deans' Council as responsibilities it will assume on behalf of the deans as a whole.

Well within the first half of the Twenty First Century, the United States will be a nation of ethnic minorities. Fully half of the youth will be ethnic minorities of today's reckoning. Thus, the time is short in which we must transform the cultural blend of the youth who strive to become tomorrow's engineers. Since women stand today but little higher in engineering ranks, the transformation that must be wrought is almost beyond imagination. Enrollment levels and graduate rates of ethnic minorities and women in engineering curricula must rise from today's somewhat less than 25 percent to 75 percent in just 40 years. By dint of effective recruitment and retention practices, we must make this decade a gateway to pluralism in the next century.

A life evolves over a vast network of pathways chosen at times of decision. Birth and death are the only fixed points of this network. The path from birth to engineer, as a practitioner or professor, has many points of departure leading to attractive or less arduously attained professions. For those who are concerned with the number of people who traverse the network to become engineers, the path from birth to engineer in all forms of professional involvement might best be likened to a pipeline, the engineering pipeline. In the lingua of this analogy, the task that we face is that of plugging the leaks--the attractive or less arduous alternatives.

The Engineering Deans' Council commissioned the study of two portions of the engineering pipeline over the past four years. The first study explored means to increase the flow through

[1] In addition to the Chairperson who prepared this paper, contributions reflect the convictions of the Committee members: Eleanor Baum, Dean of Engineering, The Cooper Union; J. Ray Bowen, Dean of Engineering, University of Washington; William T. Brazelton, Associate Dean of Engineering, Northwestern University; John Brighton, Dean of Engineering, Pennsylvania State University; Eugene M. Deloatch, Dean of Engineering, Morgan State University; George E. Dieter, Dean of Engineering, University of Maryland; Roger Eichhorn Dean of Engineering, University of Houston; Paul King, Dean of Engineering, Northeastern University; Frank Kulacki, Dean of Engineering, Colorado State University; Raymond B. Landis, Dean of Engineering and Technology, California State University at Los Angeles; George Pincus, Dean of Engineering, New Jersey Institute of Technology; Jay Pinson, Dean of Engineering, San Jose State University; W. Daniel Turner, Associate Dean of Engineering, Texas A&M University

the engineering student pipeline.[2] The second study considered actions appropriate to building the flow in the engineering graduate student pipeline with a predilection to entering the academy.[3] Each of these studies illuminated appropriate intermediate objectives and overarching strategies to increase the flow--stem the leaks--in these portions of the engineering pipeline. The study groups did not lay down specific tasks with measurable outcomes for attaining the objectives.[4] Consequently, the Engineering Deans' Council commissioned the Pipeline Implementation Committee to identify and accomplish such tasks. This Committee at its first meeting on 2 October 1990 focused on several objectives and identified some specific tasks.

Undergraduate Student Recruitment and Retention

The vitality of the American economy is strongly coupled to the robustness of American technology. Thus, there is an abiding concern for the integrity of the engineering pipeline. A critical junction is that at the entry to undergraduate study. Vigorous recruitment is the key to ensuring sufficient flow into undergraduate studies in engineering. Recently, on the side of dire foreboding, there have been projections of a calamitous shortfall in the production of scientists and engineers.[5] However, more recently the case for those projections has been found to be somewhat wanting.[6] Even though it may not be necessary to dramatically increase the production of scientists and engineers over the next couple of decades, it is essential that the production remain between steady and modestly increasing. This will be possible, even in the face of a decreasing number of prospective students, if science and engineering can (1) become more attractive among those who are now underrepresented in engineering ranks--women and underrepresented minorities--and (2) remain as attractive among those who are not now underrepresented in engineering ranks. It is reasonable to assume that the fractional number with an interest in engineering among those who are not now underrepresented will remain steady in the near future. Thus, the critical task is to recruit strongly among those who are now underrepresented.

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[2] See the May 1988 issue of *Engineering Education*.

[3] See the July/August 1989 issue of *Engineering Education*.

[4] It is worthy of note that two actions ensued from the work of the Faculty Pipeline Task Force. First, Raymond B. Landis, Dean of Engineering and Technology at California State University in Los Angeles, wrote the paper "An academic career: It could be for you" which was sent to members of the American Society for Engineering Education (ASEE) as an insert in the July/August 1989 issue of *Engineering Education* and distributed to 15,000 Tau Beta Pi undergraduate members by the ASEE with funding from the ARCO Foundation. This was a substantial effort directed at faculty recruitment. Second, the Engineering Deans' Council commissioned the Task Force on Women in Engineering which drafted a set of recommendations on gender diversity in engineering. A national network of individuals then emerged to address the issues facing women in engineering, such as dealt with in the Task Force recommendations.

[5] The root projection was developed in the Division of Policy Research and Analysis of the National Science Foundation. The projection, together with attendant analysis, is set forth in the paper "Future scarcities of scientists and engineers: problems and solutions" prepared in that office.

[6] See Alan Fechter's article "Engineering shortages and shortfalls: myths and realities" which appeared in *The Bridge* in Fall 1990 (Volume 20, Number 2). A response by Peter W. House, Director of the Division of Policy Research and Analysis at the National Science Foundation, was published immediately following the article.

At the present time the situation nationally among those underrepresented in engineering is displayed in the following table:

UNDERREPRESENTED POPULATION SEGMENT	FRESHMEN FRACTION	DEGREES FRACTION	POPULATION FRACTION
American Women	15.06%	15.73%	51.42%
Minorities			
African-American	6.18%	3.57%	11.52%
Hispanic-American	5.04%	4.06%	6.45%
Native American	0.38%	0.18%	0.59%

Table 1 Undergraduate engineering program participation by Americans in the Class of 1990 relative to the population as a whole.

The population fractions are those reported in the 1980 Census data. The freshmen and degrees fractions were derived from data reported by the Engineering Manpower Commission for fall 1986 (freshman enrollments) and for spring 1990 (degrees).[7]

A reasonable goal is to

> double the number of BS degrees awarded to individuals from these underrepresented groups over the course of the next decade.

If the growth to this level is relatively steady, then the secondary benefit will be that the total number of American women and underrepresented minorities will more than double.[8] This will result in a closing of the gap between the underrepresented population segments in engineering and in the population as a whole.

An examination of the data discloses that the fractional participation of American women in undergraduate engineering programs is essentially constant from initial enrollment to program completion. Thus, the essential task will be to increase the recruitment of American women in meeting the stated goal. Further examination of the data discloses that the fractional participation of underrepresented minorities declines rather dramatically from initial enrollment to degree completion. In fact, if the fractional participation could be held essentially constant, the graduation rate would almost double. Thus, though it will be important to increase the recruitment of underrepresented minorities in meeting the stated goal, the essential task will be to increase their retention rates in engineering programs.

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[7] See, for enrollment data, *Engineering Manpower Bulletin: Engineering Enrollment Highlights, Fall 1986* published in March 1988 as issue number 87 and, for degree data, *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends–1990* published in December 1990 as issue number 106. The adjustments to extract the numbers of foreign women from the total numbers of women receiving or studying for degrees were based upon the fractions of foreign women degree recipients to the women degree recipients reported for the first time for 1989-90 in *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends–1990.*

[8] The implicit assumption in this projection is that current levels were reached through steady growth in the number of such degrees awarded annually over the past twenty to thirty years.

A perspective on improved recruitment since the Class of 1990 was admitted in the fall of 1986 is provided by the data in the following table:

UNDERREPRESENTED POPULATION SEGMENT	CLASS OF 1990	CLASS OF 1991	CLASS OF 1992	CLASS OF 1993
American Women	15.06%	15.49%	15.89%	16.03%
Minorities				
African-American	6.18%	6.71%	7.51%	7.96%
Hispanic-American	5.04%	4.88%	5.17%	5.71%
Native American	0.38%	0.39%	0.46%	0.46%

Table 2 Engineering freshman enrollments by Americans in the Class of 1990 through the Class of 1993.

This data, derived from figures published by the Engineering Manpower Commission,[9] discloses that recruitment has improved somewhat for each of the underrepresented population segments in engineering. However, it does not disclose a trend sufficient to the attainment of the goal with respect to American women in engineering. Also, it does not disclose an increase which is sufficient, together with a strong improvement in retention, to the attainment of the goal with respect to underrepresented minorities in engineering. Thus, improvements in recruiting since the Class of 1990 was admitted are not yet sufficient to the goal.

Recruitment

The flow in the engineering pipeline up to the point of admission to an undergraduate engineering program must be boosted and leaks must be stemmed. This will require attention to the intellectual environment from cradle to college. It must affirm and regularly reaffirm the worth of engineering to society and the satisfactions in engineering to the individual. It must provide the context for acquiring knowledge appropriate to the study of engineering.

The engineering deans must participate in this endeavor. The following five actions have been identified by the Pipeline Implementation Committee as being of singular importance. They are presented to the deans of engineering for their earliest action.

- Increase and improve interactions with the K through 12 schools so as to enhance and enrich instruction in mathematics and science and extend instruction to issues in and of technology.

- Develop or expand orientation programs which focus on prospective students' interests in technology and on their transition to college.

