Faculty Resources

Attracting and Retaining Women in IT

- How Does the Physical Environment Affect Women's Entry and Persistence in Computing? (2 pages)
- How Do You Introduce Computing in an Engaging Way? (8 pages)
- 2016 Black Women and Girls in Computing Roundtable (14 pages)
- In Tech, Some Bemoan the Rise of 'Brogrammer' Culture (4 pages)

Attracting and Retaining Underrepresented Minority Students

- Addressing a Threat in the Air: How Stereotypes Affect Our Students and What We Can Do About It (12 pages)
- Top 10 Ways to Engage Underrepresented Students in Computing (7 pages)
- Why There Aren't More Latinos in the Tech Industry (4 pages)

Lists of IT Pioneers with Links to Articles / Videos

- Men of color
- Women

National Center for Women & Information Technology
PROMISING PRACTICES

How Does the Physical Environment Affect Women's Entry and Persistence in Computing?

The design of physical spaces communicates beliefs about what kinds of people belong in them and what kinds of activities should be done in them (Hattenauer, 1984). Imagine if doctors' offices were designed like dry cleaning shops: no room or furniture for sitting, clear view of what goes on behind the desks, and open glass front windows. Patients would not expect to wait long for their appointments nor could they reasonably expect privacy during a consultation. The medical profession would be, for better or worse, revolutionized.

Many of us have experienced being in a place where we felt like we did not belong, a place designed for someone not like us. For example, you might have been a staunch rock and roll fan in a country-western bar, with wagon wheels, mounted moose heads, and cow hides on the walls. Most people prefer to avoid or leave environments where they feel like they don't belong — even if they can't explain what makes them feel uncomfortable — and that reaction helps explain women's absence or departure from computing.

FEELING LIKE YOU BELONG

Much of the research on career choice focuses on "fit" between a person and an occupational environment. For example, leading scholars on this topic argue that fit in an occupation depends on having personality characteristics similar to the people already in that occupation. The jury is still out on many aspects of this theory, but estimating person-environment fit — deciding whether I belong here — is clearly an important element of career choice. For this reason, efforts to attract a broader population to computing must avoid communicating stereotypes that lead women or other underrepresented groups to feel they would not fit comfortably in a computing major or occupation.

Commonly held beliefs about gender, technology, and the relationship between the two shape the context for participation in computing. These beliefs stereotype computing as masculine, which influences thoughts and expectations about the type of person suited for computing study and work. Often operating at a subconscious level, these stereotypes affect feelings of belonging in computing environments.

Stereotypes are communicated in a variety of ways, including cues in the physical or virtual environment. For example, rooms decorated with images and objects associated with "geeky" stereotypes are less appealing and welcoming to women than are gender neutral rooms. Likewise, online classrooms decorated with these stereotyped images lead women to feel that this environment is not for them. Research has shown that this effect of stereotyped environments **measurably reduces women's interest in declaring a computing major and their anticipated success in computing.**

The physical environment is one of several factors that contribute to the gender gap in computing. Together with other commonplace practices and situations, it helps to create a climate where women feel more or less comfortable. Understanding this influence allows us to actively craft a more gender-balanced field.

CREATE A WELCOMING ENVIRONMENT

Create a physical environment that communicates a sense of belonging to a broad population. According to research done with college students, items such as stacked soda cans, Star Trek and Star Wars images and paraphernalia, video game boxes, comics, science fiction books, electronics, and computer parts communicate a lower sense of belonging to women than men. Objects such as these create a comfortable environment for only a narrow portion of the population. To instead welcome a wider range of people into computing, create a more gender neutral ambiance with items including plants, art or nature posters, water and a coffee maker, or general interest books and magazines.

