

Strategies for Motivating Minorities to Engage Computers

Position Paper for the Carnegie Mellon Symposium on Minorities and Computer Science

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Minorities and Computers

In this paper I discuss a topic that is relevant and closely related to the issue of minorities and computer science, namely, the digital divide (NTIA, 1999), or the underparticipation of minorities with computers and related technologies. There are three questions that I believe are central to this problem:

- How can we ensure that minorities have equal opportunity to use computers?
- How can we encourage minorities to use computers and pursue computer-related careers?
- How can we ensure that computer education recognizes diverse pathways to knowing, thinking, teaching, and learning, particularly as it relates to minorities?

The first question is an issue of *access*. Very simply, we must ensure that minorities have the opportunity to use computers. Without access to a computer, many of the remaining issues are moot. There are a number of initiatives being undertaken to address this problem by the government, corporations, private foundations, and non-profit organizations. The second question is an issue of relevance and *motivation*. We must provide the proper encouragement for minorities to use computers and pursue computer-related careers. Failure to do so nullifies the benefits of access, and renders the remaining question as irrelevant. We must identify the social, psychological, and cultural reasons why some minorities are not motivated to use computers and pursue computer-related careers, and outline how these obstacles can be overcome. The third question is an issue of *pluralism*. We must ensure that computer education recognizes diverse pathways to knowing, thinking, teaching, and learning, particularly as it relates to minorities, and propose strategies to address these epistemological and pedagogical concerns.

Each of these questions denotes an important and interrelated issue pertaining to minorities and computers. Improvements in one area will undoubtedly cause improvements in others. By providing access we may spark motivation. By embracing pluralism we may increase motivation. By addressing motivation we may encourage access. Naturally, it is by making comprehensive improvements in all of these areas that the greatest progress will be achieved.

Motivation and the Barriers to Motivation

With respect to access, many minorities have the economic wherewithal to purchase a computer, and I believe more would purchase a computer, *if they were motivated to use them* and could readily see its relevance. With respect to pluralism, minorities have the intellectual wherewithal to master computers, and continue to overcome the epistemological or pedagogical challenges embedded in computer education, especially *when they are motivated to use them* and learn about them. Therefore, I assert that the heart of the problem lies in finding ways to motivate minorities to embrace computer technology, and it is here that I will focus most of my attention.

Several studies have examined the barriers to minorities' success in mathematics and science (Beane, 1985; Clewell and Anderson 1991; Lockheed and others, 1985; Oakes, 1990; Olstad, Juarez, Davenport, and Haury, 1981; Stage, Kreinberg, Eccles, and Becker, 1985). These findings include the following: (1) negative attitudes toward mathematics and science; (2) lower performance levels on standardized tests than those of White males in mathematics and science courses; (3) limited exposure to extracurricular mathematics and science activities and failure to participate in advanced mathematics and science courses in

high school; and (4) lack of information about and/or interest in mathematics- or science-related careers (Clewell, 1987; Clewell, Anderson, and Thorpe, 1988).

Since mathematics and science are very closely related to computers, these findings help in explaining the barriers to minorities' success with computers. However, we must endeavor to identify the particular challenges associated with minorities and computers/computer science more specifically. For example, based on a modest sample of five interviews with students of color in computer science or a related field, I identified four potentially negative attitudes of minorities toward computers: (1) perceived as not relevant to their lives; (2) perceived as part of the White culture; (3) perceived as part of "the system"; and (4) perceived as not popular or not "cool".

Strategies and Recommendations

In their book, *Breaking the Barriers: Helping Female and Minority Students Succeed in Mathematics and Science*, Clewell, Chu, Anderson, and Thorpe, describe a number of programs that have been successful in engaging female and minority students in mathematics and science (Clewell, Chu, Anderson, and Thorpe, 1992). They also outline several strategies for improvement including role model and mentoring programs, career awareness programs, extra-curricular clubs and activities, provision of a positive support environment, and academic enrichment programs. Similar programs and strategies have, and should continue to be implemented with respect to minorities and computers. Here, I present additional ways to improve minorities' engagement with computers, many of which are being undertaken throughout the country:

- ***Establish Multiple Points of Access*** - Parents must be encouraged to purchase a computer for their homes. Schools must endeavor to provide access for their students. Communities must continue to establish community technology centers (CTC's). CTCNet, the National Urban League, and the Computer Clubhouse Network all provide examples (CTCNet, 1998, Resnick and Rusk, 1996).
- ***Raise Technological Awareness in Minority Communities*** - This should be done in a way that combats the negative stereotypes that have historically presented barriers, and motivates minorities to seek access and pursue computer-related careers. NACME's "Math is Power" campaign is one such example.
- ***Leverage Computers to Foster Holism*** - Computers open the door for previously disparate bodies of knowledge and experience to be integrated in a coherent framework. Some people prefer to learn content through self-expression in visual, dramatic, and musical arts, and benefit from opportunities to move, speak, and read aloud. The computer provides rich opportunities to promote these activities through the use of multimedia. Turkle and Papert write, "The computer, with its graphics, sounds, its text and animation, can provide a port of entry for people whose chief ways of relating to the world are through movement, intuition, visual impression, the power of words and associations (Turkle and Papert, 1992)."
- ***Redesign Computer Learning Environments and Demonstrate Relevance*** - Computer education and computer instruction should also incorporate straightforward, non-technical solutions to redesigning computer learning environments. For example, computer assignments should be organized in groups when possible and appropriate. Computer classes should demonstrate the relevance of the material to real-world problems and real people (e.g., an assignment done in the community instead of a laboratory).
- ***Recognize Diverse Pathways to Knowing, Thinking, Teaching, and Learning*** - It will require fundamental changes in the way computers are taught and computer curricula are designed to truly advance pluralism. An example of a current effort to implement such changes at the collegiate level can be found at Carnegie Mellon University, with respect to gender and computer science (Margolis, Fisher, and Miller, 1998).

Conclusion

While the issues of access, motivation, and pluralism are important and interrelated, once again, I believe that motivation lies at the heart of the problem. Despite this assertion, it cannot be overemphasized that it is only through comprehensive improvement in all of these areas that true progress will be achieved. We must endeavor to provide everyone with an equal opportunity to access computers, use computers, and learn about computers. This is particularly true for women and minorities, two groups that have been historically disenfranchised, yet are projected to represent the majority of the eligible workforce as we move toward the next millennium. The benefits derived from doing so will not only support efforts to increase the participation of minorities in computer science, but also the much broader information revolution.

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