

ACCESS AND ACHIEVEMENT

Building Educational and Career Pathways for Latinos in Advanced Technology



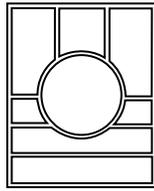
REPORT ON A
NATIONAL STUDY
OF LATINO ACCESS
TO POSTSECONDARY
EDUCATION AND
CAREERS IN
INFORMATION
TECHNOLOGY



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The Tomás Rivera Policy Institute (TRPI) advances informed policy on key issues affecting Latino communities through objective and timely research contributing to the betterment of the nation.

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FOREWARD

This document is intended to be both a final summary report of research conducted under National Science Foundation (NSF) Grant 0119858, as well as an essay on the general state of research and policy analysis pertaining to Latino access to and achievement in technical career paths.

Pertaining to the first objective, the authors will provide an overview of the methods and procedures of the NSF study, cite key findings, and discuss strengths and shortcomings of the project. To this end, the presentation of findings will be selective rather than comprehensive. The co-investigators on the project have previously published a number of more focused and detailed reports that are referenced in this document.

Regarding the second objective, this summative essay will deal more broadly with how to get a research and policy “handle” on the continuing problem of Latino involvement in the knowledge economy. In addition to reviewing our results and the more general literature in this context, the authors will make a number of program and policy recommendations. These will have relevance for both our funder the National Science Foundation — as well as various federal, state and private organizations working in this area.

We would like to acknowledge the AT&T Foundation (formerly the SBC Foundation) for supplemental support allowing for the publication of this report.

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PATHWAYS TO TECHNOLOGY CAREERS IN THE KNOWLEDGE ECONOMY

The purpose of this introductory chapter is to articulate the policy, substantive and methodological framework for this study and the results that will be presented.

CAREERS IN THE KNOWLEDGE ECONOMY

One of the generally accepted premises of current economic thinking is that a large and expanding proportion of growth is tied to what has come to be known as the "knowledge economy" or equivalently, the innovation sector. Some of the defining characteristics of this economic trend include:

- An increasing proportion of products and services that rely on a high degree of knowledge content in how they are either designed, manufactured or marketed.
- A key role being played by workers and managers who are trained in either physical or biological science, engineering, mathematics or computer sciences.
- A globalization of commerce that has been facilitated by advances in transportation technology, telecommunications and the Internet.
- A growing importance of the small, technology-based entrepreneurial company as a source of innovation and a generator of jobs.
- A key role for education — K-12 as well as colleges and universities — as producers of the skilled employees needed to operate in this new economic system.



The focus of this project is on the science and engineering work force component of the knowledge economy, particularly the subcomponent involved with computers and information technologies. In a very real sense, the U.S. has been living on borrowed assets to meet its work force needs. A large number of those currently employed in the knowledge economy are over 40, male and Caucasian. However, a large and growing segment are foreign-born or Asian Americans and still mostly male.

In contrast, the projected demographics of the future work force will be heavily concentrated among women, African Americans and Hispanics. For example, women now constitute a majority of all students enrolled in bachelor's degree programs, and 46.5 percent of total employment. Minority group members — including Asian Americans — account for 27.2 percent of enrollment in higher education.¹ At the same time, with the exception of Asian Americans, none of these demographic groups are proportionally represented in the science and engineering work force, including the primary focus of this study — information technology (IT) fields. Illustratively, women account for about half of the college-degreed work force, but only about 25 percent of the science and engineering work force. Among minority groups, African Americans, Hispanics and Native Americans participate in the science and engineering work force at a rate that is 25 percent to 50 percent less than their representation in the population. Among racial/ethnic groups, only Asian Americans participate in science and engineering occupations at a rate that is commensurate, in fact

higher, than their presence in the population. Across all racial/ethnic groups the participation rate of women in science and engineering occupations is significantly lower than that of men. In effect, there is a glaring under-representation of these groups in the current and emerging science, engineering and technology work force.

For example, despite recent U.S. Census Bureau data indicating that Latinos now constitute the largest minority group (over 10 percent of total U.S. population), their representation in science and engineering jobs and/or in the science and engineering educational pipeline is quite low, particularly in information technology-related fields. For example², among employed scientists and engineers as of 1997, Hispanics accounted for only 3.1 percent, a figure that was relatively unchanged during the 1990s. Notably, Hispanic women accounted for a discouraging one percent of science and engineering employment, suggesting an important ethnicity by gender interaction.

These patterns of under-representation are present in virtually all science, engineering and technology disciplines and careers, although they are accentuated in certain fields. For example, in terms of employed scientists and engineers, white men account for 63.2 percent of all science and engineering jobs, 59.1 percent of computer and information scientists, and 74.7 percent of engineers. Only among social and related scientists are they not in a numerically commanding position.

¹ The data in this section are primarily from: BEST — Building Engineering and Science Talent, *The Talent Imperative: Diversifying America's Science and Engineering Workforce*. San Diego, CA: BEST, April, 2004, Chapter 1.

² The data in this section are from various tables in: National Science Foundation. *Women, Minorities and Persons with Disabilities in Science and Engineering: 2000*. Arlington, VA, 2000 (NSF 00-327).

PATHWAYS TO CAREERS IN INFORMATION TECHNOLOGY

For the purposes of this study, we have defined information technology workers according to the following taxonomy:

TABLE 1 IT JOB TYPES			
POSITION TYPE	ROLE	SAMPLE TITLES	
TECHNICAL POSITIONS	Architects/Specialists	Design IT products and systems based on broad insight and deep technical knowledge.	Applications Architect Digital Media Producer E-Business Specialist Network Architect
	Developers	Develop or customize IT products and systems based on designs created by others.	Business Systems Analyst Multimedia Developer Network Engineer Programmer/Analyst Software Engineer Technical Support Engineer Web/Multimedia Developer
	Technicians	Install, administer, test and maintain IT products and systems.	Database Administrator Lead Technical Support Specialist Software Quality Assurance Technician LAN/WAN/Internet Administrator Web Administrator Web Page Designer
NON-TECHNICAL POSITIONS	Operators/ Front-line Supporters	Operate or facilitate use of IT developed by others.	Help Desk (Level 1) PC Tech Support
	Technology Service Providers	Support the work of IT technical workers by providing services such as communications, sales, marketing, recruitment and training.	Product Marketing Specialist Technical Writer Technical Recruiter Technical Salesperson Trainer
	Technical Managers	Manage workers who develop and maintain IT products and systems and those who provide IT services.	Chief Information Officer Project Manager Technology Division Manager

In the recent past, one could enter information technology without formal training in the field, although higher level jobs still typically required at least a bachelor's degree in a computer-related discipline or in some other area of science, engineering or technology. As the field has evolved, formal education and training in IT have increasingly become the pathway to careers in the field.

Graph 1 shows the IT job levels at which new entrants to the field with particular degrees can typically enter. Note that public and private two-year institutions typically grant advanced certificates (equivalent to two semesters of full-time study) and Associate of Applied Science degrees. Four-year private career colleges typically grant Bachelor of Applied Science degrees. Some of these four-year career colleges also award Associate of Applied Science degrees. Bachelor of Science programs in information technology tend to be the purview of traditional four-year college and university programs.

Hence, formal education, with at least some education necessary at the post-secondary level, has become the principal pathway to careers in information technology.

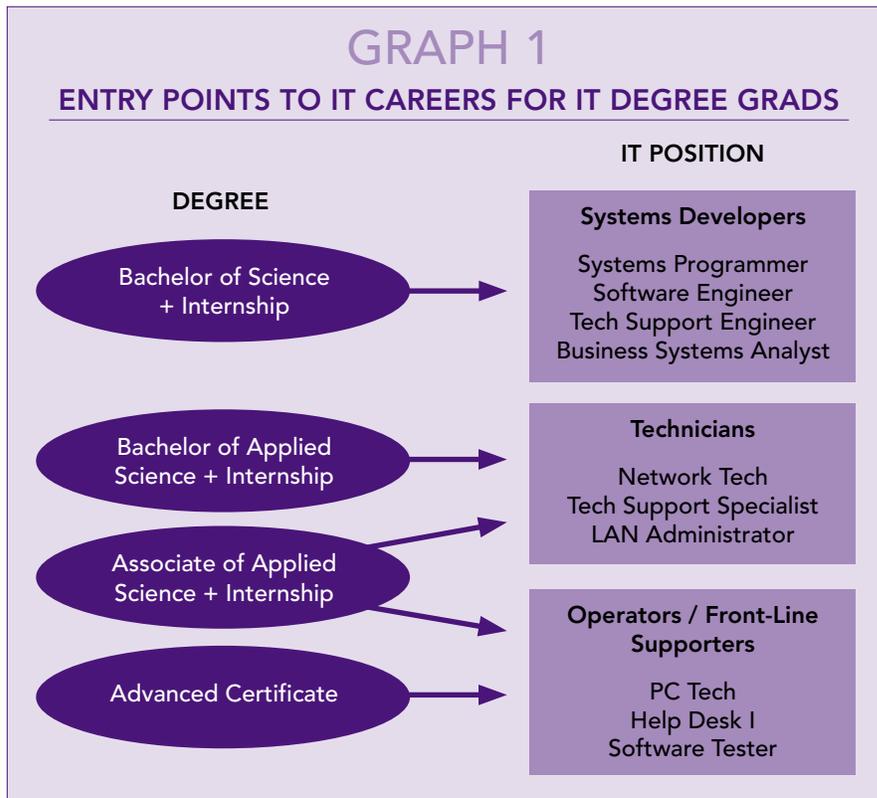
LATINOS NOT GETTING ON (OR FALLING OFF) THE PATH

Table A1 in the Appendix shows enrollment trends in undergraduate IT programs by Hispanics during the 1990s. Although the number of Hispanics earning undergraduate credentials in IT major fields increased during the 1990s at all degree levels, by the end of the decade, Hispanics were still underrepresented among bachelor's degree graduates in IT compared to their representation in undergraduate programs and the population of college-age individuals more generally. Hispanics earned more associate degrees in IT than they did bachelor's degrees. Hispanics were overrepresented among graduates at the basic and advanced certificate levels.