[9] See the issues of the *Engineering Manpower Bulletin* subtitled *Engineering Enrollment Highlights for Fall 1986* through *Fall 1989* published in March 1988 (issue 87), September 1988 (issue 89), May 1989 (issue 95), and April 1990 (issue 100). The adjustments to extract the numbers of foreign women from the total numbers of women studying for degrees were based upon the fractions of foreign women degree recipients to the women degree recipients reported for the first time for 1989-90 in *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends–1990.*

- Create or evaluate and then disseminate high-quality guidance materials on engineering--the route from science to technology--for parents and teachers.

- Facilitate precollege partnerships of industry with the K through 12 schools, especially directed toward increasing the interest of the underrepresented minorities in engineering and enriching their academic preparation for the study of engineering.

- Develop or expand transfer programs with community colleges and dual degree programs with liberal arts colleges.

Retention

To sustain the flow through the engineering pipeline during the undergraduate years requires intervention in the collegiate lives of some students from the time of their acceptance of admission. Their socialization and study skills must be enhanced and their knowledge base must be enlarged and enriched. The creative and humanistic dimensions of engineering must be repeatedly played before them. Their involvement in engineering experiences, from student professional group activities to undergraduate research and design experiences, must begin early.

The engineering deans have an opportunity to build toward a truly pluralistic community of engineering through strong retention programs in their colleges. They should set retention rate goals and track the cohorts among the underrepresented in engineering building measures of the success of actions taken to improve retention. The following three actions have been identified by the Pipeline Implementation Committee as being of singular importance. They are presented to the deans of engineering for their earliest action.

- Develop or expand (summer) bridge programs and (first year) entry programs. Both should introduce students, especially those from the underrepresented--women and underrepresented minorities--in engineering, to the spectrum of opportunities in engineering and provide them with engineering experiences. The latter should also enhance their opportunities to form peer support groups. In addition, it should seek to foster the formation of study groups and it should introduce the students to supportive professional and peer advisors.

- Provide or sustain a study center which will encourage collaborative learning by students (especially those who are underrepresented in engineering) and, with access to professional and peer tutoring, facilitate their academic success.

- Develop or expand extended-track programs which recognize that many students need to (a) limit the intensity of collegiate studies to a level commensurate with their academic abilities or (b) incorporate time for work study positions, internships, or cooperative education experiences.

- Expand faculty and staff members understanding of the distinctive characteristics of the diverse segments of our population through seminars

and workshops. The purpose of such sensitivity development is to foster high expectations, banishing prejudice based low expectations, for various of the underrepresented population segments studying engineering.

Pipeline Implementation Committee Tasks

The selection of the action items for the deans of engineering was based upon the criterion that they should be, in most instances, within their financial means and, certainly, within their span of control. The Pipeline Implementation Committee identified three tasks that it should assume on behalf of the engineering deans as a whole. These are:

- Design and assemble materials which promote the engineering professions to the population, serendipitously to prospective students and their parents, and which, within the K through 12 schools, assist counsellors and teachers. Such materials, such as pamphlets and video tapes, should be scrutinized and approved by communication specialists.

- Promote image-building for engineering through the media, such as the insertion of episodes in popular sitcoms.

- Identify proven retention activities and encourage their adoption by all deans of engineering.

Graduate Student and Faculty Member Recruitment and Retention

Upon completion of undergraduate studies, most engineering graduates enter professional practice in engineering or are diverted to preparation for another profession. In the latter instance, they bring to their alternative career choice–such as law, business, and medicine–the analytic expertise and creative talent of the engineer. The others at this junction in the engineering pipeline choose to continue in the pipeline toward a graduate degree. Those who leave the pipeline following completion of their graduate studies with a master's degree in engineering generally follow similar career paths. However, those who continue on to earn a doctor's degree in engineering generally pursue sophisticated research and development opportunities in industrial or national laboratories or the academic life in institutions of higher education.

The rising sophistication of technology has become a call to advanced study on the part of more engineers and a possible portent of the master's degree becoming the gateway to professional practice. The importance of a vigorous professorate, to prepare future engineers to become practitioners or professors or to engage in scholarship which expands our knowledge underscores the need for advanced study and generally requires pursuit of a doctor's degree. To meet the emerging technological challenges in industry and government or the intellectual rigors of the teacher-scholar in the academy, a greater number of those completing undergraduate studies in engineering must be persuaded of the merits and value of continuing in the pipeline toward a graduate degree.

The declining number of students completing undergraduate degrees in engineering does not bode well for increasing the number of engineers with graduate degrees. The under representation of American women and most minorities among baccalaureate degree recipients and the premium being offered them to immediately enter professional practice in industry, exacerbate the problem of not only increasing the number of engineers with graduate degrees, but of increasing the diversity, especially with respect to the underrepresented minorities, among the best educated of our engineering practitioners and within the professorate. In the sense that sufficient diversity breeds appropriate diversity and pluralism, the focus must in large measure be upon making graduate study especially attractive to those who are underrepresented in engineering and persuasively presenting the merits of the academic life to those completing doctoral programs.

Lest anyone feel that the task will be other than arduous, consider the data in the following two tables:

POPULATION SEGMENT	BS DEGREES AWARDED IN TWO YRS	MS DEGREE STUDENTS	MS DEGREES AWARDED
American Men and Women	128,728	23,973	19,121
American Women	20,300	4,750	3,150
Minorities			
African-American	4,333	724	424
Hispanic-American	4,970	800	515
Native American	379	74	38

Table 3 In engineering, MS degrees awarded to Americans in 1989-90 juxtaposed to full-time American MS degree students in Fall 1989 and BS degrees awarded to Americans in 1987-88 and 1988-89.

POPULATION SEGMENT	MS DEGREES AWARDED IN THREE YRS	PHD DEGREE STUDENTS	PHD DEGREES AWARDED
American Men and Women	55,200	13,820	2,775
American Women	8,200	2,300	350
Minorities			
African-American	1,155	268	36
Hispanic-American	1,338	322	53
Native American	101	25	7

Table 4 In engineering, PhD degrees awarded to Americans in 1989-90 juxtaposed to full-time American PhD degree students in Fall 1989 and MS degrees awarded to Americans in 1986-87, 1987-88, and 1988-89.

Three assumptions are advanced before commenting on the data in these tables.[10] One: The cohort of American MS degree students is largely drawn from the American BS degree graduates of the previous two years. (This assumption rests upon the expected completion times of full-time students.) Two: The cohort of American PhD degree students is largely drawn from the MS degree graduates of the previous three years. (This assumption rests upon the expected completion times of full-time students.) Three: The degree data, though including degrees awarded to part-time students, is generally reflective of the degrees awarded to full-time students.

Built upon these assumptions, the overall continuation rate for Americans into graduate study was about 18.5 percent for the MS degree student cohort of 1989-90 and beyond the MS degree into a doctoral program was about 25 percent for the PhD degree student cohort in that same year. American women continue at a greater rate than American men--approximately 23.5 percent versus 17.5 percent--for the MS degree. Likewise, their continuation rate for the PhD degree exceeds that for American men--approximately 28 percent versus 24.5 percent. For the underrepresented minorities, the continuation rates for both degrees are generally somewhat less than those for all Americans.

Overall, the fraction of the American MS degree students completing their programs during 1989-90 was about 80 percent of the American MS degree student cohort and the fraction of the American PhD students completing their programs during that same year was about 20 percent of the of the American PhD student cohort. The MS degree completion fraction for American women was lower than that for American men--approximately 66.5 percent versus 83 percent. The PhD degree completion fraction for American women was also lower than that for American men--approximately 15 percent versus 21 percent. The MS degree completion fractions for the underrepresented minorities were lower, dramatically so for Native Americans, than for all Americans. The PhD completion fractions for African-Americans and Hispanic-Americans were lower than for all Americans, but similar to that for American women. For Native Americans, the PhD completion rate was up significantly relative to that for all Americans. It is noteworthy that, because the absolute numbers are small, these qualitative judgements are suspect. For example, for 1988-89, the corresponding statement would have read: A significantly smaller fraction of Native American PhD students completed their PhD degrees than was the case for all American PhD students.

Graduate Students

The continuation rate from undergraduate studies into graduate engineering programs must be boosted. This will require attention to the intellectual challenges and quality of life--personally as well as professionally--that undergraduate students come to associate with careers in

[10] The enrollment data were reported in *Engineering Manpower Bulletin: Engineering Enrollment Highlights, Fall 1989* published in April 1990 as issue number 100 and the degree data were derived from data reported in *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends--1989* published in November 1989 as issue number 98 and *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends--1990* published in December 1990 as issue number 106. The adjustments to include graduates from the University of Puerto Rico drew on figures reported in the issues of *Engineering and Technology Degrees* subtitled *Part I - By School* for *1987-6* through *1989* published by the Engineering Manpower Commission. At each degree level, the adjustments to extract the numbers of foreign women from the total numbers of women receiving or studying for degrees were based upon the fractions of foreign women degree recipients to the women degree recipients reported for the first time for 1989-90 in *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends--1990.*

engineering that ensue from completing the academic challenges for an advanced degree. The persistence of graduate students in their studies will require attention on the part of institutions to the quality of life--personally as well as academically--that the students experience.

