

# Enhancing Inclusion in Computer Science Education

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## INTRODUCTION AND BACKGROUND<sup>1</sup>

We describe an intervention that uses computer science (CS) faculty and students to create an inclusive learning environment. Our intervention model assumes that persistence and retention are the result of a match between student motivation and abilities and the university's social and academic characteristics. This match in turn influences the effective integration of students with the university and, as a result, their persistence and retention (Cabrera, Castaneda, Nora, & Hengstler, 1992; Tinto, 1993). We are currently implementing and evaluating this intervention at Old Dominion University, a research intensive urban university with a culturally diverse student body, and Norfolk State University, an urban and historically black university (HBCU) that primarily emphasizes teaching.

## A MODEL FOR CREATING INCLUSIVE LEARNING ENVIRONMENTS

### Organizational Support for Faculty and Students

This portion of our model depicts external resources available to support change in faculty and students

(see Figure 1). Support for faculty includes peers, teaching assistants, and external consultants who provide assistance in areas targeted for change, for example, pair programming practices. Support for students includes academic resources such as tutoring, advising, and mentoring. Professional organizations, such as the Association for Women in Computing, may provide support to both faculty and students.

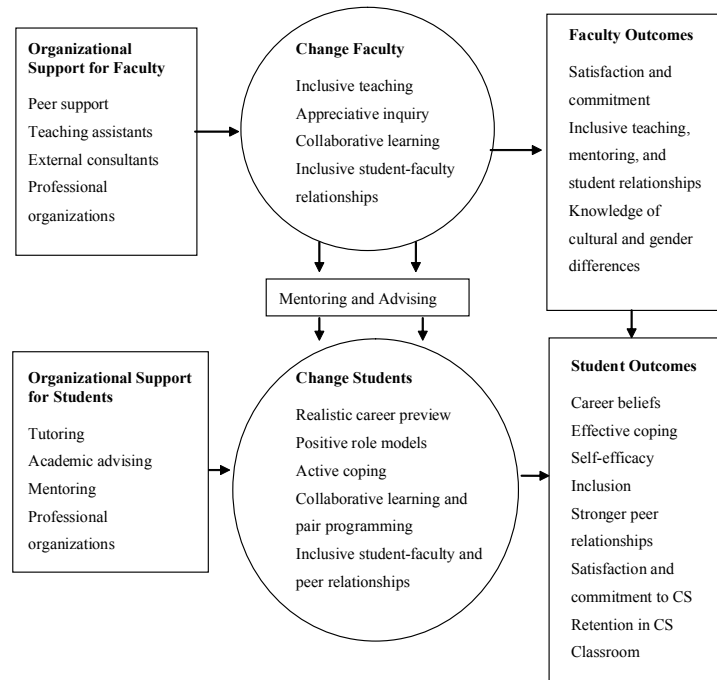
### Changing Faculty

We focus on faculty because they influence student outcomes. The intervention concentrates on faculty who teach introductory programming classes because these classes represent the first and largest barrier to success in CS. We build on existing talents and strengths of faculty by emphasizing four skill areas: (1) inclusive teaching practices, (2) appreciative inquiry, (3) collaborative learning, and (4) inclusive student-faculty relationships.

### Inclusive Teaching

Teaching style strongly influences retention in science, mathematics, and engineering (Seymour & Hewitt, 1997). Men and women and members of different ethnic groups experience IT work environ-

Figure 1. Intervention model for creating inclusive learning environments



ments and learning environments differently (Major, Davis, Sanchez-Hucles, & Mann, 2003; Steele, 1997; Steele & Aronson, 1995). Inclusive teaching encourages acceptance of diverse styles of learning and avoids actions based on stereotypes concerning group membership.

### Appreciative Inquiry

Mentoring and tutoring typically focus on deficits and remediation. Appreciative inquiry, in contrast, emphasizes optimism, positive expectations, and challenge (Srivastva & Cooperrider, 1990). People tend to act in ways to fulfill expectations of powerful others, such as professors. Moreover, use of positive expectations energizes and directs behavior in a manner to fulfill expectations. Positive expectations may be especially powerful for those for whom low expectations are held (McNatt, 2000) or for those for whom gender or racial stereotypes influence expectations (Jussim & Eccles, 1992).

### Collaborative Learning

Faculty members experience positive outcomes when they learn and share their experiences together. Collaboration may lead faculty to learn more deeply,

encourage and support one another, explore new methods of teaching, increase collegiality, discover and appreciate student differences, and develop a shared vision for teaching inclusiveness (Cox, 2002). Faculty who share learning experiences report increased interest in the teaching process, effectiveness as a teacher, and awareness and understanding of how differences may influence and enhance teaching and learning (Cox, 2002).

### Inclusive Student-Faculty Relationships

The quality of exchange in relationships influences important outcomes. Inclusive student-faculty relationships enhance mentoring and advising and increase the retention of women and minority IT students (Cohoon, 2001, 2002; Güreş & Camp, 2002). Mentoring has more positive effects when it is not remedial in nature. Inclusive mentoring may be critically important because *not actively encouraging* women and minorities may have the same effect as *actively discouraging* them (Leggon, 2003).

### Mentoring and Advising

Mentoring and advising link together faculty change and student change. Mentoring represents an at-

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