In 1997, of more than 36,000 individuals enrolled in graduate programs in computer sciences, only 2 percent were Hispanics. In startling contrast, over 35 percent were temporary residents who are increasingly more likely to return to their home country after graduation. While women accounted for 27.4 percent of graduate enrollment in computer sciences, Hispanic women accounted for only 0.58 percent.

Too few Latinos are entering the educational pathway that leads through undergraduate engineering in computers to careers in information technology. Of those who do get on this path, too many fail to make it through. For most Latinos, it is more of a maze or an obstacle course.

Some schools and colleges are more successful than others in enabling Latinos to get on and stay on an educational pathway. Tables A2a-d



report the number of undergraduate credentials in IT awarded in 1999-2000 by level of award, race/ethnicity of graduate, and type of institution. These data show that private for-profit institutions of less than two years turned out the most graduates with basic and advanced certificates (Tables A2a and A2b). They also seem to have targeted Hispanics, producing 58 percent of Hispanic basic certificate graduates and 61 percent of Hispanic advanced certificate graduates. This is of concern since such institutions generally do not offer credit toward degrees.

In 1997, of more than 36,000 individuals enrolled in graduate programs in computer sciences, only 2 percent were Hispanics.

Private two- and four-year for-profit colleges awarded roughly half of the associate degrees in IT to Hispanics (51 percent), even though they awarded 39 percent of the IT associate degrees overall (Table A2c). Public two- and four-year institutions awarded only 32 percent of the associate degrees in IT to Hispanics, even though they awarded 51 percent of the associate degrees in those fields.

At the bachelor's degree level as well, private institutions turned out proportionally more Hispanic IT graduates than public institutions (Table A2d), which nevertheless granted the largest number of degrees to minorities.

These aggregate statistics on degree production by race and institution type raise an important question: What are the characteristics of educational institutions that are effective in guiding Latino students on pathways to careers in information technology? This study was designed to better understand the characteristics of successful "pathway" schools and colleges.

HIGHER EDUCATION AS THE BRIDGE

The primary focus of data collection and resultant recommendations in this project was post-secondary education. The research team concluded — as have others³ — that activities within this section of the pipeline are most critical and have the most potential for impacting the problem. Post-secondary education is the most viable programmatic bridge between the world of IT vocations and the world of basic skills acquisition. There is much concern about shortcomings in the K-12 system generally; it is so vast, heterogeneous and bureaucratically constrained that it is unlikely to have a significant impact on transitioning students into IT-related educational and vocational paths. The most significant impact the K-12 system can have in this arena is a negative one; that is by failing to provide enough students — particularly Latino students — with an academically rigorous and successful experience in high school. Moreover, the K-12 system has few ties to the IT workplace, and as such it provides limited career guidance that is either current or persuasive.

One notable exception to this generalization is that a majority of teachers in large urban communities belong to gender and ethnic groups — either Latino or African American — that are underrepresented in the IT sector. To the extent that they use and demonstrate information technologies effectively in the classroom, they are also modeling IT-related career information.

While IT-intensive businesses and industries have significant interests in improving the flow of qualified, motivated, future employees through the educational system, they are structurally deficient in their ability to improve that flow. There are several reasons why this is so. For one, while companies are capable of providing useful input to post-secondary and K-12 institutions, their hiring patterns tend to be nationwide and thus beyond the scope of meaningful partnering with local education efforts. In addition, academic institutions

³ BEST. *A Bridge for All*, op cit.

are themselves impenetrable mazes to those not familiar with how they operate. They usually overtax the patience of business leadership wanting to make a difference in influencing curricula, in conveying industry hiring needs, and ensuring that educational institutions understand trends in technological advancements.

While women accounted for 27.4 percent of graduate enrollment in computer sciences, Hispanic women accounted for only 0.58 percent.

Post-secondary institutions with a will to improve the overall functioning of the IT pipeline are ideally positioned to do so. They have active ongoing “supplier” relationships with K-12 institutions, as well as business and industry. They have the self-interest and capacity (albeit limited) to reach into K-12 systems to foster needed changes. Similarly, post-secondary IT education has a self-interest and capacity to maintain good working relationships with business and industry in IT fields. For example, it can poll them for needed changes in curriculum. Research universities can focus on technology development to meet changing industry priorities.

For all these reasons, this project focused most of its attention on higher education as a vehicle for improving IT career opportunities for Latino youth. While some data collection was conducted in high schools and among industry informants, the team concluded that the real opportunities for changing the system were in the work of colleges and universities.

THE ROLE OF BEST PRACTICES

A strongly held belief of our research team was that organizational excellence — such as in high schools and colleges — is defined by what people do that is demonstrably related to desired outcomes. To the extent that one can uncover and operationally describe “best practices” and convey those descriptions to others, this is a robust vehicle for more widespread system reform and change. While statistical relationships are important and informative, people who actually populate and run organizations want to know what to do on Monday morning. They want rich, understandable descriptions of what their peers are doing that seems to make a difference. To the extent feasible, our project identified such practices. Also, given that our primary organizational focus ended up being on post-secondary education, most of those practices were drawn from that sector.

RESEARCH APPROACH TO IDENTIFY PATHWAY SCHOOLS AND COLLEGES

The project involved data collection in three major metropolitan areas: Los Angeles, Houston and Chicago. These cities have large Latino populations and have become important ports of entry for Latino immigration from Mexico and Central and South America. As a way of grounding the study, an early activity involved a small number (N=29) of qualitative interviews of Latinos in Los Angeles, Chicago and Houston who were already working in the IT industry. This served to inform development of the instrumentation and more formal data gathering that followed.

POST-SECONDARY SCHOOL DATA COLLECTION

The major focus of field data collection involved a three-city organizational sample of 24 post-secondary institutions: 11 four-year schools and 13 junior or

community colleges. The sample was selected based on existing secondary data sources that were consistent across the three geographic venues (California, Texas and Illinois), so as to be evenly split between institutions that were doing either well or poorly in attracting, retaining and graduating Hispanic⁴ students in IT programs. In effect, the project was able to contrast colleges and universities that were either high or low performers.⁵ The organizational sample included public institutions as well as proprietary, or for-profit, schools. In fact, the latter sub-sample turned out to be of considerable interest in terms of novel practices.

Within each institution, data collection was primarily at the unit, or department, level, although some college-level respondents were involved as well, as were a few individuals who worked in institutional functions (e.g., recruitment). Structured questionnaire data were gathered and qualitative interviews conducted of the following respondent groups: department chairs; Latino students in the IT department; alumni; professors; student outreach and recruitment; student post-graduation placement; and student support services. Each questionnaire used a number of structured items, with Likert scale⁶ response categories, that were designed to tap into program characteristics, structures, practices and policies. Some items were specific to the particular domain of job responsibility of the respondent, while others were administered to all respondent groups. The qualitative interviews generally covered the same ground, but were much less structured and designed to draw out participant responses. Over 370 surveys were completed.

SECONDARY SCHOOL DATA COLLECTION

In contrast to the post-secondary setting, there were no organizational performance metrics available from secondary sources that were IT-specific and comparable across states. In effect, there was no way to determine the relative performance of high schools in moving students along the IT academic and career pipeline. The available indicators of general academic performance for schools and/or Latino students are probably related to the IT pipeline, but in unknown ways.

As a result, a three-prong data collection strategy was implemented to better understand what factors influence Latino high school students to become interested and embark on an IT academic and career trajectory. The first was a telephone survey. A second involved case studies of a small sample of high schools in each metropolitan area that were, by reputation, effective in preparing students to enter post-secondary education leading to IT careers.

SURVEY OF COLLEGE-GOING LATINO HIGH SCHOOL GRADUATES

A telephone survey was conducted across the three study sites of a total of 800 recently graduated high school students who were avowedly attending college in the fall. As a dependent variable, a series of questions was constructed that assessed the extent to which the graduates intended to major or take courses in IT disciplines. We identified a subsample of high school graduates who were "IT-inclined" and another group categorized as "IT-averse." In addition, a number of questions explored potential predictive factors,

⁴ The terms Hispanic and Latino are used interchangeably throughout this report to refer to people who trace their ancestry to Spanish-speaking Latin American countries.

⁵ The specific steps involved in sample selection first involved all post-secondary IT programs in each region (at associate and bachelor degree levels), then selecting those that had more than the median number of Latino enrollees as well as more than the median number of graduates (thus eliminating new or small programs), and then classifying each of the remaining programs in terms of a productivity index. The latter involved a computation of ratios that captured the extent to which the institution's IT programs enrolled and graduated Latinos at a greater rate relative to other programs on campus. These ratios were used to make final selection of exemplary and comparison institutions for field research.

⁶ A Likert scale is a rating scale using standardized response categories in survey questionnaires. Respondents indicate their level of agreement with statements that express a favorable or unfavorable attitude toward a concept being measured, using response categories such as strongly agree, agree, neutral, disagree, and strongly disagree. Sample questionnaires are available from the Tomás Rivera Policy Institute upon request.