The engineering deans must participate in this endeavor. The following four actions have been identified by the Pipeline Implementation Committee as being of singular importance. They are presented to the deans of engineering for their earliest action.

- Create opportunities which challenge the academic bent of undergraduate students with the potential for graduate study. Such opportunities might include (1) research and teaching experiences, (2) BS-MS dual degree programs, (3) research focused honors programs, and (4) research oriented cooperative education programs. For practice focused individuals, serious consideration should be given to the creation of professional degree programs. Such a program, possibly without a thesis requirement, might offer a Master of Engineering (ME) degree or might be cast as a BS-ME dual degree program.

- Provide or expand programs for the underrepresented in engineering. The programs should enlist graduate student participation so as to integrate undergraduate and graduate students in a bond of scholarship and personal support. Participation by members of the faculty will reinforce the sense of importance of all of those in the academic community to the scholarly aims of their college. The robustness of these programs will call for long-term commitment of support.

- Develop inter-institutional agreements, especially regionally, which encourage and facilitate continuation into graduate engineering programs by students from those institutions. Such encouragement might take the form of support of summer research opportunities on the part of undergraduate students from the partner institutions.

- Create inducements to graduate study for non-traditional candidates. This might take the form of extended graduate programs, possibly subsidized by industry, for those who are employed full-time. It might be reflected in a modified residence requirement for doctoral students who must continue full-time employment in industry or government.

Faculty Members

A recent report[11] discloses that the number of unfilled engineering faculty positions has declined from 8.8 percent in 1985 to 7.2 percent in 1987 to 5.5 percent in 1989. This most likely

[11] See "Engineering and Engineering Technology Faculty Survey, Fall 1989, Part I" by Paul Dolgan, Mack Gilkeson, and Earl E. Gottsman which appeared in the September/October 1990 issue of *Engineering Education*.

ensues from (1) the modest annual increase in PhD graduates over this period,[12] from 3,383 to 4,175 to 5,017, and (2) the elimination of positions in the face of (a) a declining number of undergraduate students since the mid-1980s and (b) a faltering national economy. However, even though the annual vacancy rate has dropped to a reasonable level and is likely to remain there for the immediate future, the professorate in engineering is far from being as diverse as the general population. In particular, women fill only 4.1 percent of engineering faculty positions, though satisfyingly up from 3.4 percent in 1987, and the ethnic minorities hold just 12.1 percent of the positions, quite disturbingly down from 14.0 percent in 1982.[13] Since a noticeably more diverse professorate would undoubtedly accelerate the existence of diversity among engineering students and, thence, among engineers in the country, the critical issues to be faced are the recruitment and retention of the underrepresented to the professorate.

Even though the vacancy rate might now be at a reasonable level, there is a strong indicator that there will be too many vacant positions in the not too distant future. That indicator is the distribution of vacant positions by rank. In particular, whereas only 2.6 percent and 3.0 percent of the professor and associate professor positions were unfilled in 1989, 13.5 percent of the assistant professor positions went unfilled.[14] If this differential distribution of unfilled positions continues, then the portent of this indicator is: As senior faculty members leave the academy, the number of unfilled position can be expected to increase. Thus, a looming critical issue will be the recruitment of intellectually vigorous junior faculty members.

It is worthy of note that the annual pool of engineering PhD recipients is now approximately evenly divided between Americans and foreign born individuals. The consequence is that the engineering professoriate is tending towards an even mix of Americans and their foreign born colleagues. Though there is concern that this might be a negative factor in inducing more Americans to study engineering and more American BS degree recipients to graduate study in engineering and subsequently to engineering faculty positions, it is evident that this should be a positive factor in preparing engineering students to practice their profession in a world culture. This trend to internationalized faculties of engineering is a reality which should be parlayed into internationalized engineering programs, thereby becoming an inducement to study engineering.

The engineering deans must accept at strong role in representing the merits of the academic life to those completing doctoral programs, especially to those who are underrepresented in the professorate. The following two actions, serving both recruitment and retention, have been identified by the Pipeline Implementation Committee as being of singular importance. They are presented to the deans of engineering for their earliest action.

- Develop flexible employment conditions for faculty members. This should increase (1) the caring image the institution would want to convey to prospective faculty members and (2) the caring attention to the needs of faculty members provided by the institution. This is likely to be quite

[12] See *Engineering Manpower Bulletin: Engineering Degree Statistics and Trends–1990* published in December 1990 as issue number 106.

[13] See the reference cited in footnote 10.

[14] See the reference cited in footnote 10.

important to faculty members and prospective faculty members who must struggle with the tension between having and raising a family and establishing their academic credentials for reappointment, tenure, and promotion. In this context such caring attention might take the form of easily accessible day care facilities, of position sharing by a couple with similar professional credentials, or of reduced time appointments congruent with familiy obligations.

- Establish an academic climate in which promotion and tenure become worthy goals, are not just hurdles, and improve (early career) opportunities which facilitate the attainment of those goals, such as by (1) establishing faculty mentoring of junior faculty members, (2) facilitating appropriate summer employment, (3) identifying research opportunities, and (4) securing adequate research start-up packages.

Pipeline Implementation Committee Tasks

The selection of the action items for the deans of engineering was based upon the criterion that they should be, in most instances, within their financial means and, certainly, within under their influence and control. The Pipeline Implementation Committee identified eight tasks that it should assume on behalf of the engineering deans as a whole. These are:

- Catalog and critique the strategies currently being used to recruit graduate students, especially those who are underrepresented in engineering; foster the creation of regional consortia for recruiting graduate students.

- Conduct a survey of engineering faculty employment conditions, measuring, for example, the extent of (1) junior faculty mentoring, (2) flexible tenure clock policies, (3) communication skills expectations, and (4) student and peer review of teaching.

- Determine the degree and quality of faculty sensitivity training on such matters as (1) gender and ethnic discrimination, (2) verbal abuse, (3) body language, and (4) cultural value differences; sponsor a sensitivity training workshops, such as at a near future Engineering Deans' Institute; disseminate information on existing sensitivity training materials, such as would support half-day workshops.

- Catalog programs for faculty development under auspices of (1) t federal government (NSF, DOD, DOE. and so on) and (2) the various professional societies; devise and secure sponsorship of programs for faculty development.

Closing Comments

Engineering deans must individually and collectively act to sustain a vital corps of engineering practitioners and professors. It certainly should not be allowed to diminish in size in an era of increasing technology. In fact it might well be argued that the number of people highly literate

in technology should constitute an even larger fraction of our country's population. Furthermore, the engineering community should reflect the diversity of the larger society. The achievement of this end is certainly the greatest human resources challenge the engineering deans will face. This paper sets forth 15 actions that are within the sphere of influence and control of the engineering deans. In addition, 7 tasks were identified by the Pipeline Implementation Committee as responsibilities it would assume on behalf of the deans as a whole. An eighth such task is that of monitoring and sharing the successes of the deans individually in accomplishing their action items.

Acknowledgement

The Pipeline Implementation Committee extends its appreciation to Ann Leigh-Speicher of the American Society for Engineering Education for her considerable effort in organizing the October 2nc meeting of the Committee and for her diligence in recording and transcribing the discussions within and ensuing conclusions by the Committee at that meeting.

Chairman FORD. Thank you. Mr. Lay.

Mr. LAY. Thank you, Mr. Chairman. I'll give a five minute synopsis of my remarks, but would like to have my entire statement entered into the record.

I'm Ken Lay, IBM Director of Education. John Gardner, a philosopher, educator and citizen activist, said, "A nation is never finished. You can't build it and leave it standing as the pharaohs did the pyramids. It has to be recreated for each generation."

Our discussions here are part of a recreating process, and that's why I'm very pleased to be with you today.

IBM is in the information business. We operate in 137 countries and have 373,000 employees around the world, some 206,000 of which work in the United States.

Let me begin by discussing current employee population, specifically, that in the U.S. The bulk of IBM hiring is done on the college or graduate school campus, and most of our new employees come with technical or scientific backgrounds.

In 1990, 84 percent had technical degrees; 37 percent had masters or Ph.D.s. In 1991, 97 percent of all new IBM hires will have at least a two-year college degree. Technical skills are absolutely essential to the conduct of our business, and we spend approximately $2.5 billion a year to enhance their skills.

The pace of technological change demands that we hire people who have the flexibility to be able to be retrained and refreshed with new skills, so we go to great lengths to continuously upgrade the skills of our existing work force to stay competitive.

In terms of recruiting, we have no concern about the quality or availability of our college hires, generally. However, we are struggling to fill our growing needs for people with advanced degrees. We have had to rely more and more on foreign students studying in the U.S. primarily because American students are not entering math and science disciplines. This means we spend more time on immigration issues and sponsorship than we did in the past.

Ideally, our desire would be to have enough U.S. students pursuing advanced math, science, and engineering degrees; however, this just doesn't seem to be the case. Therefore, when we consider the pipeline issue, we become very concerned.

