

# Programming for Communication: Overcoming Motivational Barriers to Computation for All

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## Abstract

*Computer science as a discipline is failing to reach a diverse audience. As a result, computational illiteracy threatens many groups of underserved students—women, minorities and possibly other, as yet undocumented groups, such as students of the humanities. If learning programming were contextualized in domains relevant to different audiences, more students would be motivated to learn to program. I contend that teaching computer science in the context of digital media manipulation will attract and engage many students who would otherwise not choose to learn programming.*

## 1. Introduction

The inability of post-secondary computer science departments to attract and engage a diverse audience has been documented in the form of declining enrollment and completion by women and minorities [7,8] and dramatically high field attrition [6]. Universities in the United States have reported withdrawal, failure, and D-grade (WFD) rates in introductory computer science reaching 50% [3,5]. The potential repercussions of these trends include widespread computational illiteracy among females, minorities and possibly as yet undocumented groups such as students of the humanities and other fields.

It seems that traditional introductions to computer science (CS) are more likely to frustrate many students than encourage them to pursue further learning. Studies of the under-representation of women in particular fault the emphasis in CS courses on technical detail rather than application, the perception of computing as an uncreative or asocial field, and a frequently uncongenial “computer culture” [1,4]. Turkle and Papert maintain that the dearth of women in computing is induced not only by historical prejudice or discrimination, “but by ways of thinking that make them reluctant to join in” and that “equal access to even the most basic elements of computation requires an epistemological pluralism, accepting the validity of multiple ways of knowing and thinking” [9].

At the Georgia Institute of Technology, these problems exist in microcosm: the overall WFD rate in introductory CS has averaged nearly 30% over the past three years and female enrollment in the College of Computing has dropped by roughly a percentage point in each of the last four fall semesters (currently 11%) [2]. A new course at Georgia Tech has recently been developed to provide an alternate introduction to CS, one that focuses on using computers for communication instead of calculation. *Introduction to Media Computation* combines learning about the fundamentals of digital media with basic programming skills and CS concepts. It is open to non-CS, non-engineering students such as liberal arts, management, and architecture majors.

I believe that Media Computation will provide an introductory CS experience that overcomes reasons that many students, especially females, seem unreceptive to CS. Media manipulation as a creative context for computing combined with the collaborative course implementation trialed at Georgia Tech will lead to lower WFD rates, increased interest in computing among female students, and, eventually, record numbers of non-CS majors taking elective CS at Georgia Tech.

## 2. Pilot Study

During the spring semester, 2003, Georgia Tech offered a pilot of the media computation course. I managed a research team that recorded and analyzed student achievement and attitudes through a series of surveys, interviews, assessments and observations. In some areas the results have been dramatic; in others, inconclusive.

Generally, response to the pilot course was extremely encouraging. WFD rates reached only 11.5%, compared to 42.9% in the traditional introductory CS course. Overall, students were positive in their opinions about media computation. At midterm, over 20% of media computation students named content as their favorite aspect of the course. No media computation students reported a complete aversion to the course, compared to