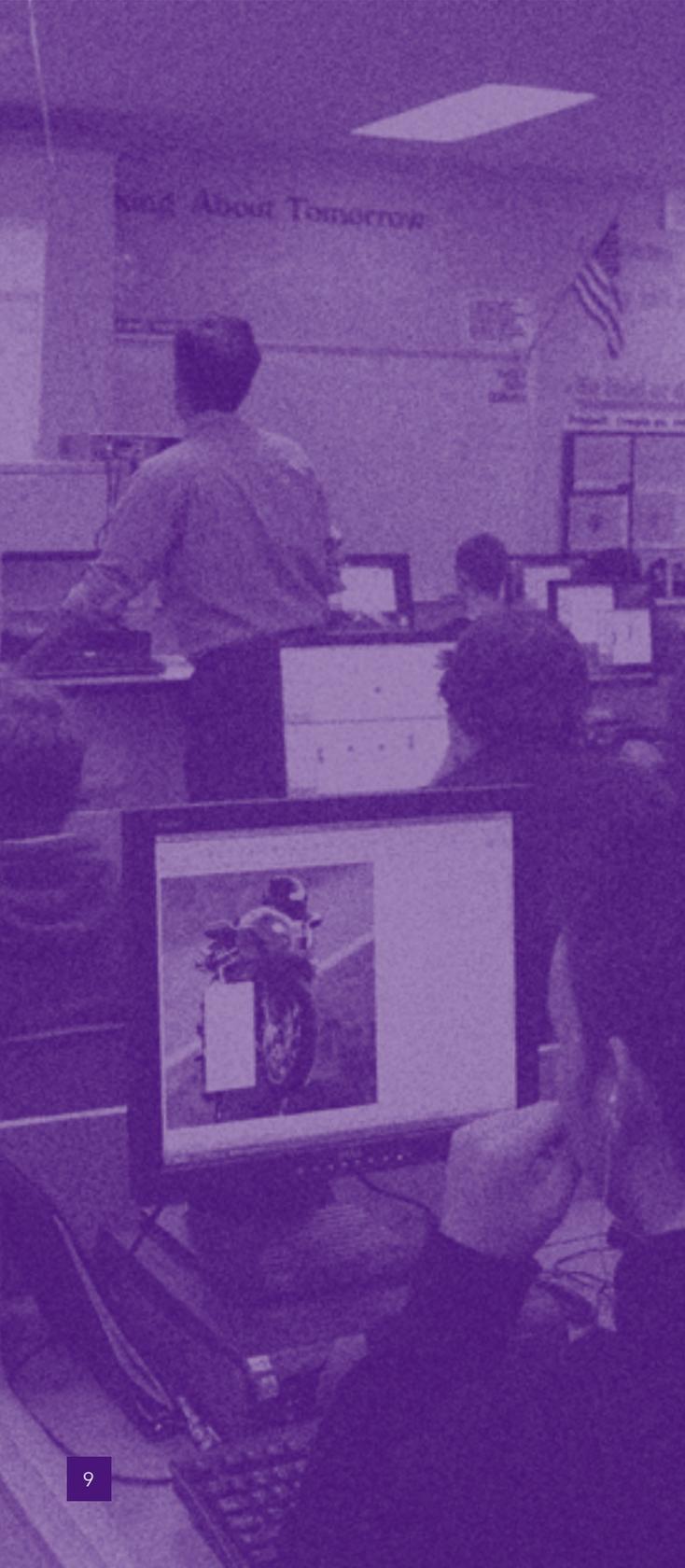
including exposure to computers, peer and family influences, input from teachers and counselors, and outreach from colleges. Besides examining variables related to academic choice (e.g., choosing an IT major or IT courses), the survey data were also intended to uncover examples of innovative high schools that encouraged an IT academic and career path.

HIGH SCHOOL CASE STUDIES

In greater Los Angeles, Chicago and Houston, various informants—education researchers and administrators—were informally polled about what they considered exemplary high school programs in terms of affording

intensive exposure and career direction in IT. These informants presumably had extensive knowledge across various school districts on novel and productive programs, although none had comparative quantitative data to back up their nominations; these were qualitative judgments. Eventually, a study sample of nine schools was obtained across the three metropolitan study areas. One- to two-day visits to each school were conducted by research team members, and semi-structured interviews were conducted with program leadership, students and administrators.

OBSTACLES ON THE PATHWAY



This chapter explores the obstacles Latinos face on the educational path that leads to IT careers. It draws on our field work in high schools and undergraduate institutions that are relatively effective in preparing Latinos to earn undergraduate credentials in IT, as well as on a survey of recent high school graduates.

BARRIERS TO ENTERING POST-SECONDARY EDUCATION

Some of these barriers represent absolute roadblocks, while others are barriers in terms of dramatically reducing the Latino student's probability of success.

DROPPING OUT OF HIGH SCHOOL

While the proportion of Latino high school graduates who are enrolled in college is on a par with other population groups, the proportion of all Latinos in the 18-24 age group who are in college tends to be lower. The simple reason is that the high school dropout rate for Latinos continues to be quite high. In effect, they are out of the IT career pipeline before they get a chance to get in. While there are options to get back on track — such as obtaining a GED independently or as part of a military experience — this single fact is the most important ingredient in the lower participation rate of Latinos in college, in IT careers, or for that matter, in a host of other careers and educational experiences. There is a large body of literature on research and practice that addresses this problem, which goes beyond the scope of this project.

THE LIMITED RIGOR OF THE HIGH SCHOOL EXPERIENCE

Completing high school per se is not the key to either college entry or to a high knowledge career such as in information technology. The evidence

from national studies⁷ is clear: completion (including regular attendance) of a tough, rigorous high school curriculum — including advanced math, language skills and science — is a prerequisite to admission to better post-secondary programs as well as success therein. Unfortunately, a large proportion of entering Latino college students are shunted to needed remedial course work, a situation that often functions as a deterrent to starting college at all or lengthens the time required for degree completion.

INADEQUATE FORMAL GUIDANCE: THE SCHOOL

The average high school student, particularly one from a working class and/or immigrant background, is likely to be poorly informed, not only about IT career paths but more generally about the economic and career advantages of doing well in high school and going to college. The typical large, urban U.S. high school is woefully understaffed in terms of student advisory and guidance staff. Often, the Latino student will not seek and obtain guidance until the last year or two of the high school experience, and will not have been well informed about the tactical steps that should have been taken in the freshman year (e.g., taking advanced math, qualifying for and taking Advanced Placement classes). By the senior year, critical decisions about course work have been bypassed and college plans poorly formulated. This problem is further compounded by poor understanding of IT career prerequisites and paths on the part of high school counselors.

INADEQUATE INFORMAL GUIDANCE: THE FAMILY

In addition to whatever formal guidance is available through the school, the high school student is also likely to receive extensive advice and guidance from

Many Latino students are the first in their family to attend college. As such, they often have poorly developed goals, do not understand/ cannot navigate the road map between course work and career success, and are overwhelmed with the plethora of choices with which they are confronted in the college setting.

informal sources: peers, parents and family. While good-intentioned, there is considerable evidence that for Latino young people, particularly from working class and/or immigrant families, these sources may be ill-informed. For example, there is evidence that “college knowledge” among Latino parents⁸ is objectively low and that children may miss out on crucial steps in getting qualified and thus admitted to college. Parents may not be well informed about the differences between community colleges and four-year schools, or about actual costs in going to college, such as financial aid programs or how to qualify.

⁷ Adelman, Clifford. *Answers in the Tool Box: Academic Intensity, Attendance Patterns, and Bachelor's Degree Attainment*. Washington, D.C.: U.S. Department of Education, 1999.

⁸ Tornatzky, L., Cutler, R., and J. Lee. *College Knowledge: What Latino Parents Need to Know and Why They Don't Know It*. Claremont, CA: Tomás Rivera Policy Institute, 2002.

LIMITED EXPOSURE TO TECHNOLOGY AND CAREER INFORMATION

It is difficult enough for Latino youngsters to successfully navigate the path to college admission, but for many it is even more daunting to attain an early focus on IT-related programs and careers. To do so, the high school student has to know what a career in information technology entails, its positive and negative aspects, and how it might correspond with their larger goals and self concept. Obtaining this kind of knowledge is a sketchy proposition for Latino youth. Since Latinos are underrepresented in the IT work force, the youngster is less likely to have a relative or community member who can provide experiential insight. Similarly, few high school computer classes expose students to IT career options, either didactically or experientially. As noted above, counselors are overworked and very few have a working understanding of IT careers and the IT industry. For example, students may have a vague attraction to computer-linked careers, but not understand the importance of math in the work of IT professionals. The upshot of this is that fewer Latino students prepare and apply for college with an eye toward IT careers. There are not enough role models and no clear road map to follow.

FINANCES PERCEIVED AND ACTUAL

While the income gap between Latinos and non-Hispanic whites has decreased significantly over the past several years, it is still notable. Latino families tend to be working class in terms of jobs and income and for many, the prospect of paying for a child's college education is a large hurdle. This reality is exacerbated by the fact that Latino families are often not knowledgeable about how the immediate out-of-pocket costs of college can be significantly reduced through federal, state and college-based financial aid programs. This situation is worsened when high school guidance counselors are in short supply, and parents do not avail themselves of college nights and college visits.