Three gaps help explain the pipeline issue. First, there's an economic, there's an academic gap. Reports by the International Association for the Evaluational Achievement tells us our high school students rank at the bottom in math and science test scores, while Singapore, Korea, Japan and Hungary are at the top. One of the reports tells us that in physics 89 percent of U.S. high schools score below the worst school in Hong Kong.

The skills gap is increasingly translated into a competitive gap; for example, IBM recently compared operations in our U.S. plants with an IBM plant in Japan. These plants represent the same company, management system and processes, but the yield, turnaround times, development cycle times and costs are frequently better outside the U.S.

Let's turn our attention to some specifics about our educational system. Enrollments among college freshmen in engineering and computer science courses continue to decline. Another cause for concern about the pipeline are the people who won't be in it be-

cause of the lack of opportunities to attend postsecondary institutions.

Between 1976 and 1988, college attendance rates dropped 2.6 percent for low income students of all races, and declined 8 percent for low income white males. It decreased 25 percent for African Americans and 16 percent for Hispanics. And while college enrollment increased by 6 percent for white females, it decreased 16 percent and 18 percent for African American and Hispanic females, respectively.

What is particularly dismaying about the drop in minority college enrollment is that 85 percent of all net new entrants into the work force between now and the year 2000 will be women immigrants or minorities.

In our need for higher skills and more scientists and engineers, we will have to make some radical changes to improve the pipeline that IBM and other high tech companies will be relying upon. The challenges facing postsecondary education are obvious: We must educate more people for college, and we must encourage more to choose math and science majors.

For years, IBM has been a major supporter of colleges and universities, including historically black colleges. Focusing on college and graduate programs was natural for us; it is where we do most of our hiring. However, we also realize that while this back-end focus was necessary, it was not enough. We would also have to focus on the front end of education, the K to 12 system, if we want to increase the flow of math and science majors from the high schools to the colleges.

Now, let me talk about what I think we must do. First, help incorporate the quality process into all levels of educational systems with the aim of achieving defect free education. Second, raise the level of public awareness about the education issue in general, and about the need to instill an excitement about math and science in our youth in particular.

Third, increase the access to higher education for all students. They will be virtually unemployable without it. Fourth, foster the collaboration among corporations and the university and K to 12 systems. We're all in this together. After all, lifelong learning will fuel the Nation's productivity for years to come.

Fifth, put more emphasis on research and development of learning systems; that is, the application of educational solutions that take advantage of technology to insure that all students learn at very high levels. And, sixth, reinvest in the continual development of our teachers at all levels. You can not have excellent education without a quality educational staff.

In short, if we are to address our postsecondary educational system, we can not do so without focusing on all levels of education.

I opened with a quote from John Gardner saying a nation is never finished, that it must be recreated for each generation. So it is with education. The challenge to our generation is to recrate a system that serves all our young people so that they, in turn, can continue to recreate our Nation.

The excitement of that challenge lies in the hopeful vision shared by many of a future that sees all our children prepared for a full and productive work life, limited only by their determination and energies. I believe we can all help make this a reality. Thanks very much.

[The prepared statement of Ken Lay follows:]

Kenneth R. Lay
IBM Director of Education
Testimony
House Education and Labor Subcommittee on Postsecondary Education
Washington, D.C.
May 2, 1991

Thank you, Mr. Chairman.

I'm Ken Lay, IBM Director of Education.

John Gardner -- a philosopher, educator and citizen activist -- said, "A nation is never finished. You can't build it and leave it standing as the pharaohs did the pyramids. It has to be recreated for each generation."

Our discussions here are part of a recreating process, and that's why I am very pleased to be with you today.

I appreciate this subcommittee's invitation to testify on the subject of education, a subject that touches upon the vital forces of our country and its ability to compete in a global economy. IBM believes that we have a commitment in this regard, both internally and externally.

IBM is in the information business. We operate in 137 countries and have 373,800 employees around the world. Some 205,500 work in the United States.

Let me begin by discussing our current employee population -- specifically, that in the U.S.

The bulk of IBM hiring is done on the college or graduate school campus. And most of our new employees come with a technical or scientific background.

In 1990, 84% had technical degrees. Thirty-seven percent had Master of Science and/or Ph.D degrees. In 1991, 97% of all IBM new hires will have at least a two-year college degree.

Technical skills are absolutely essential to the conduct of our business.

In addition, the pace of technological change demands that we hire people who have the flexibility to be able to be retrained and refreshed with new skills; so we go to great lengths to continuously upgrade the skills of our existing work force to stay competitive.

We spend more than $1 billion worldwide each year on employee education and training -- or more than $2 billion, when we include the salaries of the people sitting in the seats. In addition, we have an education reimbursement program that allows employees to be reimbursed for taking college and other work-related courses. In 1990, 10,500 employees participated in this program at a cost of $13 million. This emphasis on education has us committed to IBM being a learning organization, that is, one that has a passion for continuous improvement.

In terms of recruiting, we have no concern about the quality or availability of our college hires generally. However, we are struggling to fill our growing needs for people with advanced degrees. We have had to rely more and more on foreign students studying in the U.S. primarily because American students are not entering math and science disciplines. This means we spend more time on immigration issues and sponsorship than we did in the past.

Ideally, our desire would be to have enough U.S. students pursuing advanced math, science, and engineering degrees; however, this just doesn't seem to be the case. Therefore, when we consider the "pipeline" issue in this regard, we become very concerned.

On the other hand, we feel the free flow on brain power is extremely beneficial to the U.S. and IBM. Therefore, we should not, on policy grounds, restrict our economy's access to foreign students especially given the skills shortage that currently exists.

Three gaps help explain the pipeline issue. First, there is the academic gap. Reports by the International Association for the Evaluation of Educational Achievement tells us our high school students rank at the bottom in math and science test scores while Singapore, Korea, Japan, and Hungary are at the top. One of the reports tells us that in Physics, 89% of U.S. schools score below the lowest school in Hong Kong.

Reflecting that situation is the widening skills gap between U.S. and foreign workers. The American economy continues to slide toward low-skill, low-wage jobs. This can impact our productivity growth which, since 1970, has lagged by a third the rate we achieved in the 1950s and 1960s.

The skills gap is increasingly translated into a competitive gap. For example, IBM recently compared operations in our U.S. plants with an IBM plant in Japan.

These plants represent the same company, management system, and processes, but the yields, turnaround times, development-cycle times, and costs are frequently better outside the U.S.

Let's turn our attention to some specifics about our educational system. Enrollments among college freshmen in engineering and computer science courses continue to decline.

In 1984, the country had a shortage of 1,700 Ph.D. scientists and engineers. In 2000, we expect it will be 8,300.

At the same time, engineering job growth will average 25% between 1988 and 2000 while growth from all jobs will amount to only 15%. Interestingly enough, since 1984, total engineering enrollment has declined more than 17%.

Another cause for concern about the pipeline are the people who won't be in it because of the lack of opportunities to attend postsecondary institutions.

Between 1976 and 1988, college attendance rates dropped 2.6 percent for low income students of all races and declined eight percent for low income white males. It decreased 25% for African Americans and almost 16 percent for Hispanics. And while college enrollment increased by 6% for White females, it decreased 16% and 18% for African American and Hispanic females, respectively.

What is particularly dismaying about the drop in minority college enrollment is that 85% of all net new entrants to the work force between now and the year 2000 will be women, immigrants, or minorities.

These groups have been historically underrepresented on the campus and specifically in the math and science disciplines. In 1989, 7.2% of all B.S. engineering degrees went to minorities; and only 4.4% of all doctorates awarded went to underrepresented minorities - African Americans, Hispanics and Native Americans.

Further, of Ph.Ds. awarded in 1989 for Math, Computer Science, and Engineering, underrepresented minorities comprised only 1.6%, 1.1%, and 1.4% of the totals, respectively. The corresponding percentages for women students were 18.1%, 17.5%, and 8.2%; and for foreign students 39.8%, 29.2%, and 42.4%.

In our need for higher skills and more scientists and engineers, we will have to make some radical changes to improve the pipeline that IBM and other high tech companies will be relying on.

The challenges facing postsecondary education are obvious. We must educate more people for college and we must encourage more of those to choose math and science majors.

Let me start with what IBM has done and is doing.

For years, IBM has been a major supporter of colleges and universities including historically Black colleges.

In 1989, IBM announced a $25 million Teacher Preparation and Innovation program. This program selected an area of K-12 reform that involves schools of education and is an area where we felt we could make a difference. 140 colleges received awards of equipment, courseware and training. In return, they will train new and practicing teachers in the use of technology in day-to-day teaching. These 140 institutions touch 25% of all new teachers graduating in June of this year and, as a result, can have a significant impact.

Another new direction in the instructional area is the use of curriculum consortia. The approach is to identify leaders in a specific discipline, structure a joint project involving 5-10 universities, develop technology-based curricular material and disseminate it through t' rd parties.

The prototype for the 5 consortia under way is the Comprehensive Unified Physics Learning Environment (CUPLE) which was structured by the University of Maryland and the American Association of Physics Teachers. These represent just 2 of the numerous IBM programs that amounted to contributions of more than $41 million to U.S. education in 1990.