RESOURCES

Cheryan, S., Plaut, V., Davies, P., & Steele, C. (2009). Ambient belonging: How stereotypical cues impact gender participation in computer science. *Journal of Personality and Social Psychology, 97*(6), 1045-1060. Also see video presentations of Dr. Cheryan's work at http://www.uwtv.org/programs/displayevent.aspx?rID=33000 and http://www.uwtv.org/programs/displayevent.aspx?rID=33001

Hattenhauer, D. (1984). The rhetoric of architecture: A semiotic approach. *Communication Quarterly, 32*, 71-77.

Satterwhite, R., Fleenor, J., Braddy, P., Feldman, J., & Hoopes, L. (2009). A case of homogeneity of personality at the occupational level. *International Journal of Selection and Assessment. 17*(2), 154-164.

NCWIT offers practices for increasing and benefiting from gender diversity in IT at the K-12, undergraduate, graduate, and career levels.
Visit www.ncwit.org/practices to find out more.

ncwit.org **Author | J. McGrath Cohoon**

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National Center for Women & Information Technology
PROMISING PRACTICES

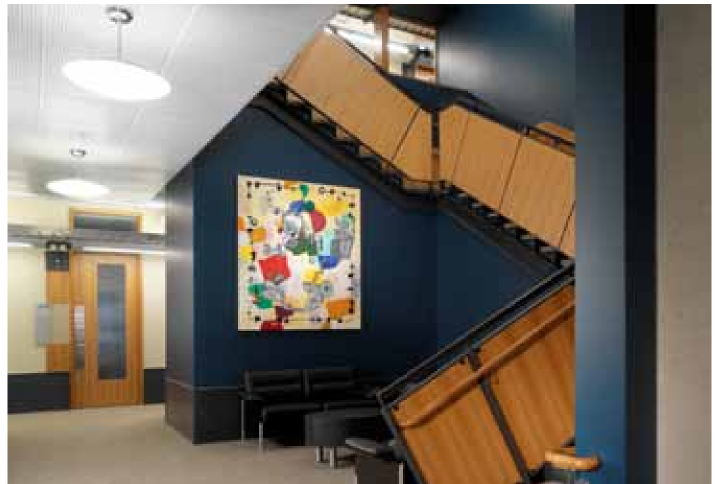
Design Physical Space that Has Broad Appeal (Case Study 1)

Affecting Women's Entry and Persistence in Computing through Physical Space

K-12 Education | Undergraduate | Graduate | Career

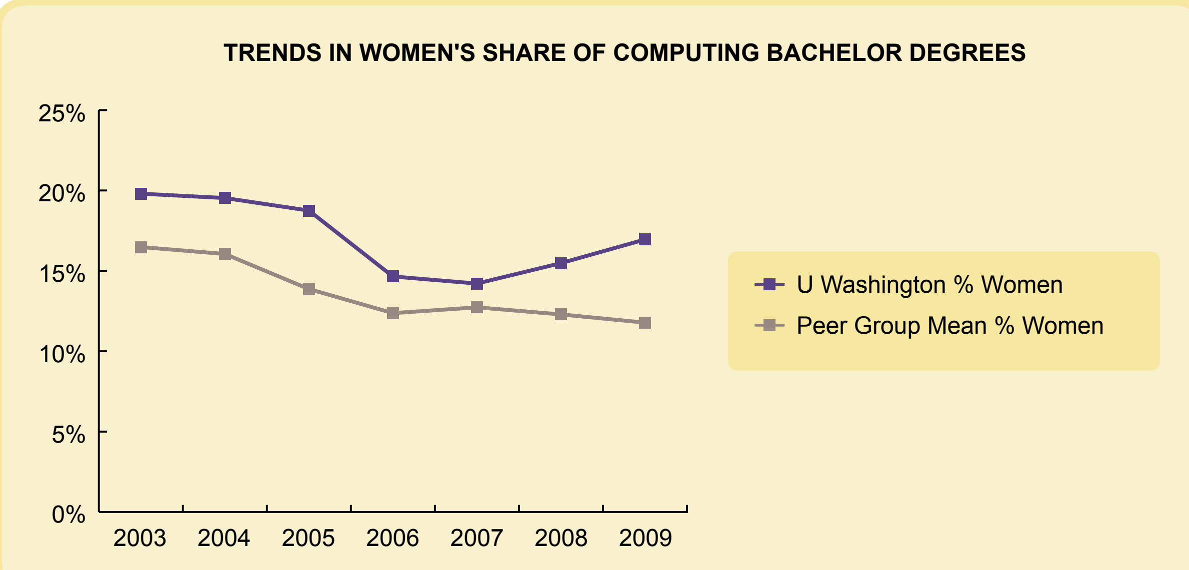
Hank Levy, Chair of the University of Washington's Department of Computer Science & Engineering, described the design of a new building that applied principles supported by research on stereotypes and the environment. The new building is one of many actions the department takes for promoting diversity.

