

Out of the Mix: Native Americans in Information Technology

Roli Varma

University of New Mexico

The number of Native Americans – the original peoples of the United States of America – pursuing education in information technology (IT) related disciplines is low. For instance, the 1999-2000 Taulbee Survey found that Native Americans earned 31 (0%) of computer science (CS) and 4 (0%) of computer engineering (CE) bachelor degrees.⁴ Under-representation of Native Americans in IT is critical for the American society, which promotes equal access to education and employment. Because of their relatively small number (1.5% of U.S. population), Native Americans are seldom represented in the assessment of racial disparities in IT. Most importantly, once Native Americans' land stretched from the Atlantic to the Pacific Ocean and from the Arctic Circle to the tip of South America. But, over the years, their lives have been disrupted and they have been dislocated.²⁰ With the rise of information society, Native Americans face another danger of being left behind.

Most scholarly work has been on the gender gap in science and engineering (S&E). It is generally assumed that many of the reasons that discourage women from S&E education and careers apply to under-represented minorities. When scholars have studied under-represented minorities in S&E, they have concentrated on Afro-Americans and Hispanics.^{5,7,16} There is little work on Native Americans in S&E.

Recently, scholars have begun to take a more in-depth look into the specific disciplines of IT and under-representation of women.^{1,6,9,10,11,13,21} Some have begun to focus on under-represented minorities in IT^{3,22} Studies reveal racial/ethnic socialization of childhood, bias in schooling, lack of proficiency in mathematics and science, problems resulting from working in a predominantly white environment, lack of resources especially computers at home, digital divide, image of IT, and absence of the minorities role models – all of which contributes towards under-representation of minorities in IT education and career. Though most of these are likely to apply to Native Americans, there may be additional historical and cultural factors, which may play an essential role in their learning process.

Native Americans maintain tribal traditions and languages and accept those new technologies, which address their needs.²⁰ They tend to have humanistic and holistic approaches of learning and knowledge. Their worldviews emphasize the importance of grasping the big picture before studying particular things or subjects.¹² Native Americans consider competitiveness, boasting about oneself, direct eye contact, and individual success taboos.²⁴ Instead, they prefer harmony and group-oriented learning environments to be more important than the individual success.² As

a result, Native American students may face additional difficulties in pursuing a major in IT related disciplines than other under-represented groups in IT such as women, Afro-Americans, and Hispanics.

This paper discusses why so few Native American students pursue education in IT related disciplines after high school. It is based on 50 in-depth interviews of undergraduate students at six non-tribal and tribal universities where they were attending CS/CE programs. The study is limited to these two fields because scholars have taken a degree in CS/CE as the main route for an IT career. It includes tribal universities in the sample because they educate a disproportionate share of post secondary Native American students in IT-related field. Tribal colleges and universities were created or chartered by one or more tribes in the late 1960s. There are 27 tribal colleges and universities under the Carnegie classification, most of them are located on reservations. This paper presents findings from one key question: “Why there are very few Native American students pursuing a degree in CS/CE?”

Brief Profile of Native Americans

Native Americans, officially classified as American Indians or Alaska Native, are those people who have origin in any of the original peoples of North and South America and who maintain tribal affiliation or community attachment. Approximately 4.1 million Native Americans (this number includes 2.5 million who reported only American Indian and Alaska Native and 1.6 million who reported American Indian and Alaska Native as well as one or more other races) reside in the United States.¹⁹ Almost 500,000 Native Americans live on over 300 reservations and trust lands – areas with boundaries established by treaty, statute, and/or executive or court order. Though counted as one group, they are made up of approximately 500 tribes, which vary greatly in size. Only six tribes (Cherokee, Navajo, Latin American Indian, Choctaw, Sioux, and Chippewa) have over 100,000 persons each, and four tribes (Apache, Black feet, Iroquois, and Pueblo) have populations of at least 50,000 each; most tribes have populations less than 10,000.¹⁹

The Native American population is rather young. In 1998, the median age was 27.4 years, about 8 years younger than the median for the population as a whole.¹⁸ This is partially because of higher fertility rates than the total population. The vast majority of Native American households consist of large families (3.6 people per family versus 3.1 people for all families). In 1998, almost 75% of Native American households consisted of families; of these, 65% were maintained by married couples, 26% by women with no husband, and 9% by men with no wife.¹⁸ Native Americans have more families maintained by a female household than the total population.

Economically, many Native Americans live in poverty compared to the total population. A three-year average (1997-1999) poverty rate for Native Americans was 25.9%, the highest among all racial groups.⁸ Overall, Native Americans are employed in service occupations; farming, forestry, and fishing jobs; precision production, craft, and repair occupations; or are employed as operators, fabricators, and laborers. Only a small proportion of them are employed in managerial and professional specialty occupations as well as in technical, sales, and administrative support occupations. Native American women have increased their participation in the labor force.