Focussing on college and graduate programs was natural for us; it is where we do most of our hiring.

However, we also realized that while this "back-end" focus was necessary, it was not enough. We would have to also focus on the "front-end" of education, the K-12 system, if we want to increase the flow of Math and Science majors from the high schools to the colleges.

In the last two years, we have begun 15 new K-12 programs. They include commitments of more than $71 million through 1994 in cash, technology, and technical support.

In addition, approximately 20,000 IBMers in the U.S., or one in ten, are volunteers in the K-12 systems across the country.

Thus, IBM has joined many other companies, as well as foundations and state governments, in declaring that we must help improve American education. This is our challenge.

In broad terms, let me talk about what we must do having accepted this challenge.

First, help incorporate the "quality" process into all levels of our educational systems with the aim of achieving "defect-free" education.

Second, raise the level of public awareness about the education issue, in general, and about the need to instill an excitement about math and science in our youth, in particular.

For instance, it has been shown that there have been increases in math and science enrollments when large national math and science-oriented programs, such as NASA-type programs, are given public policy and funding priority.

Third, increase the access to higher education for all students. They will be virtually unemployable without it.

Fourth, foster the collaboration among corporations and the university and K-12 systems. We're all in this together. After all, lifelong learning will fuel the nation's productivity for years to come.

Fifth, put more emphasis on research and development of "learning systems," that is, the application of educational solutions that take advantage of technology, to insure that all students learn at very high levels.

And sixth, reinvest in the continual development of our teachers at all levels. You cannot have excellent education without a high quality education staff.

In short, if we are to address our postsecondary educational system, we cannot do so without focusing on all levels of education.

I opened with a quote from John Gardner, saying a nation is never finished ... that it must be recreated for each generation. So it is with education. The challenge to our generation is to recreate a system that serves all our young people so that they, in turn, can continue to recreate our nation.

The excitement of that challenge lies in the hopeful vision shared by many of a future that sees all our children prepared for a full and productive work life limited only by their own determination and energies. I believe we can all help make that vision a reality.

Chairman FORD. Thank you very much. And thank you to all of the panel. I've been going through your prepared statements here, including yours, President—am I saying it right when I say Trachtenberg?

Mr. TRACHTENBERG. If we were in Germany, you would be. That was the authentic way, but it's Trachtenberg here.

Chairman FORD. There is some advantage to having a name that consists of two simple four-letter words. And you'd be surprised how the new male telephone operators can misp onounce it, even when I say the name is Ford like in the automobile, they spell Toyota, I guess.

These will be also, I think, a part of what I suggested as a separate printout for this hearing, because I think it may well be the most referred to basic hearing all during the process.

You presented the dilemma here. The President said that he viewed the exporting of educated foreigners as a fine and sound foreign relations effort on our part. And then you came right along behind him, Ken, and you said that you employ people all over the world and you were eating up all of the educated people who were around in those countries with your big company.

When I first came here, there was something that was still struggling to get funded called the Fulbright-Hayes scholarship. My recollection of the theory of Fulbright-Hayes was that we would entice people to come to our American universities. They would become so infected with the American way of life while they were in our universities that they would return to their countries, become prime ministers or other functionaries in the government, and be forever friendly to the United States. Both Mr. Hayes and Mr. Fulbright were on the Foreign Relations Committee, not the Education Committee.

They had, as their motivation, the idea that this was going to be an important tool for us. By the time I arrived here in 1965, it had fallen into disfavor with the Appropriations Committee because, whether accurately or not, they believed that most of the people who were taking a Fulbright scholarship to come here for an education were then going back to their own country and working for IBM or Ford Motor Company or General Motors or somebody else, and never got into government there. That American companies tracked them right back and said, "Here we've got somebody that speaks the language of the country, knows the culture, and they've got an American education. Let's g to them."

And that killed the program. The very fact that American businesses so frequently were identified as the users of the product of that program discouraged the Congress from continuing to support outside education.

Now, there are other forces doing it now. Dr. Deloatch, I gave a commencement a few years ago at a private university that has a good engineering school. And while waiting to speak, I was looking at the list of the graduates by discipline. And that's the way they were going to be called forward for their degrees.

And I looked at the engineers. Now, my part of the country has a lot of people from the Middle East in it. I suppose you've all seen the references during the recent war to the fact that the Detroit

metropolitan area probably has as many Arabs as there are any place in the United States, of all kinds.

And so the names kind of strike me familiarly. I was really amazed that there were more people who sounded like they were from the Middle East than from the United States getting their engineering degree that day. And then I found out that there actually was a real competition amongst countries that had the money to invest in sending people to our engineering schools.

So it's not an accident that there are more foreigners, or proportionately more foreigners, coming here to be trained as engineering than Americans willing to pursue that discipline themselves. There are actually deliberate efforts, either by the economic interests of those countries or the governmental interests of those countries. And frequently in the Middle East, they're one and the same. The family of Iban Sahd is the government; it also owns everything.

The country we just freed has another crown prince that the British put on the throne. We just fought another war and put him back on the throne; he owns everything. So government and economic interests combine and then they say, "We need some engineers."

So they're really investing their money. And private engineering schools in this country are not in a position to say, "Well, we don't want you because we want more Americans." They can pay the tab.

President Trachtenberg, you said that the medical school tuition was $23,000. Do you have any doubt that if you put it up to $50,000 you could fill the medical school?

Mr. TRACHTENBERG. Yes, I do.

Chairman FORD. Not with the same kind of people you have, but——

Mr. TRACHTENBERG. Well, I should tell you that that's a discussion I've had with the dean of the medical school on many occasions because closing the budget gap at the medical school and at the medical center is frequently a challenge for us.

He has persuaded me that the number of people applying to medical schools has been declining in the last several years. It's become a less glamorous profession than it once was. The capacity of physicians to live the kinds of lives that one historically thought came with the M.D. degree has been mitigated. There has been more intrusion into the practice of medicine, both by government and third party payers. Malpractice has made medicine less exciting, at least so it's represented to me.

My own sense is that it's still going to be one of the most exciting and rewarding professions available to humankind. But I think there would a decline. Surely, the quality of the students would go down unless we could find some way to compensate for the tuition with financial aid, which is functionally what we're doing at the undergraduate level.

Next year, tuition at George Washington University at the undergraduate level will be $14,6000. At least that's, as they say in your state, sticker price. But the actual price paid by most of the students will be less between what the Federal Government has been able to do by way of scholarships and loans, what we do with

our own philanthropy—I can't speak and whistle at the same time. I don't know where that's coming from.

Chairman FORD. We need an engineer very badly. It's been distracting, and I apologize to everyone. I've been attending hearings in this room since 1965, and I don't remember this phenomenon. We must have a new engineer on the job.

Mr. TRACHTENBERG. It is, essentially, to discount the sticker price for students who we think can benefit from the academic experience, but who can't pay the freight. And that's fine so long as the institution has the ability to do that

But as we construct next year's budget, we're functionally going to be funding two things, new things: more tuition, discount, more scholarships, and modest raises for faculty and staff. And most of the other things in the University that we had hoped to do are going to have to be put off until another budget cycle.

Now, we're not alone in this. I'm not here to whine and snivel. This is a problem that hospitals are having in this country and that many other university systems are having in this country. But I do think it's an issue that needs to be addressed.

Chairman FORD. Let me ask you, as a panel, one final question and then I'll turn it over to Mr. Hayes. One of the uneasy feelings that comes through from the previous panel is that as soon as we let ourselves concentrate on the needs of employable training, or training people for the needs of American industry, it's very easy to slip over into what I thought I heard Dr. Deloatch say that we have to do something with Federal policy to encourage more people to go toward engineering. Mr. Lay says we've got to do something with Federal policy to encourage more people to go toward math and science.

And during the modern tradition of this legislation, it was very distinct from the National Defense Education Act, which was triggered by Sputnik, that said we need more teachers so we're going to encourage people to become teachers. And we need some more scientists so we're going to encourage more training of the kind that you two gentlemen are talking about.

From 1965 forward, however, we resisted the idea of suggesting directly or indirectly that a scientific or medical education was superior to an education in art appreciation or pre-Columbian art or music appreciation or being a musician. And we said we don't want the Federal Government to be attaching any kind of strings to aid that directs people's career choices. Maybe we have to rethink that to a certain extent.

But in what ways do you gentlemen perceive us nudging people toward these goals with Federal policy? The obvious one is the way we did it with medicine, for example, for years by saying if you will enlist for a period of time in a public health service, we'll pay part of your education. Those programs, unfortunately, were killed during the last administration's cutting and slashing of programs in the budget. They weren't under this committee; they were under the Energy and Commerce Committee.

We no longer can afford, they tell us, to forgive teachers loans so we can get more teachers. But how would you go about it without a lot of money, nudging people in these directions?

Mr. TRACHTENBERG. I think the issue really does come down to how many dollars you've got. There's going to be, it seems to me, some minimum foundation that you're going to want to use in a general way. And if you are satisfied that you are providing a minimum foundation sufficient to address a consequential portion of the need in the country, you could then, I think, talk about developing categorical aid programs specifically designed to induce people into certain kinds of careers.