The Paul G. Allen Center for Computer Science & Engineering at the University of Washington opened in 2003. Among its major goals, the building was intended to be warm, welcoming, and "non-techy" in appearance. All spaces are carpeted to give it a soft feel, and the extensive use of cherry wood trim adds warmth. Unlike most academic buildings, there are no conference or technical posters lining the hallways. Instead, occupants and visitors see a collection of original paintings, prints, and photographs from 22 university-affiliated artists whenever they enter or leave a floor in the building. This artwork is the only wall covering in the building. Computer labs in the basement have colorful walls adorned with large nature photographs. Overall, the goal was to make the Allen Center a people-oriented building that surrounds users with softness, warmth, and a celebration of aesthetics.



Ed LaCasse Photograph of the Paul G. Allen Center for Computer Science & Engineering

Levy advised that we be aware of the message that our environment communicates and design it to convey a friendly and welcoming feel to *all* visitors. The graph below suggests that the new building may be accomplishing that goal at the University of Washington and, along with the department's other diversity initiatives, contributing to increases in women's representation at a time when peer institutions saw continued declines.



RESOURCES

Case Study Contributors: Hank Levy

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How Do You Introduce Computing in an Engaging Way?

Experience with computers between boys and girls has equalized, but boys continue to have greater knowledge of computing and programming *concepts* than do girls. Not so in biology, chemistry, or mathematics, where both boys and girls are encouraged to provide evidence of proficiency when they apply to college. High school study of these subjects familiarizes students with the content and concepts, and gives them confidence. The result is that women's undergraduate completion rates have neared parity in these disciplines.

Because IT study is elective in almost all K-12 schools, developing relevant and interesting assignments that appeal to a broader audience is recommended for:

- fostering a climate where the non-predisposed can belong both academically and socially
- recruiting students who are not predisposed to pursuing computing
- exposing fundamental computing concepts to inexperienced learners

Is prior programming experience required for students to be successful in an IT program? Most undergraduate departments would say no. That is, experience with programming is not the same as expertise in problem-solving, algorithmic thinking, or computing theory. Yet research shows that introductory courses and their embedded assignments work better for students who have *some* experience with programming.

Research also shows that students with programming experience are more confident and more successful in introductory courses than are their inexperienced peers. Students with lower grades or less confidence are less likely to persist in an IT major. What is more, when introductory courses have limited opportunities for talking to other students (e.g., collaborative learning), inexperienced students have little information on which to judge whether they belong academically in the major. Hence more women than men switch out of IT majors (most often to other sciences or mathematics).

MAKING IT MEANINGFUL

Educational researchers emphasize the importance of linking educational materials and curricular programs to students' existing knowledge and experiences. When class syllabi list topics and assignments that focus on unfamiliar concepts with limited, if any, relationship to a student's life experience or interests, she or he is unlikely to take that class. High school curricula contribute to low enrollments in college computing because, under the existing educational policy of election, computing is rarely required in secondary schools. This means that students are likely to have a narrow and inaccurate view of what IT study involves, what careers are possible, or what kind of people "do" IT. Given the very small proportion of females who study computing in high school, females are less likely to choose IT in college.