The educational attainment levels of Native Americans have improved significantly over the last two decades. In 1995, 131,000 Native Americans were enrolled in the nation's colleges and universities, up from 84,000 in 1980. Nearly 6 in 10 of these students were women. During the 1993-94 school year, over 13,000 Native Americans received college degrees either an associate's, bachelor's, master's, doctor's or professional.¹⁸ Despite the advances, Native Americans remain considerably below the levels of the total population. They are less likely than the total population to graduate from high school, to enroll in college, and to graduate from college.²³

Among Native Americans who do enroll in or graduate from college, they are less likely to be in S&E fields. They enter college and universities academically unprepared for rigorous science and engineering curricula.^{14,15} For Native Americans, the phenomenon of stepping into and out of S&E is a typical mode of college attendance. Those who return to higher education, only few continue a degree in science and engineering; most change their field. A small percentage of Native Americans finished degrees in science and engineering. In 1996, Native Americans earned 1% of the associate, 0.6% of bachelor, 0.4% of master, and 0.4% of doctorate degrees in science and engineering.¹⁴

Findings

In response to the question – Why there are very few Native American students pursuing a degree in CS/CE? – students identified a number of obstacles which Native Americans face. Below is a brief description of these obstacles.

The majority of students believed that there is a lack of computer resources in Native American communities, which leads to non-exposure and unfamiliarity with CS/CE programs. Students felt that lack of exposure creates distinct obstacles for Native American students that non-minority students do not encounter. One student responded: “I have to say the resources available to Native Americans in reservations right now are extremely low.” Another said: “I think there's a lot more computers now in schools. When I was in school, there weren't that many computers. We had some but they were for entertainment or to finish assignments.” One student added: “Somehow computers have been much more common with white, upper- and middle-class households, and not so much with non-white groups and lower class. Because of lack of familiarity, [Native Americans] are not sure what computers are all about.” Another student said: “I imagine it is because of the technological aspect. Maybe traditional people haven't been exposed to it as much as other people.”

Many students believed that low Native American students participation in CS/CE programs is due to lack of personal motivation resulting from a conflict between the traditional culture of Native Americans and the academic culture of CS/CE programs. According to them, unlike the culture of CS/CE programs, Native American culture tends to emphasize nature with computer technology being counter to that focus. The environment in the CS/CE programs is intimidating and thus discourages Native American people's participation. One student said: “I would say some of it would be the upbringing and the ideology of nature of controlling forces as the divine force and a lot of Native Americans might see computers as a [conflict] of nature so they would

want you to stay away from them as a profession.” Another student indicated: “Just because they have different values, [Native Americans] do not have the drive to do well in school.” One student said: “I can’t say because there’s a lack of opportunity. I think there is a lack of self motivation mostly because of different life styles and value system.” Another student felt: “Because it’s very hard to accomplish this degree, and I just don’t think [Native Americans] have the determination, the discipline or even the encouragement. Because they’re content with their own traditional lives.”

Moreover, there are a small number of Native Americans in higher education, which results in the availability of a small number of Native Americans for CS/CE programs. Because Native Americans are underrepresented in higher education, they are also underrepresented in CS/CE programs. Many students noted that there are a small number of Native Americans in higher education, which can influence the number of Native Americans available for CS/CE programs. One student said: “A lot of them are not even in college, and the ones who are they’re studying different fields.” Another said: “I think most of it has to do with the fact that most Native Americans don’t even get past High School. How can they be in CS/CE?”

Students also asserted that the low number of Native Americans in CS/CE is a result of their interest in other fields and disciplines such as social work and nursing. They think that there is no work with CS/CE degree on the reservation. One student said: “I’m pretty sure that they are not interested in computer science because they are more interested in another field. I don’t know maybe it’s the high school. There is not just working interest in computer science.” Another student said: “I don’t know why there are not too many [Native Americans] in computer science. I know there are a lot of Native Americans on campus and they all are pursuing different degrees such as Native American studies, Navajo language, and business administration. Maybe they think computer science is too hard or they’re just interested in other fields.” Another student said: “Maybe, people might want to do something else that might benefit their tribe than pursuing a degree in computer science.”

Students also indicated that CS/CE programs are not presented as a viable career path to Native Americans. Consequently, they simply do not know that CS/CE programs offer opportunities for building a career. According to students, there is low Native American participation in CS/CE because Native Americans do not see the utility in a CS/CE degree. Native Americans may not understand the potential applications of computer technology. One student said: “I think it maybe because maybe way back then a lot of people just went to high school and after that they sought out to get a job and they took care of their families and stayed home.” Another student said: “I’m not really sure... I can’t speak for everybody, but from where I came from, it just wasn’t something that people thought about.” One student narrated: “Where I come from a lot of students have trouble with their studies in high school. Many of them, they’ll get their GED or they’ll graduate, but they’ll go right into the work force. I guess that what they look at what is important. The main goal in my community is to get your high school diploma. Then most of them go into the workforce. It’s not until they’re in their thirties or forties and they have their families, that they decide to come back and get some type of higher education.”

Finally students suggested lack of family encouragement and support as a reason for low Native American participation in CS/CE. Parents do not encourage their children to pursue CS/CE programs because of which Native Americans do not develop early exposure and interest. One

student said: "A lot of Native American students don't have that kind of support from home growing up. They don't put a value of doing well in school." Another said: "I think parents should push their kids to go to the schools on the reservations. If kids do not go to the school, it is rare that they will go to college."