It's not the worst thing in the world that somebody elects to go down one career path or another, assuming they've go the competence and some interest in it, if the financial aid is available. And, indeed, I think an awful lot of people make decisions on that basis now.

But we're not doing that. In fact, what we're doing is going in the other direction. I'll give you one example. The ROTC does not, I think, specifically require that students do engineering education in order to be a part of the program. And, indeed, they do have students who do engineering and some do international affairs and other things.

But they imply in ways that, apparently, many of the students understand that engineering is a smiled-upon discipline and that the career options for the graduates after they've been commissioned will be greater if they have degrees in engineering.

And a significant number of our engineers at George Washington University are Naval ROTC cadets who then go on, get their degree, serve in the Navy and then either continue with military careers or come back into the civilian work force trained as engineers. I must say that a very considerable portion of those engineering students are also minorities, so we're really getting a terrific yield for our investment dollar.

The ROTC is in the process of cutting back its program by about 20 percent, and I think that will inevitably have an impact on some of the issues that Dean Deloatch addressed and that Mr. Lay invited our attention to.

Chairman FORD. Well, for the little bit of nudging we would be able to do, aren't we really swimming against a pretty strong tide that is created by the perceptions of people out there about how to make out in life? I mean, I can't think offhand of any kind of television programs or even ads on television that portray the people going to the country club in their air conditioned Rolls Royce as engineers or mathematicians. It's usually doctors and lawyers and M.B.A.s, corporate bigwigs.

Dr. Deloatch, how many of your student do you suppose would realize that for the first time in modern history all three of the big automobile companies are being run by engineers, not M.B.A.s. And many of us are pleased to see that sort of shift taking place.

But do they identify at all with a Lee Iacoca, $13 million a year? His training is not an M.B.A; his training is as an engineer. He started out making cars. Now, I think there's not very much attention given to the fact that some engineers do very well indeed and that most engineers can look toward a pretty stable future.

All I see is more and more people, including members of the minority groups and women, running toward M.B.A.s because that's the picture they see of economic success out there. Now, we're

swimming toward that tide, and I don't know how you turn it around. But I have the suspicion, and I'd be willing to have you disagree with me, that a lot of education decisions, maybe most education decisions, are made with economic goals, not with altruistic goals of one kind or another.

I don't think we're back in the sixties when most kids said as entering freshmen they were going to college to improve the world or improve America or improve the status of their particular class. And now, most of them say when interviewed by the college board when they enter college, 77 percent say, "to make more money."

Now, how do you buck that with something as unsexy as being a mathematician or a scientist?

Mr. DELOATCH. I don't know where in my testimony I called for some targeted sort of approach to getting more kids involved, let's say, in engineering. I don't know exactly where I made that statement.

The statement I am making, and I think we've got to do as engineering educators, is to maintain our fraction of the graduates from the high schools coming and selecting engineering degrees. That's the first thing, and I think we're doing fairly well in that. Nine to ten percent of the population exiting high schools going on to the universities will select engineering careers.

Once they've made that choice and come to us, then there are some problems. We do not maintain those students as well as we'd like to. Now, one of the things that we're not doing well is telling them up front that we're talking about a 4.7 year average to exit an engineering program. We're doing everything we can to try to work on that. If it can be 4, we'd like to make it 4. But if it must be 5, I think we might have to have some truth in advertising.

But the situation is that's one of them we're working on. The second one we must work on is that there are other reasons for leakage in the university pipeline. And one of those that we talked about is the cost of this education and the ability to stay with it.

The minority youngsters are succeeding at a rate of only 30 to 35 percent in engineering. It is not because of the ability, because the ability was tested out by the SAT scores and the high school records they bring with them. It has many other things tied to it. And if we can tie that back to the fact that, yes, on an average, and this is statistical, that the average minority family in this country has at their disposal 60 percent of the income for majority families, there is no accessible funds there even to go to school. The kids did not realize that when they walked in the door.

You can pay your tuition and fees for the first semester, but many people do not realize that it's going to cost you $350 more to simply have the books to read from in order to get through the first semester. It is very difficult, if we will let ourselves move back, to the actuality of many families in this country. They can not afford the education which the kids are capable of receiving.

So the kids, then, find a way to try to survive and they start working and doing other things. It takes things off whack.

There is one other thing you talked about just before, and I think if you're looking at names of graduates of engineering students at the school that you spoke at, you are looking at graduate degrees

being awarded to students at those schools. Most likely, you were seeing the names of the Ph.D. recipients in engineering.

And in so doing, you were also looking at the future engineering faculty in this country. Some very high percentage, more than 50 percent of all the engineering faculty hired over the last two to three years, are overseas students or graduates from overseas.

At the same time, the first degree for these people, for the most part, was received in their home country, not in this country. And so we have a situation here that when you find people in front of our young people who are trying to aspire to be the captains of industry in this country, who are having people address them that do not understand their culture, their language, their ways of doing things, and then trying to drive them into professions that would emulate the person in front of the room, the students turn off.

There are many, many complex situations, and much of this falls back to the ability or the capability or the finances available for people to get the education which we know we need so much. And it has nothing and not a lot to do with this 10 percent and their ability to do engineering or science efforts.

That's one of the things I want to make very clear. We're not talking about the whole 90 percent who don't go to engineering; we're talking about the 10 percent who do. And those 10 percent are well qualified and well prepared to complete an engineering degree if we make the environment ready for them. That's my point.

Mr. LAY. You asked how we might nudge people into college. I think one of the things we have to address is this national case of self-denial that we have. You did mention before that one out of every four high school students drop out. You did mention that another one out of four graduate, but with skills that are below the sixth grade level, which says that half of every high school cohort is virtually unemployable. Most people don't know that.

Most people in the country don't know that we're at last in math and science. Most people in the country don't know that——

Chairman FORD. I think that people will accept as stated fact that our kids test below other countries in math and science, but do you know what the reaction is? So what? There's not a very broad appreciation, if any at all, amongst the American public that it makes any difference.

Mr. LAY. Part of the public opinion piece has got to be a recognition that because of the competitive situation it puts us in, we're talking about a real economic situation, and one that's going to have some economic ramifications in the future. And that does touch every person.

One of the things that people also don't know about is when you take a look at a book like The Unfinished Agenda, the value or the investment, the positive investment you make by investing in early childhood, when you invest a dollar there you save an awful lot years later.

So I think one of the issues we having to address is raising the level of public awareness to the competitiveness and economic nature of this education issue.

The other thing to focus on is early childhood education, because that in and of itself will help address many, many of the ills that come later on.

And, thirdly, many students do not enter into math and science at the college level because they have not been adequately prepared beforehand. There has been a deemphasis on math and science earlier in their education. In addition to the fact that only one-third of the schools in this country, high schools in this country, teach calculus and only two-thirds teach physics.

So we have to take another look at what we're doing with our children before they get to college so that when they do get there they are prepared, if they choose, to go into math and science. We have to instill in them a love of math and science.

And, by the way, as you mentioned before, the media does play a role in that. If we had some role models on television and radio that were the engineers, in addition to the L.A. Laws of the world, that might be of benefit as well. We have to change public perception of the image of scientists and engineers. You generally don't find them walking along with the very thick glasses and slide rules and with beakers in their back pocket. It's a very different wold and most young people don't have an appreciation for that.

Chairman FORD. Well, my generation looked up to the engineer because they did something. They built something; they built bridges. Boulder Dam was the big thing when I was growing up. But that isn't what turns kids on today. You just said it. The L.A. Law guys get the good-looking girls and the fancy cars. What's the engineer doing?

Mr. LAY. When we bring young people to our labs to expose them to how we manufacture chips, they're absolutely fascinated, absolutely fascinated. And I would imagine that the young people that they bring to the design and engineering plants in Michigan of our auto manufacturers, I would imagine they would be fascinated just as well.

We need to find ways to expose our young people to it so they can see it, touch it, and feel it. Then they'll gain an appreciation for it.

Chairman FORD. Thank you very much. Mr. Hayes.

Mr. HAYES. Mr. Chairman, I want to apologize first for not being able to be here to hear the entire testimony of the witnesses. It's unfortunate that sometimes we have scheduled three hearings dealing with different phases of our Education and Labor Committee's programs.

I have three questions, which I think won't require long answers. Two I would like to direct to you, Mr. Lay. As I look at your written testimony, your prepared testimony, you say that 97 percent of your new hires in this year, 1991, have at least a two-year college degree.

To your knowledge, do other major corporations have the same comparable standards?

Mr. LAY. I really don't know the answer to that. I really do not know.

Mr. HAYES. This is something that may be peculiar to IBM?

Mr. LAY. Again, it's hard for me to say. I really don't know.

Chairman FORD. All right. You also say in the same written testimony that IBM has had to look to foreign sources to fill employee needs. If we don't do something to prepare U.S. students for jobs with IBM or other major corporations, what will happen to these workers?

Mr. LAY. Well, I think it's incumbent upon us to insure that we can fill our requirements with the kind of skills we need. And one of the ways of doing that is by not just investing in our current employees, but investing in American education, both at the university level as well as at the K to 12 level, to insure that we're getting enough people into the pipeline.