The challenge to educators at all levels is to develop engaging assignments and curriculum that can appeal to a variety of students with different learning styles, interests, socio-cultural backgrounds, and abilities, while maintaining the rigor of the discipline. Putting the concepts of computing in appealing contexts and building on existing competence can both reduce entry barriers and level the playing field for those with limited experience.

Creative assignments that teach algorithmic thinking while also calling on students' existing knowledge or interests, may serve to both recruit and retain students. When experienced and inexperienced students use non-computer-based assignments to learn computing concepts, they quickly realize that their peers with programming experience are not necessarily better at algorithmic thinking, just more experienced with programming. Building confidence through relevant and interesting assignments is a promising practice for motivating student enrollment and retention.

RESOURCES

Lecia Barker and William Aspray, "The State of Research on Pre-College Experiences of Girls with Information Technology." In McGrath Cohoon, J. and W. Aspray (Eds.) *Women and Information Technology: Research on the Reasons for Under-Representation*. Cambridge, MA: MIT Press, 2006.

Joanne McGrath Cohoon and William Aspray, "A Critical Review of the Research on Women's Participation in Postsecondary Computing Education." In McGrath Cohoon, J. and W. Aspray (Eds.) *Women and Information Technology: Research on the Reasons for Under-Representation*. Cambridge, MA: MIT Press, 2006.

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Storytelling (Case Study 1)

An Engaging Way to Introduce Computing

K-12 Education **Undergraduate**

Learning to program with Alice is an innovative approach to teaching and learning introductory programming and other computing concepts. Beginning students, including middle and high school students and undergraduates, use the Alice programming environment to populate a virtual world with 3D models of objects (e.g., people, animals, vehicles, and more).

Formal assessment of this approach has been performed in several college and university environments. In published results, Alice is reported to be a successful intervention technique for students who have less mathematics preparation and/or programming experience. When these students used Alice first, their average grade was a 3.0 GPA in CS1 – comparable to the grades of their peers with greater mathematics backgrounds and prior programming experience. Without Alice, these "at-risk" students earned an average 1.2 GPA in CS1.

Implementing the approach is supported by an extensive collection of curriculum and instructional materials. Sample course calendars, presentation notes, labs, projects, and test banks are included. An online community and Alice newsletter provide quick and easy access to online assistance.

TWO MAJOR LEARNING OUTCOMES FROM LEARNING TO PROGRAM WITH ALICE

1. Fundamental Concepts of Programming

Alice allows students to immediately visualize how their animation programs run, fostering understanding of the relationship between the programming statements and constructs and the behavior of their animations. Students learn the basics of computing by manipulating objects that are actors and scenes in a virtual world of their own creation.

2. Problem Solving and Logical Thinking

The traditional steps of problem-solving are applied through storytelling or task performance. Students use animation storyboards as design tools, creating a sequence of steps (in pseudocode) that they eventually implement, test, and revise. Students learn if-else and Boolean logic by creating interactive animations and simple games.

RESOURCES

Alice software: http://www.alice.org
Curriculum and instructional materials, workshops: http://www.aliceprogramming.net
Moskal, B., Cooper, S. & Lurie, D. (2004, March). *Evaluating the Effectiveness of a New Instructional Approach*. Paper presented at the meeting of SIGCSE 2004, Norfolk, VA.

The Alice Team: Randy Pausch (developer), Wanda Dann, Stephen Cooper, and Don Slater
Case Study Contributor: Wanda Dann, wpdann@ithaca.edu

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Unplugged (Case Study 2)