BARRIERS TO COMPLETING POST-SECONDARY EDUCATION

As noted elsewhere, there are many alternative IT career paths and levels of technical sophistication and associated financial compensation. Not all IT career goals are contingent upon completing a bachelor's level of education, although more of them are, and the trend is clearly in that direction. Between entry to the post-secondary educational and training system and securing an IT-related position, there are many ways in which the Latino student can get stuck. Among all student populations they tend to have among the lowest degree completion rates and take the longest time to complete work toward a degree. There are several types of barriers to post-secondary completion — some a carryover from an inadequate high school preparation, some a function of family and cultural dynamics, some attributable to shortcomings in institutional policies and practices, or any combination of these.

PREPARATION AND SKILL DEFICITS

Once enrolled in college in an IT program, Latino students are burdened by particular skill deficits — some substantive and others that are more of a process nature. Of the former, foremost is weak preparation in math and the sciences. Of the latter, Latino students too often have underdeveloped study habits, critical thinking and communication skills. Moreover, the opportunities to focus on and remedy these deficits are often poorly organized or limited in scope. Given these preparation shortcomings, it is incumbent on post-secondary institutions to provide early, intense and program-integrated remedial services.

DIRECTION AND CHOICES

Many Latino students are the first in their family to attend college. As such, they often have poorly developed goals, do not understand/cannot navigate the road map between course work and career

success, and are overwhelmed with the plethora of choices with which they are confronted in the college setting. The freedom of the college experience can be overwhelming. This suggests that a focus on providing personal attention, structure and an achievable plan would be helpful.

FAMILY AND FINANCIAL DEMANDS

The typical white, middle-class college student is someone who focuses primarily on the college experience. For the Latino college student, particularly a first-generation college student from a working class family, a whole set of other demands and expectations tend to factor in. For one, being a contributing member of the family is a norm. This may mean contributing via wages from a job, or for a woman, helping out with child care. Family priorities may trump dedicated time or space for study, and often there is little understanding on the part of parents regarding what is involved in succeeding in college. For many of these reasons, the choice of a college is premised on not straying too far from the community and the family. Going away to college — in another state for example — is not actively encouraged; there is a strong bias toward starting post-secondary education at the local community college. So too, many Latino students attend part-time or may not start immediately after graduating high school. It should be emphasized that all of these pressures and expectations are exacerbated for Latinas, who may be pressed into child care duties to help support the family.

INADEQUATE STUDENT SUPPORT SERVICES

Guidance, mentoring and advising are key success factors for Latino college students, and in many higher education institutions are not adequate. In some settings there is a disinclination to understand and respond to the special needs of Latino students. For example, an often heard refrain in the institutions that

Guidance, mentoring and advising are key success factors for Latino college students, and in many higher education institutions are not adequate.

are doing a poor job of graduating Latino students with IT-related degrees is, “We treat everybody equally.” The colleges and universities that are more successful are more likely to tailor support services in ways that leverage the strengths of Latino culture and family dynamics. For example, there are increasing examples of institutions successfully using peer and group-based support systems with Latino students.

POOR TRANSITION BETWEEN TWO-YEAR AND FOUR-YEAR INSTITUTIONS

For reasons noted above, Latinos are much more likely to start their post-secondary education in a community college. While this has many advantages in terms of convenience and cost, the data are relatively clear that attending a community college will tend to depress the probability of completing a bachelor’s degree.⁹ While this is part of a general trend for Latinos to attend less selective institutions (which depresses the rate of downstream degree completion) there are factors that are unique to the community college setting. For one, many of the course offerings are tailored to increasing job skills and may not transfer to a four-year degree program. Second, while varying widely across states, articulation agreements between public two-year and public four-year institutions tend to be a chronic problem.¹⁰

⁹ Fry, Richard. *Latinos in Higher Education: Many Enroll, Too Few Graduate*. Washington, DC: Pew Hispanic Center, September 5, 2004.

¹⁰ Wellman, Jane V. *State Policy and Community College-Baccalaureate Transfer*. San Jose, CA: The National Center for Public Policy and Higher Education, August, 2002.

THE PROBLEM IN WHOLE: A SUMMARY SNAPSHOT

Clearly, a number of factors work against a young Latino having success in attaining the educational credentials that would lead to a technology-related career, whether in information technology and computers or a number of other knowledge-intensive pursuits. To summarize those factors, consider the following typical scenario:

During high school, a Hispanic student is likely to steer clear of the more difficult courses in the curriculum, particularly those that focus on advanced math or science. Advanced Placement courses are less likely to be taken even if they are offered at their school,¹¹ and in contrast to his/her non-Hispanic peers, there is likely to be little thought or planning given to college choices until late in the junior year or thereafter. The parents and siblings, if they have not gone to college themselves, will be able to provide little guidance or advice other than general encouragement. There will be many pressures to attend a college close to home, and to live at home while attending college. Out of state college will usually not be considered, particularly if the student is a young woman. During high school a pattern of working after school and on weekends will be established and encouraged — and expected to continue while in college. The most likely post-secondary choice will be a community college that is close and can be reached easily, perhaps via public transportation. Career goals are vague, and even if the student has some interest in majoring in “computers,” there is likely to be little understanding or experience in what that means in the real world.

After starting college — starting may be delayed and enrollment is likely to be part-time — our student will likely feel overwhelmed by the many options that are available — courses, social connections, extracurricular activities. Advisement will be available, but hard to schedule. The other Latino students in the college will be having similar experiences. An informal peer network of friendship and advice will be helpful. The quality of instruction will be quite varied and professors will tend to provide little in connectivity between what takes place in the class or lab and what jobs will be like in the future. There is not a lot of information that seems practical and the student will be hard-pressed to answer parental questions about where this educational pathway is going. Economic and social pressures are likely to result in a skip pattern of attendance and enrollment. Our student is likely to take fewer classes and credit hours and/or drop out for a semester at some point.

There is not enough guidance about what happens next, either in terms of how the community college experience (which most likely) segues into a four-year college or university, or how jobs are acquired and careers built. For the young Latina, all of these pressures and quandaries are even more accentuated, and it is likely that she will not complete the program. If our student does transfer to a four-year school, there may be some loss of credits because of poor articulation agreements and/or poor guidance. Many of the same behavioral patterns seen in the community college will repeat themselves.

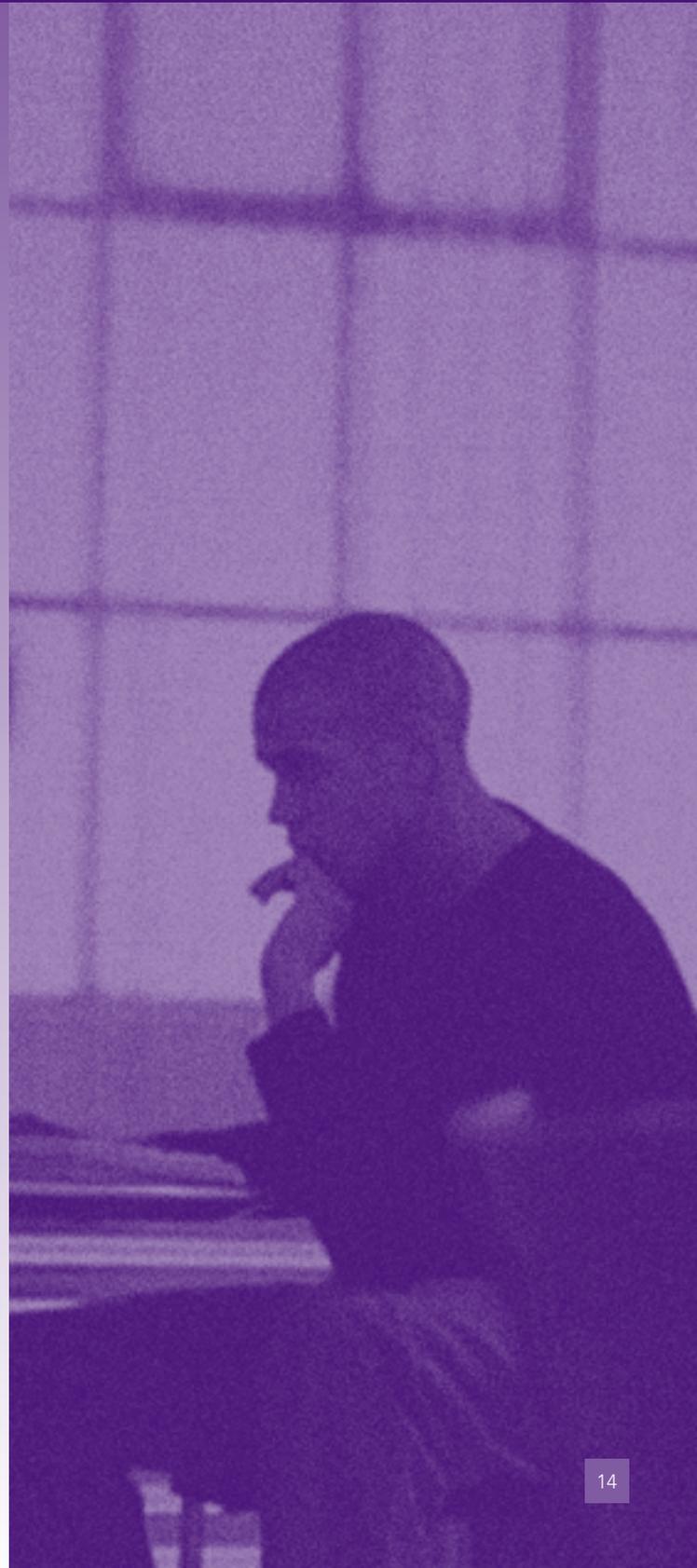
Assuming that the above has some correspondence to the experiences of millions of Latino youth, what can be done to ease their path through the pipeline? The next section will provide a number of best practices and policies that seem to be working. Given the focus of the project, most of these policies and practices will be about what colleges can do, as opposed to secondary schools and industry.