We invested last year in this country about $41 million in universities focusing on trying to improve the output, trying to improve the skills of the people in the university work force. In addition to that, we spend over $24 million in the K to 12 environment trying to do the very same thing, trying to increase the pipeline of well qualified students and also trying to, where we could, direct them toward math and science.

So I think what we try to do is invest in American education to insure that we increase both the quality of students as well as the quantity of students.

Mr. DELOATCH. Could I say something? You know, one of the saddest things and toughest things for me as a dean, on an almost day to day basis, is to have a young man or a young woman whose family was so proud of them when they left high school and they filled out all the papers and did all the things to get accepted and admitted into the university, and even more so, into and engineering program. And then somewhere, three, four, five months downstream or the second semester, generally, come into my office and say that they can not continue, for reason and only one reason—because they don't have the financial wherewithal to do that.

When that young person turns away and goes out that door, he or she has been lost to IBM because there's a difficult way to get back in. I heard some coming in and going out, but engineering programs don't lend themselves very well to that, and neither do science programs.

It's not a problem of us having some youngsters who are ready to play in the arena. We have a mismatch in terms of the vast resources we have in this country and getting to the places where they have to be if we're going to remain competitive in this global market place in a science and technological way.

And I don't understand it because I know what we have in terms of resources. We simply don't appear to have the will to compete with the countries that know the way to win is through science and technology. I think we keep going back to grade one, grade two, grade three. We're losing 12,000 black engineering potential a year because, in most part, financial resource needs and, also, the lack of role models in front of those classrooms who understand the plight of those young people and what they've had to go through in this Nation to be at the place where they are.

And because of that interface and lack of interaction, we lose valuable talent. And I think it's important that we understand that. And whatever we do and attempt through this reauthorization act to make things happen in this country, that's the way to

do it. We've got to get the finances where they belong and have to be.

Mr. HAYES. In the interest of time, the last question I have I probably direct it to Mr. Deloatch. How do we entice minorities and women into these fields of technology, considering these are the jobs that will be in abundance in the year 2000? How do we do it?

You mentioned the question of financing, making more of that available, but actually, less finances are being made available to kids who may want into these and other postsecondary schools.

Mr. DELOATCH. Let me say this. Many of these young people—I'm at an institution, again, an urban institution, where I have a profile of my student. The student comes from a family of about 5.4 or 6 people per family. Fifty-three percent of the time it's a single family head of household. In many cases, they're having more drive to go to school than would be those coming from dual family head of households because of the commitment to change their life and what has happened to them.

Everything is there except the fact that in this great Nation their resources are not placed at the right place to do it.

Mr. HAYES. Do you think that's by accident or design?

Mr. DELOATCH. Every time you turn one of these youngsters from that size family back to that family after they have aspired to get out and go to the university, you have killed the other four. You can't—you must see that you can do this as a waterfall effect. All you've got to do is to get those who are in to complete those things, go back and be role models.

And I'll tell you frankly that the starting salaries in engineering, when you go from zero in four to five years to an income that's twice that which your parents make, in the area of $38,000 to $40,000 a year starting salary, you change it overnight. And I'm telling you if we let these kids keep going in the swinging door you're not going to have the pool that you want.

I know it's what it's about. It's about finances and getting them to the sources where they're needed. And these kids will solve the problem for us. But if we try to solve the problem with intellect, it's not going to happen. So I don't know how else to tell you, but we have a problem of a mismatch with what financial capability we have and where we're placing those finances. I see that as the primary problem for minorities.

We have another set of problems for women, and that relates to how the present faculty and the present leadership in engineering sees who should be there. We're solving that problem. We're going to change that problem. But that's a tough one, too. So we've got some serious problems in this country, and not all of them are about the capability of these kids we keep talking about. These kids can play, and they're willing and ready to play, and they're capable of playing. We, as the adults, have something to do.

Mr. HAYES. Mr. Trachtenberg and Mr. Lay, do you share the opinion or do you differ with the opinion?

Mr. LAY. I would add one thing. In addition to the financial implications, I think there's also a preparedness issue. We're losing one out of three majority engineering students somewhere along

the four or five years, and we're losing two out of three minority students somewhere along the line.

I think if you were to put that in Detroit terms, that says that we're not doing well on our assembly line. What we've got to do is insure that all the majorities and all the minorities get across the line. And I think while finance is one of the issues, I think another issue might be preparedness.

How well can we be preparing our students for the engineering disciplines if only two thirds of our high schools teach physics and only one third teach calculus? I don't think we're preparing all our students as adequately as possible so they have the very best shot at pursuing whatever technical career they wish and completing it.

And I'll give you a number to think about. Of one 100 students that enter the ninth grade, five will graduate from college eight years later. And of those five, less than one will be a minority and less than one will have a technical degree.

We've got to put the right kind of support mechanisms, intellectually as well as financially, in place so that we insure that everyone who comes in the door exits the other end successfully. And we've just not done as good a job of that as we could.

Mr. TRACHTENBERG. Let me, if I may, try to connect the remarks that have been made by my two colleagues here. I think there's a need for pre-college programs that expands the pool of potential engineering students in general, and particularly among minorities. And one of the ways that you'll be able to induce students to enroll and put out the effort to be involved in the pre-college programs and then to go on to do the Bachelor's degrees and then, perhaps, Master's degrees in engineering, is if they genuinely believe that the resources are going to be there for them.

We've heard a great deal in the last couple of years about the "I have a dream," program. I think what its biggest virtue is that it made kids who didn't think they had any possibility of going on to college or university believe that there was a possibility, and if they got in, the dollars would be there to carry them through.

And it also provided them with the counseling and the support and the tutorial help they needed during their pre-college years so that when the door was opened because the money was there, they were ready to walk through that door.

And what we're really talking about, although this is a higher education authorization that we're talking about, what we're really looking at in this final part of the discussion is an ecology of education that starts at pre-kindergarten and runs all the way through the Doctoral program.

And, frankly, if we don't get with the program, I think we're going to see IBM doing more and more of its work in Ireland and other parts of the world, just as more and more American companies are taking various of their programs offshore. I think it's a daunting problem for us.

Mr. HAYES. It couldn't be that they've given up on our young students here, as many of them want the opportunity and are denied the opportunity? I would venture to say that if confronted with a situation even if an African American student had completed his engineering degree, and you had three students, one African American, one white, and one woman, lined up for one job as an engi-

neer with IBM, my guess is, my feeling is, based on the current trend, that the white male would probably get the job more than either of the other two.

That's the reason why we need the Civil Rights Act.

Mr. DELOATCH. I don't want to disagree with you too strongly on that, but I would think that possibly the woman might get the job at this point right now. And I think that's good. I think it's healthy.

I think that there are some other issues, though. I think the one you said that giving up on our youngsters—let me just tell you, I heard the chairman earlier today allude to the Desert Storm situation and so forth and talk about the kind of reaction we got and what the quality of forces were in terms of education.

I'll tell you frankly, I don't know how to do it. But if I had that kind of model where nobody failed when they come into my shop coming to be an engineer, and the reason they don't fail is because I feed them, I house them, they sleep well, they get a stipend. The whole works is in place.

I'll tell you frankly I will turn out 90 percent of all the engineers you send to me regardless of what they are—African American, Hispanic, women, whatever. But you don't do it that way. And since you don't do it that way, you get back what you pay for.

And that's our problem. We are not concerned about our young people. I tell you the quality of these kids who come into the university and walk into that door are high. Many of those who don't make it through engineering, yes, finish at the business school or finish in psychology or something else.

The reason, though, they're not finishing in engineering is because we're paying the price for something we did before. In our graduate research effort we did not have in those laboratories any young American people, and as a result of that, we're not having those young faculty members up in front of these kids.

I think there's some critical things we need to examine, and if we keep going the way we're going, I can predict for you where we will be 15 years when we come back to this hearing room.

Chairman FORD. Mr. Serrano.

Mr. SERRANO. Thank you, Mr. Chairman. I'll be brief. First of all, Mr. Chairman, let me apologize. Like Mr. Hayes, I was at different subcommittee meetings of the same committee, and I know you take attendance on all of them so I just wanted to be on record as having done the right thing.

Chairman FORD. Mr. Serrano, since you're a new member of the committee, I tender this as friendly advice: When in doubt, come to the Chairman's meeting.

Mr. SERRANO. Yes. Mr. Hayes advised me to make sure to come to the one where there are not too many members so you can be seen.

Basically, I just want to comment, although I'd love to place to you a question. But I think all three of you have touched on it. You know, I attend a lot of schools in the South Bronx, and I notice something. I visit a lot of schools and I notice something. Whenever there's either job fair or a whenever there's a school play with young people talking about the future, it's usually, in general terms, try to go to college.

When we get specific, there's lawyers and doctors. But very few times does any young man or young woman get to play the role of an engineer in that school play. And there doesn't seem to be, in my opinion, a push, an introduction, even early on, that this is one of the other very important professions available.

And so I think a lot of our young people are growing up feeling that if they aspire to go past, you know, to get past that 60 or 50 or whatever the figure may be percent dropout rate that I have in my community, there are these, either general areas or specific law or medicine that's in their mind.