An Engaging Way to Introduce Computing

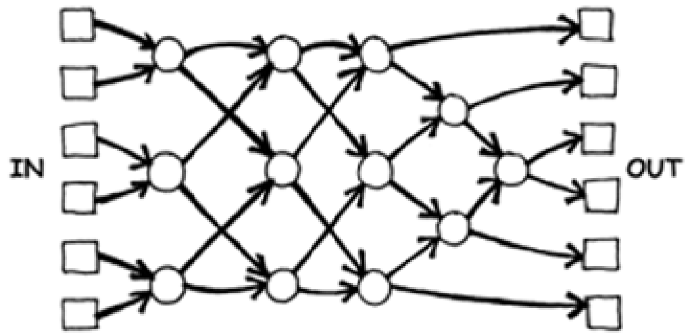
K-12 Education | Undergraduate

Computing is often a mystery: While people may know how to use computers, they rarely know what makes computers work. "CS Unplugged" uncovers the mystery by exposing students to computer science concepts, such as the nature of data or how data is sorted, but without the computer. The activities in "CS Unplugged" help to shatter the image of computing as long, lonely hours in front of an LCD screen by exposing learners to the kind of reasoning needed for inventing the next great ideas in computing.

"CS Unplugged" activities engage students in learning computer science concepts using hands-on activities. The activity described here, "Sorting Network," illustrates the structures used in parallel sorting networks, exposing learners to sorting, parallelism, and binary comparison through active, kinetic learning. In teams of six, students compare numbers (small or large) and follow simple logic.

HOW DO YOU DO IT?

Start by drawing the layout to the right on the ground, using chalk on a pavement, masking tape for indoor surfaces, or electrician's tape on a tarpaulin. Each student on the team holds a card with a number on it (for the first time, use the numbers from 1 to 6). The goal is to get the numbers sorted into order.



Each student stands on one of the squares on the "in" side of the diagram. Students follow the arrow to step onto the first circle, where they meet another student and compare numbers. The student with the smaller number follows the arrow out on their left, while the student with the larger number follows the arrow out on their right.

Students continue following the arrows to each circle as another student steps to the circle, each time comparing numbers. The smaller always goes left and the larger goes right. Eventually they will reach the "out" side in sorted order. (The full lesson plan, "Beat the Clock: Sorting Networks" can be found on the website described below.)

The exercise can be extended in a number of ways. For example, students could be timed to discover how quickly they can complete the sorting. For this, use larger numbers so it is hard to see where you are supposed to end up. And there are many questions to ponder: What if the smaller one goes to the right each time? How would you design a layout for sorting three numbers? Thirty numbers? Does it work backwards? Can you design a smaller layout to find the smallest number?

WHAT COMPUTING CONCEPTS DO STUDENTS LEARN?

When three pairs of students are comparing numbers at the same time, it takes much less time than comparing only one pair of numbers at a time. This "Sorting Network" demonstrates parallel computation, one of many ways that computer scientists have devised to sort data quickly. Instructors tell students that they have just learned about the computing concepts behind computer applications with which they are familiar, such as alphabetical lists of files, etc.

Initial evaluations of sessions involving this activity and others show that children gain a better appreciation of what Computer Science is about, and girls in particular respond positively to the logic and problem solving. More detailed international evaluations are underway.

RESOURCES

For more information on this activity and a pdf of the complete teacher's version, see http://csunplugged.com.
Please see NCWIT's Computer Science-in-a-Box: Unplug Your Curriculum, http://ncwit.org/resources.res.box.cs.html.

Case Study Contributor: Dr. Tim Bell, tim.bell@canterbury.ac.nz

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Meet Them Where They Are (Case Study 3)

An Engaging Way to Introduce Computing

K-12 Education

To educate girls about information technology and potential careers in the field, the Girl Scouts, Hornets' Nest Council in North Carolina runs a Girls are I.T. program, sponsored by a National Science Foundation research grant. Through its two key components – an educational website and a mobile technology bus—the program aims to increase access to technology by meeting girls where they are, both geographically and experientially. Since its inception, the bus has reached over 5,200 girls, many of whom are in rural locations with limited exposure to technical experiences.