¹¹ Lomibao, Stephanie, M. Barreto and H. Pachon. *The Reality of Race Neutral Admissions for Minority Students at The University of California: Turning the Tide or Turning Them Away?* Los Angeles, CA: Tomás Rivera Policy Institute, October 2004.

PATHWAY SCHOOLS AND COLLEGES

The presentation approach that will be taken in this chapter is to first describe in broad themes the characteristics of post-secondary institutions that seem to be associated with enrolling and graduating Latino students in IT-related programs. Following this, the presentation will include a mix of organizational policies and practices that exemplify a particular theme. The former would be represented, for example, by a college's goal statements, mission, rules and established procedures. While not a clear distinction, organizational practices tend to be less formalized and likely to be operating in the trenches of the organization. The important thing to emphasize from an educational reform perspective is that both policies and practices — if they are exemplary — can be copied and adapted by others. To the extent that space permits, the descriptions of these best practices and policies will be as explicit and operational as possible. Finally, the presentation will include statistical findings derived from the components of our data that lent themselves to quantitative analyses.

(High performing colleges) recognize that the needs of Latinos are different and somewhat unique, and that extra and special efforts need to be undertaken. Moreover, this is not seen as a burden but as a key component of organizational success and self-identity.



THEME: MISSION FOCUS

The ability to recruit, enroll and graduate Latinos in IT-related program is not a temporary diversion or an incidental part of a program. For the colleges that do well at this, it is a central part of what they do and are as an organization. They are dedicated to serving first-time college students in general and underrepresented groups in particular. This emphasis is found in college and departmental goal and mission statements, in descriptive literature, on Web sites and most importantly, in what faculty and staff say about their institution. They recognize that the needs of Latinos are different and somewhat unique, and that extra and special efforts need to be undertaken. Moreover, this is not seen as a burden but as a key component of organizational success and self-identity. In effect, the organizational culture of high-performing schools is perfectly aligned with serving first-in-family Latino college students and is an explicit focus of marketing, outreach and recruiting.

By way of contrast, in schools that are low performers in terms of attracting and graduating Latino students, the organizational atmosphere is quite different. When questioned about the various problems and issues confronting Latino youth in technology-oriented education, the responses tend to be uninformed and careless, in the truest sense of the word. Respondents tend to articulate that “everybody is treated the same,” and that this position is morally correct and does not ignore the needs of a significant component of the student body. In those institutions, an emphasis on working with Latino students is not implemented at the unit level, or with differing degrees of emphasis, in different units.

POSITIVE EXAMPLES: POLICIES AND PRACTICES

- In conversations with faculty at College X, virtually everyone articulated the goals of serving first-generation college students, as well as an understanding of the special needs and strong motivation that these students bring with them.

- In all of its program descriptive material — brochures, videos — College Y makes it a point to mention its commitment to serving underrepresented groups in both quality instruction and support as well as in downstream job placement.
- Faculty in one IT-related college program have adopted a set of core values that includes a “student first” orientation, as well as a commitment to quality and continuous improvement and a “sense of responsiveness and accountability” for their actions.

THEME: CAREER EMPHASIS

IT-related programs vary widely in their relative emphasis on theory versus a practical, career orientation. In all of their interactions with external communities the better-performing programs place a heavy emphasis on careers, jobs and real world education — themes that are attractive to both Latino parents as well as employers. Consistent with what employers want, there are also strong themes in the curriculum on communication skills, critical thinking, mathematical reasoning and project-focused instruction. Career orientation is facilitated by interaction on campus with potential employers, in student organizations and in the use of practical examples in classroom and laboratory instruction. Significant program resources are devoted to preparation for employment, job placement and internships.

POSITIVE EXAMPLES: POLICIES AND PRACTICES

- At one college, every class in the IT program has specified instructional objectives and target competencies, all of which were developed in collaboration with industry informants and partners. Instructors can elaborate on these objectives but are not permitted to ignore them.
- Reflecting the expressed needs of industry advisors for employees with “soft skills” such as written

and verbal communication and team work, every class at College Z incorporates written project reports, team projects and oral presentations with overheads and visuals.

- As part of its introductory course work, one college incorporates a mini-course in career strategies, which is designed to introduce students to different options and career paths after graduation.
- At one high-performing college, all students are required to complete a capstone, or end-of-program project, which must be done at a company or a community organization and involve solving an important IT problem.
- Faculty at an urban college make a special point to tie all instruction to tangible, meaningful examples and demonstrations. For example, early on Latino students are taught — via demonstration — how to access Spanish language symbols on the keypad which places computer competence in a cultural context.
- A four-year college in Texas strongly emphasizes internships as a vehicle for rapidly introducing students to the world of technical work and to what employers want from new hires. At any given time, approximately 20 percent of the students are deployed on internships, primarily in the contiguous city.
- A service that is in high demand among Latino students — particularly first-in-family college attenders — is training and advice in how to approach an employer and land a job. Support services are in place at College X that emphasize approach tactics, resume writing, and role-playing the interview process.

THEME: COMMUNITY VISIBILITY

Those colleges that do well at attracting and graduating Latino students also have a tangible and visible community presence. For example, in student recruitment they participate actively in college nights

at high schools, meet with parents of prospective enrollees, host on-campus events for high school students and their families, and provide program materials in Spanish. Much of the content of these outreach efforts is focused on preparing for college, financial aid, admission processes, and orienting parents how post-secondary education works. Marketing entails extensive use of a multimedia to reach a broad sector of Latino communities. These institutions are also engaged with members of the IT industry, soliciting input for curriculum and program directions, arranging internships, and working to ease the transition of students into employment.

POSITIVE EXAMPLES: POLICIES AND PRACTICES

- One college employs a cadre of Spanish-speaking recruiters who participate in a range of community events. Getting first-generation immigrant parents to talk about their experiences in the U.S. and their aspirations for their children is particularly effective in building both the parents and student's interest in attending a university. Once a prospective student shows a serious interest, a recruiter will make a home visit, speaking with both the parents and the student. The practical aspects of the program are emphasized.
- A four-year college in California hosts a mother-daughter special event that focuses on getting young Latinas interested in engineering. The program invites hundreds of young women, who are early in their high school experience, and their mothers to spend a day on campus, talk with faculty, visit the labs and learn about its program. The experience gets mother-daughter pairs thinking earlier about potential career paths such as engineering, and the value of college generally.
- One college has made an extra effort to forge partnerships with high schools in the community, most of which have high enrollments of Latinos with little family history of college-going. One programmatic spin has been the growth of dual-enrollment programs in which students are concurrently involved in college classes while finishing high school.

- College B runs a Science and Technology Enrichment Program (STEP) that targets fifth and sixth graders in the area. It provides a venue to simultaneously engage students and the community, get young people to think about technology-related careers, and bring the name of the college into active consideration for future post-secondary plans.
- The MESA (Math, Engineering and Science Achievement) program was active on several campuses in the study sample, and not just in providing student support. One chapter reaches out to high schools and junior high schools in the area to make presentations on technical careers. It also provides campus tours for students and tries to convey what it is like to be a student in technology majors.
- Another college runs an Early Academic Outreach Program that provides college student mentors, who work with junior high and high school students in 150 schools in the area. The goal is to improve academic performance in school and to encourage students to think about technical careers and majors.
- One high-performing community college focuses its campus tours primarily on Latino parents. They have found that once the parents get a feel for the campus and how their children will fit in, the whole process of enrollment moves quickly.
- As both an outreach and recruiting tool, a California community college operates a program that reaches fifth-grade students and their parents, and involves a contract between the family and the college. Students achieving the promised level of academic performance and attainment in high school receive a full scholarship upon graduation.
- A four-year college in Houston runs a high school summer program that spans four years and provides students with exposure to science, technology and engineering through classes and interaction with professionals in the field. The recruitment focuses intensively on minority schools.
- A community college in the Houston area relies heavily on partnerships with local Hispanic community organizations (e.g., chambers of commerce) to help provide financial assistance to students. These organizations provide a Hispanic presence for the college in the community and at the same time provide financial and human resources to benefit the students.
- A successful community college system in Houston views interactions with parents as an essential part of the recruitment process. They make a point of including parents when bilingual advisors visit specific apartment complexes to inform students about college and post-secondary educational opportunities. Furthermore, the community college distributes college information to the parents in Spanish.

THEME: COMPREHENSIVE AND CULTURALLY CONGRUENT STUDENT SUPPORT

Among high-performing schools, student support is a central component of the instructional program, as opposed to being an ancillary activity assigned as a staff support function. Professors and instructors are expected to be actively involved in providing support, in both formal and programmatic activities as well as more informal mentoring relationships. Several of the high-performing colleges recognize the importance of the group in Latino social relations and are very active in fostering Latino student study groups, peer counseling and professional societies.

POSITIVE EXAMPLES: POLICIES AND PRACTICES

- At a Midwestern high-performing college, one-on-one tutoring is available on an extensive basis and with a heavy focus on math skills. While the sessions are organized by a professionally staffed student support center, the tutors are advanced students in the program.