Conclusion

Findings show that low Native Americans participation in CS/CE programs is mostly due to lack of exposure to computers and computer-related courses in high school, personal motivation resulting from a conflict between the Native American culture and the academic culture, interest in fields other than CS/CE, small number of Native Americans in higher education, and lack of family encouragement from family and friends.

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References

1. American Association of University Women (2000). *Tech-Savvy: Educating Girls in the New Computer Age*. Available at <<www.aauw.org/2000/techsavvy.html>>
2. Anderson, L. and Stein, W. (1992). "Making Math Relevant" *Tribal College* 3(3), 18-19.
3. Aspray, William. and Bernat, Andrew. (2000). *Recruitment and Retention of Underrepresented Minority Graduate Students in Computer Science*. Washington D.C.: Computing Research Association.
4. Bryant, Randal E. and Irwin, Mary Jane. (2001, March). "Current and Future Ph.D. Output Will Not Satisfy Demand for Faculty" *Computing Research News*, 5-11.
5. Campbell, George, Jr., Denes, Ronnie. and Morrison, Catherine. (Eds.) (2000). *Access Denied: Race, Ethnicity, and the Scientific Enterprise*. New York: Oxford University Press.
6. Cassell, Justine. and Jenkins, Henry. (Eds.) (1998). *From Barbie to Mortal Kombat: Gender and Computer Games*. Cambridge: MIT Press.
7. Clewell, B., Anderson, B. and Thorpe, M. (1992). *Breaking the Barriers: Helping Female and Minority Students Succeed in Mathematics and Science*. San Francisco: Jossey-Bass.
8. HHES Information Staff. (2000). *Poverty Rate Lowest in 20 Years, Household Income at Record High*, United States Department of Commerce News CB00-158. Washington D.C.: U.S. Government Printing Office. Available at <<<http://www.census.gov/Press-Release/www/2000/cb00-158.htm>>>
9. Howell, Kathy. (1993). "The Experience of Women in Undergraduate Computer Science: What Does the Research Say?" *SIGCSE Bulletin*, 25(2), 1-8.
10. Margolis, Jane. and Fisher, Allen (2002). *Unlocking the Clubhouse: Women in Computing*. Cambridge: MIT Press.
11. Martin, C. D. and Murchie-Beyma, E. (Eds.) (1992) *In Search of Gender-Free Paradigms for Computer Science Education*. Eugene: International Society for Technology in Education.
12. Megginson, R. (1990). *Mathematics and Native Americans*. Washington, D.C.: Mathematical Association of America.

13. Moses, L. E. (1993). "Our Computer Science Classrooms: Are They Friendly to Female Students" *SIGCSE Bulletin*, 25(3), 3-12.
14. National Science Foundation. (2000). *Women, Minorities, and Persons with Disabilities in Science and Engineering*. Arlington: Author.
15. National Science Foundation. (2002). *Science and Engineering Indicators*. Arlington: Author.
16. Seymour, Elaine. and Hewitt, Nancy M. (1997). *Talking About Leaving: Why Undergraduates Leave the Sciences*. Colorado: Westview Press.
17. Spertus, Ellen. (1991). "Why Are There So Few Female Computer Scientists?" *The MIT Artificial Intelligence Laboratory Technical Report 1315*. Available at <<http://www.mills.edu/ACAD_INFO/MCS/SPERTUS/Gender/why.html>>
18. U.S. Census Bureau. (1998). "American Indian Heritage Month: November 1-30" *Census Bureau Facts and Features*. Available at <<<http://www.census.gov/Press-Release/cb98ff13.html>>>
19. U.S. Census Bureau. (2002). *The American Indian and Alaska Native Population: 2000, Census 2000 Brief*. Available at <<<http://www.census.gov/population/www/cen2000/briefs.html>>>
20. U.S. Department of Commerce. (1993). *We the... First Americans*. Washington D.C.: Bureau of the Census.
21. Varma, Roli. (2002a). "Women in Information Technology: A Case Study of Undergraduate Students in a Minority-Serving Institution" *Bulletin of Science, Technology & Society*, 22(4), 274-282.
22. Varma, Roli. (2002b). "Undergraduate Minorities in IT-Related Fields: Findings from a Case Study in a Minority-Serving Institution" *American Society for Engineering Education Annual Conference & Exposition*. Available at <<<http://www.asee.org/conferences>>>
23. Wilds, D. J. and Wilson, R. (1998). *Minorities in Higher Education, 1997-98: Sixteenth Annual Status Report*. Washington, D.C.: American Council of Education.
24. Wildcat, Daniel. and Necefer, Edward. (1993). "A Native American Model" in Enid B. Jones (ed.) *Lessons for the Future: Minorities in Math, Science and Engineering at Community Colleges*. Washington, D.C.: American Association of Community Colleges.

Roli Varma is an associate professor in the School of Public Administration at the University of New Mexico. She also teaches Technology in Society for the School of Engineering. Her research and publication include women and minorities in information technology, new immigrants in science and engineering, engineering ethics, and management of industrial research and development. She can be reached at varma@unm.edu.