And as I'm listening to you, I'm realizing that in the South Bronx, for instance, you just don't hear someone say engineering is an option, a good option, and it's one we need. And yet we hear from IBM that we're going outside the country to find them, which I understand is a business decision.

But I think it's as important to IBM as it is to our school system to understand that we just can't keep going out of the country.

And, again, just a comment, but if any of you may know why it is that somewhere along the way——

Mr. LAY. If I could comment on that. While we do go—in all the countries in which we do business, we hire nationals whenever we can so the bulk of our employee bases are made up of nationals. One of the things that we're trying to focus on is insuring that the pool of people that we select is broad enough and good enough so that we can draw the best we can. That's why we're spending as much time and energy as we are on the American education situation.

But, more specifically, about the Bronx, I visited Roosevelt and Taft on a number of occasions, and I think part of it is that the young people there don't see people who look like themselves doing engineering. I think they see law enforcement people; I think they see people in those kinds of professions. But they tend not to see people from high technology corporations. They tend not to have discussions about math and engineering.

When I ask them what kind of jobs they're looking for, they're very unspecific. And what they're looking for is a job, almost any job. And now, while the people think the South Bronx may be different from any place, and it does have its unique problems, there are many cities around the country that have problems that may be as severe as the South Bronx.

And I think part of it is that has become an enclave unto itself, and people from the business community have not invested as much time as we need to reaching in there and giving those people the kind of role models they need early enough so they can change their academic program so that when they do come out they have a vision that they can be something other than what they perceived before.

Mr. TRACHTENBERG. Just a footnote in response. Let's assume that you're right. I'd be delighted if the minority youngsters wanted to be lawyers and physicians and were able to then carry that ambition to fruition and see it happen. Our problem is not that we're not seeing Hispanic and black engineers. Our problem is we're not seeing black and Hispanic engineers in sufficient numbers, nor physicians, nor lawyers, nor a whole variety of fields.

When I was a dean many years ago, I used to say to freshman black students, "I want to imagine something with me. I want you to imagine that on the day you graduate from university, a meteor passes by the earth and all the white people in the world disappear.

"Now, there's still going to be a lot of folks out there, people of color, and they're going to get sick and they're going to need doctors. And their teeth are going to need to be drilled, and they're going to get into hassles and they're going to need lawyers. And there are no white doctors and there are no white lawyers and there are no white dentists. Who is going to do the job for them? If it's not you, the answer is nobody."

Now, I'm proud to say that many of the students that I personally taught are today physicians and lawyers, but the numbers are altogether too small. And in engineering, it's particularly daunting. And it may well be because while the numbers are small in physicians and lawyers, there are black lawyers and there are black physicians. In engineering, the numbers are so small as to almost be statistically insignificant.

Chairman FORD. Thank you very much. The committee stands in recess.

[Whereupon, at 1:35 p.m., the committee was adjourned, subject to the call of the chair.]

[Additional material submitted for the record follows.]

Testimony Submitted to the
Subcommittee on Postsecondary Education
U.S. House of Representatives

by

Stephen J. Blair
President
National Association of Trade and Technical Schools

May 2, 1991
2175 Rayburn House Office Building
Washington, D.C.

Mr. Chairman. I am the President of the National Association of Trade and Technical Schools (NATTS), an organization that represents approximately 1,200 private career colleges and schools educating nearly 700,000 students. I appreciate this opportunity to share my thoughts with you in conjunction with your hearing on the reauthorization of the Higher Education Act.

I believe it is especially appropriate that you are beginning your consideration of the future of federal financial assistance programs by examining who is in the education "pipeline" and the challenges we face in building the workforce of tomorrow.

Congress is considering the reauthorization of the Higher Education Act at a critical time in our history. Clearly, the decisions you will make at this important crossroads will have a major impact not only on our nation's economic future, but also on the lives of millions of Americans.

Growing international competitiveness and rapid technological change make educating a skilled workforce more important than

ever. Ensuring that all our citizens gain the education and skills needed to make a productive contribution to our economy is essential if we are to survive in the global marketplace of the 1990s and the 21st century.

At the same time, we must recognize that, here at home, we face a widening gap between rich and poor and a decline in real wages for most American families. By opening doors of educational opportunity, we can help more Americans -- especially those who have been battered by the economic changes of the last two decades -- achieve the American dream.

I would like to share some of my thoughts about who is in the education pipeline, how they can best be served by the current system of postsecondary education, and how postsecondary institutions can help us meet our workforce needs. In addition, I will explain more specifically how private career colleges and schools fit into the picture and the important role they will play in helping us meet these challenges.

THE EDUCATION PIPELINE

It is important for us all to understand that today's elementary and secondary students -- and thus the postsecondary students and workforce of tomorrow -- are vastly different than what existed when the Higher Education Act was first written 25 years ago. Elementary and secondary student bodies today contain far more low-income, minority, and immigrant young people. This is especially true in our inner cities.

The U.S. Department of Labor's landmark study Workforce 2000

documented that in the 1990s our workforce will increasingly be made up of women, minorities, and immigrants. Despite efforts to improve American schools, we know that many of these people will enter the workforce ill-served by elementary and secondary institutions. Far too many will have failed to graduate from high school.

At the same time, Workforce 2000 found that during the 1990s the workforce will grow at the slowest rate in decades. We cannot afford to ignore any potential worker. We will need productive contributions from all of them.

These facts tell us that we must make strenuous efforts to serve all our citizens. While we must continue to improve elementary and secondary schools, we cannot afford to ignore those who may have dropped out of high school or those who we have failed to serve adequately. We must work to recapture them and bring them back into the education pipeline.

In practice, this will mean ensuring that ability-to-benefit (ATB) and General Equivalency Degree (GED) students can continue to be served by postsecondary institutions. It will also mean doing a better job of explaining the wide spectrum of educational opportunities that are available -- from four-year universities to community colleges to private career colleges and technical schools. People must understand that our pluralistic system of postsecondary education has programs that can best meet their interests, needs, and abilities.

MEETING OUR WORKFORCE NEEDS

This pluralistic system of postsecondary education is also vital to meeting our workforce needs. After all, while an efficient and productive economy relies on its educators, doctors, and engineers, it also requires greater numbers of technicians, medical assistants, computer programmers, and others who are trained at private career colleges and schools. Our nation's economic future requires skilled workers who are educated and trained from the entire spectrum of postsecondary education.

Last summer, the National Center for Education and the Economy's Commission on the Skills of the American Workforce noted that 70 percent of the jobs in the year 2000 will require some kind of postsecondary technical education, but only 20 percent of those will require a traditional baccalaureate college degree. Discussing the jobs that will not require a baccalaureate degree, the panel wrote, "These jobs are the backbone of our economy, and the productivity of workers in these jobs will make or break our economic future."

The nation's 4,000 private career colleges and schools provide career-specific education for more than 100 professions that our essential to our economic future. If we are going to build the kind of skilled workers we need to compete in the 1990s, we must nurture this vital sector of postsecondary education. A major segment of tomorrow's workforce depends on it.

When we look to the workforce of the future, it is also important to remember people who are already working today. The American Society for Training and Development estimates that as

many as 50 million of today's workers will need additional education and training opportunities over the next decade. Many people in the years ahead will need training -- simply to upgrade their skills for their current jobs, to keep up with changing technologies or to move into new career fields.

As you well know, postsecondary institutions are serving more and more "older" students. This is particularly true of private career schools. Working with the business community, we will continue to play an important role in helping current workers improve their skills.

Today, in fact, most private career colleges and schools have active and strong working relationships with business and industry. Most institutions have business advisory councils that meet regularly to advise the schools about curriculum and the entire education program. These councils help ensure that programs remain up-to-date and that students get the kind of education and training businesses need.

AICS/NATTS REAUTHORIZATION LEGISLATIVE PROPOSAL

Working with the Association of Independent Colleges and Schools (AICS), NATTS has developed a comprehensive legislative proposal for the reauthorization of the Higher Education Act. We have shared this proposal with this Committee.

While I will not take this opportunity to give a detailed explanation of the plan's many components, I look forward to doing so in the future. I would also welcome the opportunity to answer any questions members of the Subcommittee may have about our

proposal.

Today, however, I would like to stress that the entire package is designed to help the nation meet its workforce needs. Primarily it does this by ensuring that more people will have access to the aid they need to gain workforce skills through postsecondary institutions. The major attributes of the package are that it will:

- o provide access to postsecondary education for all students;
- o respect the great diversity of opportunities offered by our pluralistic system of postsecondary education;
- o restore a better balance between grants and loans;
- o improve the integrity of the aid programs through greater accountability;
- o enhance the effectiveness of the programs through simplification and improved administration;
- o improve the predictability in how much aid will be available to help parents and students plan; and
- o create a new student support services program for disadvantaged students.

I do not believe it is any exaggeration to say that the reauthorization of the Higher Education Act is the most important piece of domestic legislation facing Congress. It will determine whether our nation meets the economic challenges of the future. And for millions of people it will decide whether they have the opportunity to pursue their version of the American dream.

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