- At College V, a student's support team is composed of a program advisor, an academic advisor and classroom instructors. In contrast to low-performing schools, the latter are actively involved in providing support, and work very closely with the advisors.
- In addition to giving end-of-course grades, instructors at College X are required to provide department chairs with early warnings about students who are doing poorly in a class. This covers both hard outcomes (test scores) as well as behavioral predictors (missing class). It is difficult for a student to slide into mediocrity without alerting and activating a support network.
- At one college, a group of Latino students — with the encouragement of staff and faculty — established a Hispanic Network, which sponsors events that introduce high school students to the college and provide academic and social support for those already enrolled.
- At a Midwestern college, faculty are required to spend at least 10 hours a week working with students outside the classroom, including time spent in the learning center (a support facility staffed entirely by faculty).
- Having experienced first hand the problems of Latino students not transferring to four-year schools, an enterprising community college runs a program (called Puente) that not only provides substantive mentoring on how to select courses and apply to expedite the transfer process, but also organizes tours of some of the major four-year schools and research universities in the state.
- In order to kick-start the student support process at DeVry in Chicago, incoming students with marginal high school records who do not meet their entrance requirements attend a six-week summer session remedial program that focuses on both skill building (e.g., time management) and also works on developing cohorts of Latino students who can support one another in more informal ways. This highly structured program attracts first-generation students who are not prepared for college. On the negative side, the percentage of students completing the program varies from year-to-year.
- The MESA (Math, Engineering and Science Achievement) program is a bulwark of student support for Latinos on many California campuses. There is strong, student peer-based involvement in the delivery of services, which typically include advisement and counseling, workshops, 24-hour study centers, study groups, tutoring (peer and other), work experience and access to potential employers.
- College Y has found that counseling for Latino students tends not to be focused on academic issues per se, but on soft skills, such as studying and time management, as well as managing relationships with family and significant others. It therefore emphasizes both academic and soft skills counseling to ensure students receive all the assistance they need.
- As a way of supporting Latino students who typically work and/or support families, College Y has adopted a flexible approach to the academic calendar. Classes are offered early in the morning, at night, online and via television.
- A successful two-year program in Houston employs retention specialists who focus on day students who most need special attention. They provide informal mentoring with academic courses, engage the students socially and help them feel comfortable accessing other support services. A special focus is placed on the male population, as dropout rates are especially high among African American and Latino men. Program participation is voluntary, but in the case of suspended students who are returning to college, mandatory participation in the mentoring program is a condition for their return.

THEME: ACCOUNTABILITY

Among high-performing colleges, not only is there a mission focus and program features that emphasize serving Latinos and first-generation college attenders, but there is accountability in terms of meeting those goals. For example, many of the high-performing colleges include performance criteria concerning serving first generation college students in the annual evaluation of administrators, faculty and staff. Students are routinely surveyed during their time in the program and after they leave. Employers are likewise surveyed about their perceptions of graduates' skill sets and shortcomings. Moreover, these data are used to drive program changes and improvements.

POSITIVE EXAMPLES: POLICIES AND PRACTICES

- One college reports tracking graduates for at least one year, and documenting historical patterns on where students are hired, pay scales and reflections on their experience at the institution.
- Another college conducted a large sample study of student retention, not only documenting retention rates but also determining predictors thereof. The latter included such student descriptors as demographics and test scores, but also course-taking and support services offered to students. The results are being used to overhaul the program.
- A Texas college operates a system of real-time monitoring of applications and enrollments. Since the school has adopted a goal of better serving underrepresented groups, this data system has enabled the school to adjust resources and emphases to reach its desired study body demographics.

THE SPECIAL CASE OF PRIVATE CAREER-ORIENTED COLLEGES

While the best policies and practices were found across the field sample of institutions — albeit more consistently among those that had better records in enrolling and graduating Latinos — there is one category of colleges that seems to epitomize, in their approach to education, all of the things that appear to work with Latino youth. Moreover, these colleges are positioning themselves to serve the Hispanic market and community, and are doing very well indeed. These are the private career-oriented colleges, which include proprietary for-profit institutions.¹²

HISTORY AND CONTEXT OF PRIVATE CAREER HIGHER EDUCATION

Private career-oriented higher education blossomed in the decade following World War II when the GI Bill of Rights provided veterans with generous support for a wide variety of educational and training experiences. Not only did the veterans partake of traditional higher education opportunities — contributing to a massive growth in public colleges and universities — but they also participated in a plethora of short courses, hands-on training programs and correspondence programs that covered virtually everything from diesel mechanics to Sanskrit. As the WW II cohort of veterans became assimilated into the economy and later versions of GI bill benefits became more restrictive, there was a dampening of activity in this sector of the educational establishment. Nonetheless, a number of large and prominent companies and institutions have continued to provide services that have been more focused, perhaps narrower and definitely more explicitly career-oriented, than mainstream post-secondary education.

¹² This section draws heavily from a project report developed by one of the co-investigators in the NSF project: Jenkins, Davis. *Preparing Latinos for Technology Careers: Lessons from Private Career Colleges*. Chicago, IL: Great Cities Institute, University of Illinois at Chicago, August, 2003.

Over the past 10 years there has been significant growth of what might best be described as market-focused higher education. One influence has been the tremendous growth of computer usage and the Internet and a corresponding increase in educational programs that are offered partly or completely online. A second influence has been the significant growth of the technology sector of the economy, which has raised the demand for continuing education focused on technology,¹³ non-traditional degree programs, executive education and the like. This trend has influenced traditional post-secondary institutions as well as the world of career colleges (e.g., ITT, DeVry). In addition, the private career college has been quite responsive to unmet needs in the higher education marketplace, in particular in attracting and educating minority group members.

Not too surprisingly, a number of private career-oriented colleges turned up among the high-performing schools in our study sample. Since numerically they are dwarfed by the scope of the traditional post-secondary community, nationally and in the metropolitan areas we studied, this in itself is a notable finding. Moreover, as will be discussed below, these institutions exemplify in their policies and practices the things that seemed to work in the larger study sample — only more so. Before examining these novel practices and policies, however, the increasing importance for Latinos of this cohort of institutions in technology-oriented education should be noted.

ROLE OF PRIVATE CAREER-ORIENTED HIGHER EDUCATION IN THE LATINO COMMUNITY

Based on data drawn from longitudinal national databases (IPEDS Completion Survey, 1999-2000)¹⁴ that was re-analyzed by research team member Davis Jenkins, it seems clear that private for-profit institutions have established a niche in the Latino IT educational market. They turn out a disproportionate

fraction of Latino IT-certificate holders, about half of the IT associate degrees awarded to Latinos, and proportionally more of the four-year IT degrees awarded to Latinos.

PRIVATE CAREER COLLEGES' BUSINESS MODELS AND BEST PRACTICES

Private career-oriented colleges do not look at Latino IT students — or prospective students — as a social problem to be solved. They see them as a market to be served and one that has been arguably underserved by traditional post-secondary providers. While they do all of the things other successful institutions do, they do more of them, more consistently and with greater discipline, and operate in a business-oriented culture that emphasizes ongoing quality improvement. They also do some things in ways that are quantitatively and qualitatively distinctive.

■ Outreach and Community Engagement

Private career colleges devote significantly more resources — people and expenditures — to marketing in Latino communities. Recruitment methods are tuned and adapted based on evaluation data, and more time is spent with Latino parents. Admissions decisions include face-to-face interviews with prospective students, often with their parents. While traditional educators may look with suspicion at this type of marketing emphasis, the fact is that many Latino parents are not well informed about college options and may need this type of outreach.

■ Instructional Focus

Private career colleges have fewer options in courses, more required courses and a standard structure that is imposed on all courses. For first-in-family Latino college students this has significant advantages in that it reduces uncertainties and provides a clear path to completion.

¹³ Lee, Carolyn W.B. and Mary Walshok. *Critical Path Analysis of California's S & T Education System: Alternative Paths to Competency through Continuing Education and Lifelong Learning*. California Council on Science and Technology, Sacramento, CA: February, 2002.

¹⁴ U.S. Department of Education (n.d.). Integrated postsecondary education data system. [Data Files]. Washington, DC: National Center for Education Statistics.

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■ Career Emphasis

Knowledge for its own sake, or curiosity-driven learning, has a lower priority than instruction in skills and subsequent job placement. All course work has mandated components dealing with competencies important to employers — presentation skills, critical thinking, writing reports, and project management.

■ Program Structure and Schedule

Private career colleges are not tied to a traditional academic schedule and offer courses in time slots (e.g., evenings, weekends) that respond to students' needs. Classes tend to be small, and all required courses are offered as scheduled. An "upside down" curriculum structure enables students to take technical classes early on, and general study requirements throughout their college years.

■ Organizational Flexibility and Control

In private career colleges instructional design and staffing is controlled by central authority. The basic structure of all courses is mandated; faculty violate those guidelines at their peril. Rigorous, systematic evaluation is used to assess students' acquisition of key competencies.

■ Emphasis on Applied Learning and Teamwork

Most courses and degree completion involve problem-solving projects that are intended to emulate the career environment, typically those where employees will work as a team. Accordingly, many projects are executed by student groups.

■ Up-to-Date Equipment

Private career colleges tend to have lab equipment — hardware and software — that is much more advanced than equipment in traditional public institutions.

■ Intensive, Integrated Student Support Systems

More resources — staff, spending and time — are deployed in a highly focused way to bring students rapidly back up to speed. Moreover, the support systems are integrated into the main instructional activities, which include significant roles played by professors.

There are some shortcomings in the private, career-oriented programs. For one, they tend to be pricey relative to publicly supported higher education. Nonetheless, an increasing number of Latino students and their parents see it as a good buy in terms of career placement.

Second, while the highly structured format of the instructional programs seems to reap benefits in terms of student matriculation, there is a price that is paid by students. Within traditional post-secondary education, and to some extent in the technology industry, there is a continuing negative perception about the depth and quality of this type of education. In effect, there is a branding problem that is partly legitimate and partly condescension on the part of mainstream educational institutions, some of which may be a carryover from the matchbook and bus advertisement days of proprietary education when graduates of these institutions varied widely in their ability to perform on the job. The true test of a career-college education will lie in the staying and earning power of its graduates. This would be a 20-year follow-up study that has yet to be conducted, and beyond the scope of the data available to our research team.

The military models of education and training share many interesting similarities with private career-focused institutions. The U.S. Army, Navy, Air Force and Marines train relatively raw enlistees to operate and repair sophisticated technology. The military and career-college approach clearly define the essential content to be conveyed with few electives available. Both have structured and well-thought out approaches to instructional delivery. Both assess student progress repeatedly and objectively and are quick to give extra attention to a struggling student. Also, both do well in producing reasonably prepared students through an educational program, on time and onto the first rung of the career ladder.

CAN TECHNOLOGY-TARGETED HIGH SCHOOL PROGRAMS MAKE A DIFFERENCE?

While the general thrust of this study has been to better understand the role of post-secondary institutions in enhancing Latino educational and career outcomes, the project also examined the role that specially focused high school programs might contribute. There appears to be two areas in which high schools might play a role. The first is to increase the flow of Latino young people into post-secondary education, but with a high school experience that has been sufficiently rigorous so as to increase their chances of success in college. While there is a large and historic body of literature on exemplary outlier schools that are out-performing similar schools, little of it has focused on the role of high schools as a bridge to technology-intensive education and careers. The second is to determine the extent to which there are clear linkages between high school programs that emphasize IT and computers, and college choices and IT careers. To that end, the team identified a sample of nine high school programs across the three metropolitan areas. This was accomplished by examining state-based datasets on college-going, test scores, and a qualitative

“reputational” analysis. The latter involved regional experts nominating high schools whose programs were involved in innovations in IT-related education, via both classroom and experiential approaches, and that were doing a credible job in transitioning large numbers of Latino students to college.

Our conclusions and findings, based on a small group of high schools, were as follows:

- The schools in the case study sample did quite well in terms of preparing students, Latinos and others, for admission to college. That is, they avoided or ameliorated many of the usual barriers¹⁵ to success, such as inadequate school and parental guidance, insufficient rigor in course work, students failing to plan for college and having limited knowledge about how college works (particularly finances).
- In contrast, there was little persuasive evidence that the high schools were successfully steering prospective Latino graduates into IT-related college programs and majors, and even less evidence that students were understanding IT career options. Either the programs were so small or isolated as to have little aggregate impact or there was no visible evidence that anything special was being done for or with Latino students. In addition, the IT programs in these schools seemed to be more focused on imparting basic computer-related skills than career knowledge. The latter seemed to be beyond the expertise, interest or experience of high school instructors.

Some of the reasons for this state of affairs came out of the interview sessions. Several circumstances conspired against high schools being founts of useful and persuasive career guidance and information:

- Information technology is almost by definition a rapidly changing field, both in terms of prevailing approaches to hardware and software development as well as the price and performance of available equipment, and high schools usually do not use state of the art equipment and software.

¹⁵ For a complete discussion of these issues, see: Jenkins, Davis. “Rethinking How We Prepare Latino Youth for Success in College and Careers.” Paper prepared for NALEO Education Leadership Initiative. San Antonio, TX: March 5, 2005.

- High school computer instructors, many of whom come from industry jobs, rapidly become dated in terms of their knowledge of the technology, business strategies and the underlying computer science. Any career advice given to students is likely to be similarly flawed.
- IT-related instruction is typically tied to a computer laboratory setting. Unfortunately, capital budgets in most K-12 school districts are limited such that students are being trained on technology that is two or three generations removed from current industry practice. The use of dated technology also attenuates the currency of career guidance and exposure.
- Most computer instruction in high schools is focused on teaching basic PC skills for large classes. There is little opportunity for discussion of more in-depth career topics because the average student will lose interest.
- In the best case scenario, the actual number of graduating high school students who are seriously interested in a career in computers is likely to be very small. Overloaded teachers — all good intentions notwithstanding — will not be able to provide the extent of career guidance that is appropriate.

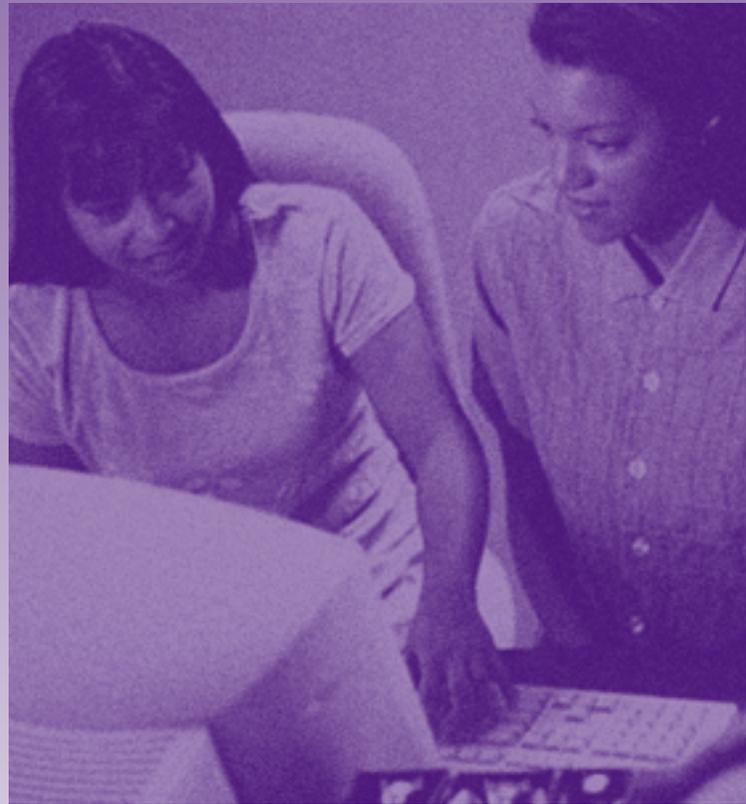
While high school can be an effective bridge to higher education for more students, especially Latinos, it is doubtful whether it can function as an IT career bridge.

HELPING LATINO FAMILIES FIND PATHWAY SCHOOLS AND COLLEGES

This study has identified characteristics and practices of schools and colleges that are relatively effective in enabling Latinos to complete undergraduate programs in information technology. These institutions are distinguished first and foremost by a mission that focuses on serving Latinos and other underrepresented students. In an ideal world, other schools and colleges would adopt similar practices. Positive change would then quickly diffuse throughout the U.S. educational system, and the problem we originally addressed would disappear.

In contrast to most sections on policy implications, we will not list recommendations for what schools, colleges and higher education policy-makers should do. Of course, more schools and colleges should reach out to Latino communities earlier, with more people on the ground and with a passionate mission to enroll, graduate and guide more students into the knowledge industry. Certainly, high school and college teachers should own this agenda and become more involved in mentoring and supporting Latino students. Unquestionably, there should be greater cooperation and mutual advisement between technology industries and higher education.

High schools and colleges would need strong incentives to change the way they do business. In reality, the incentives are not there. Schools are judged primarily on test scores rather than on whether their students are able to enter and succeed in post-secondary education. Colleges and universities are not held accountable for long term career outcomes. Selective colleges can “cream” or choose from the most qualified applicants. All of which means that IT employers will continue to rely on an imported work force or on subcontracting IT jobs outside the state.



Our team focuses its recommendations on those who have the greatest vested interest in ensuring that Latino youth enter and succeed in science and engineering fields: Latino students and their parents: In particular, working-class Latino families that are upwardly mobile with ambitions for their children. These Latino parents have not finished college; many have no college experience. They are typically not well-informed about either higher education or technology career paths. When pushed, they will urge their children to get the most education for the least money and attend the college that is closest to home. They are not privy to the data examined in this study. And like most Americans of any class or ethnicity, they are unable to perform a price/value analysis regarding educational choices, as they might do when purchasing an automobile or investing in real estate. For the most part, educational choices in the U.S. involve selecting among institutions about which they know little.

MAKING EDUCATIONAL CHOICES REAL: A PROPOSAL

One solution for getting through to Latino families would be to provide an information tool to penetrate the confusing array of information on education institutions and career paths. The rationale is based on the simple economic concept that markets work when the participants have more complete information about their choices. The current situation is one in which the “market” participants — students and their families — have at best fragmentary information about post-secondary providers and programs. They know nothing about high-performers and low-performers, or the research reports and Web-based material that could help them find programs that work. There are various rating systems for colleges generally, such as published by *U.S. News and World Report*, but they tend to provide little programmatic detail, particularly about regional institutions. Moreover, few such rating systems utilize quantitative data and are more likely to be popularity contests among elite raters and “experts.”

One solution for getting through to Latino families would be to provide an information tool to penetrate the confusing array of information on education institutions and career paths.

As an analog to what we are proposing, the Consumers Union and its monthly publication, *Consumer Reports*, has transformed the buying practices of average citizens. People today are much more likely to maximize their personal price/value calculus in their purchases than they did a few years ago. This is particularly so if they have very readable descriptions of recommended products that are top-rated in terms of understandable, practical criteria that are presented in attractive graphics and text.

Our team visualizes a *Consumers’ Directory for Latino Parents and Students*, with experimental editions for the Chicago, Los Angeles and Houston metropolitan areas to begin with. One could streamline the performance metrics that were utilized in the current project, develop an approach to categorize key “product features”, and have detailed descriptions of a range of programs — some top-rated and others less so. One could imitate the approach of *Consumer Reports* and specify best buys and choices to avoid. Of course, any such directory would need to be written in simple, accessible language and be available in English and Spanish.

A fairly straightforward field test of the efficacy of such an approach could be organized and conducted, although it would be somewhat expensive and logistically challenging. The research design would have to be a longitudinal randomized experimental

design that follows a cohort of students over time¹⁶ in order to adequately test the approach. The hypothesis being tested would be that empirically validated program descriptions, once provided to Latino parents and their high school age children, would yield better educational choices. Better choices would be operationalized as opting for schools that do better at graduating Latino students and moving them along a meaningful career path toward an important technological field.

An underlying assumption is that concerned Latino parents would respond to understandable descriptions of program features (best practices), as well as information about practical, tangible outcomes (jobs and careers), in a way that is analogous to how they respond to useful information about more prosaic consumer

products or services. In our opinion, the educational profession has been too much inclined toward obscure terminology and double-talk. Educational choice is a laudable concept, but in practice it is very difficult for the average parent and student — particularly a Latino parent of a first-time college attendee — to sort and prioritize this information.

What we are proposing in these last few paragraphs has not been tested in the real world with this population of families and students. While there is a large educational research literature about novel programs and best practices — and this report represents a small addition to that body of work — it has never been practically “translated” to the world of real families confronting very important educational choices. It should be tried.

¹⁶ Fairweather, G. W. and Tornatzky, L. G. *Experimental Methods for Social Policy Research*. New York: Pergamon Press, 1977.

APPENDIX A: DATA TABLES

TABLE A1

UNDERGRADUATE AWARDS BY AWARD TYPE AND RACE/ETHNICITY:
1989, 1994 and 1999
INFORMATION TECHNOLOGY MAJORS (see Table 1 for definition)

DEGREE LEVEL		1989		1994		1999		1994-99 % CHANGE
		N	%	N	%	N	%	
< 1 Year Certificates	All	25,943	100%	30,162	100%	43,328	100%	44%
	White	.	.	16,895	61%	22,709	52%	34%
	Afr. American	.	.	4,724	17%	7,455	17%	58%
	Hispanic	.	.	3,101	11%	6,328	15%	104%
	Asian	.	.	1,556	6%	2,828	7%	82%
	Other	.	.	1,437	5%	4,008	9%	179%
1-2 Year Certificates	All	21,843	100%	24,427	100%	31,825	100%	30%
	White	.	.	11,267	52%	17,680	56%	57%
	Afr. American	.	.	2,715	12%	4,317	14%	59%
	Hispanic	.	.	4,435	20%	5,404	17%	22%
	Asian	.	.	736	3%	2,148	7%	192%
	Other	.	.	2,694	12%	2,276	7%	-16%
Associate Degree	All	43,606	100%	39,657	100%	60,155	100%	52%
	White	.	.	26,913	68%	37,877	63%	41%
	Afr. American	.	.	4,516	11%	7,996	13%	77%
	Hispanic	.	.	3,739	9%	6,869	11%	84%
	Asian	.	.	1,785	5%	4,208	7%	136%
	Other	.	.	2,436	6%	3,205	5%	32%
Bachelors Degree	All	59,249	100%	53,387	100%	75,434	100%	41%
	White	.	.	33,139	62%	44,204	59%	33%
	Afr. American	.	.	4,580	9%	6,590	9%	44%
	Hispanic	.	.	3,334	6%	5,147	7%	54%
	Asian	.	.	5,811	11%	10,577	14%	82%
	Other	.	.	6,514	12%	8,916	12%	37%

SOURCE: Integrated Postsecondary Educational Data System (IPEDS), Completion Surveys 1989, 1994, 1999. Authors' calculations.

NOTE: IPEDS 1989 does not include breakdown of recipient race/ethnicity by major field.

TABLE A2a
UNDERGRADUATE AWARDS BY RACE/ETHNICITY
AND INSTITUTION TYPE, 1999-2000
INFORMATION TECHNOLOGY MAJORS (see Table 1 for definition)
AWARDS OF LESS THAN ONE ACADEMIC YEAR

	All		Afr. American		Hispanic		Asian		White		Other	
	N	%	N	%	N	%	N	%	N	%	N	%
4YR PUB	442	1%	6	0%	3	0%	9	0%	415	2%	9	0%
4YR P-NFP	159	0%	9	0%	36	1%	7	0%	88	0%	19	0%
4YR P-FP	825	2%	83	1%	159	3%	97	3%	387	2%	99	2%
2YR PUB	8,634	20%	1,153	15%	598	9%	702	25%	5,710	25%	471	12%
2YR P-NFP	918	2%	58	1%	129	2%	154	5%	543	2%	34	1%
2YR P-FP	7,991	18%	1,373	18%	835	13%	430	15%	4,207	19%	1,146	29%
<2YR PUB	7,681	18%	1,132	15%	573	9%	158	6%	5,421	24%	397	10%
<2YR P-NFP	458	1%	44	1%	336	5%	28	1%	43	0%	7	0%
<2YR P-FP	16,220	37%	3,597	48%	3,659	58%	1,243	44%	5,895	26%	1,826	46%
ALL	43,328	100%	7,455	100%	6,328	100%	2,828	100%	22,709	100%	4,008	100%

SOURCE: IPEDS, Completion Survey, 1999-2000. Author's calculations.

TABLE A2b
UNDERGRADUATE AWARDS BY RACE/ETHNICITY
AND INSTITUTION TYPE, 1999-2000
INFORMATION TECHNOLOGY MAJORS (see Table 1 for definition)
AWARDS OF AT LEAST ONE BUT LESS THAN TWO ACADEMIC YEARS

	All		Afr. American		Hispanic		Asian		White		Other	
	N	%	N	%	N	%	N	%	N	%	N	%
4YR PUB	451	1%	71	2%	10	0%	20	1%	321	2%	29	1%
4YR P-NFP	1,626	5%	236	5%	195	4%	129	6%	995	6%	71	3%
4YR P-FP	727	2%	113	3%	32	1%	51	2%	460	3%	71	3%
2YR PUB	8,014	25%	931	22%	614	11%	530	25%	5,397	31%	542	24%
2YR P-NFP	457	1%	39	1%	50	1%	46	2%	276	2%	46	2%
2YR P-FP	6,895	22%	1,282	30%	619	11%	455	21%	4,336	25%	203	9%
<2YR PUB	2,299	7%	176	4%	351	6%	62	3%	1,475	8%	235	10%
<2YR P-NFP	394	1%	13	0%	228	4%	11	1%	92	1%	50	2%
<2YR P-FP	10,962	34%	1,456	34%	3,305	61%	844	39%	4,328	24%	1,029	45%
ALL	31,825	100%	4,317	100%	5,404	100%	2,148	100%	17,680	100%	2,276	100%

SOURCE: IPEDS, Completion Survey, 1999-2000. Author's calculations.

TABLE A2c
UNDERGRADUATE AWARDS BY RACE/ETHNICITY
AND INSTITUTION TYPE, 1999-2000
INFORMATION TECHNOLOGY MAJORS (see Table 1 for definition)
ASSOCIATE DEGREES

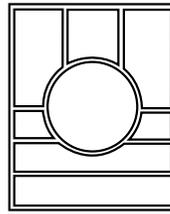
	All		Afr. American		Hispanic		Asian		White		Other	
	N	%	N	%	N	%	N	%	N	%	N	%
4YR PUB	2,868	5%	332	4%	184	3%	123	3%	2,066	5%	163	5%
4YR P-NFP	2,613	4%	336	4%	575	8%	128	3%	1,444	4%	130	4%
4YR P-FP	8,886	15%	1,454	18%	1,363	20%	702	17%	4,732	12%	635	20%
2YR PUB	27,652	46%	3,046	38%	1,993	29%	1,886	45%	19,120	50%	1,607	50%
2YR P-NFP	3,778	6%	306	4%	613	9%	821	20%	1,813	5%	225	7%
2YR P-FP	14,323	24%	2,510	31%	2,138	31%	534	13%	8,696	23%	445	14%
<2YR P-FP	7,681	18%	1,132	15%	573	9%	158	6%	5,421	24%	397	10%
ALL	60,155	100%	7,996	100%	6,869	100%	4,208	100%	37,877	100%	3,205	100%

SOURCE: IPEDS, Completion Survey, 1999-2000. Author's calculations.

TABLE A2d
UNDERGRADUATE AWARDS BY RACE/ETHNICITY
AND INSTITUTION TYPE, 1999-2000
INFORMATION TECHNOLOGY MAJORS (see Table 1 for definition)
BACHELOR'S DEGREES

	All		Afr. American		Hispanic		Asian		White		Other	
	N	%	N	%	N	%	N	%	N	%	N	%
4YR PUB	46,783	62%	3,852	58%	2,748	53%	7,545	71%	27,292	62%	5,346	60%
4YR P-NFP	21,177	28%	1,589	24%	1,559	30%	2,204	21%	12,936	29%	2,889	32%
4YR P-FP	7,474	10%	1,149	17%	840	16%	828	8%	3,976	9%	681	8%
ALL	75,434	100%	6,590	100%	5,147	100%	10,577	100%	44,204	100%	8,916	100%

SOURCE: IPEDS, Completion Survey, 1999-2000. Author's calculations.



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