The Mobile Technology Classroom features 12 workstations designed to showcase technology and technology careers in ways that tend to appeal to many girls. For example, four hands-on activities explore how technology helps people live better lives – (see detailed descriptions below). In each activity, girls are encouraged to imagine the future of technology based on the program component they've just completed. The girls then upload their ideas to www.girlsareit.org, a website that presents the history of technology and highlights women who have exciting IT careers.

EXAMPLES OF HANDS-ON ACTIVITIES OFFERED ON THE MOBILE TECHNOLOGY CLASSROOM

- **Nanotechnology**
  Girls explore how a nanodevice is built, what "nano" means, and how tiny nanodevices will be used in the future. Using laptop computers, they create four different nanodevices – light emitters, oscillators, mesh fabric, and DNA Scaffold.

- **Assistive Technology**
  Girls "see" and "talk" using computer software and hardware designed to assist the visually-, hearing- and speech-impaired. They begin to understand how technology aids those with disabilities, software's limitations in this area, and the need for continued progress.

- **HTML Webpage Design**
  Girls learn to create and edit a web page with HTML code. They then design a web page for their troop or for a local non-profit in need of a website.

- **Wireless Sensors**
  Girls operate an explorebot, similar to the Mars Rover. From their laptops, they see what the robot sees and maneuver through various terrains located in the back of the bus, learning how technology enables us to go places that may not be safe for humans. The missions include New Species Discovery, Earthquake Search and Rescue, and Shipwreck in the South Seas.

While this unique program might be difficult to replicate, educators can increase girls' access to IT through curriculum that adapts several key components:

- Use hands-on activities that solve real-life problems and/or call on girls existing knowledge and interests.
- Build in strategies for reaching girls with limited access to technology (e.g. remove geographical or other logistical barriers).
- Develop all-girl activities that are collaborative.

RESOURCES

For more information about this program see the Girls are I.T. website, www.girlsareit.org or contact Heather Doyle, hdoyle@hngirlscouts.org.
For more information about other Girl Scouts of the USA technology programs see www.GirlsGoTech.org.

Case Study Contributors: Girl Scouts, Hornets' Nest Council, and Girl Scouts of the USA

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PROMISING PRACTICES

Teaching Programming and Language Concepts Using LEGOs® (Case Study 4)

An Engaging Way to Introduce Computing

K-12 Education | **Undergraduate**

Teaching Programming and Language Concepts Using LEGOs® is an innovative method for using LEGO® bricks to teach programming and other computing concepts to middle and high school students as well as to undergraduate freshmen in introductory computer science classes. In this assignment, individual LEGO® bricks are used to express a special-purpose programming language, integrating tactile and kinesthetic elements into the learning experience and helping to make abstract concepts more concrete.

The method has two main learning outcomes:

- *Language Specification* – The goal of the assignment is to be able to build LEGO® creations on a standard grid base plate. To build a creation brick by brick, it is necessary to specify the type of brick, its color, and its location on the base plate. The combination of colors and positions indicates a specific action. Students learn to develop and state a set of sequenced instructions, a critical skill for programming.
- *Bridge to Other Abstract Concepts* – This teaching method has been used to teach a variety of topics to different audiences, including freshman CS majors, K-12 students, and K-12 teachers. In each group the use of the language provides opportunities to discuss more abstract concepts, including CPU Simulation, Writing and Testing Programs, and Extending the Programming Language.

Informal assessment of these exercises has been positive. Participants enjoy working with LEGOs® as a means of exploring programming and processing concepts. In one case, 100% of the freshmen taking an introductory computer science course were engaged in the exercise: an unprecedented event, according to the instructor. In fact, 75% of participants volunteered positive comments about the LEGO® exercise in end-of-semester course evaluations. Currently, the exploration of partnerships with assessment specialists to help develop quantitative aptitude progress methods is underway.

The use of LEGOs® may "level the playing field." Students both with and without computer programming experience struggle with the assignment. When told that they have learned a central concept of computer programming, inexperienced students feel both successful and confident, in spite of not using the computer to "program." Because the LEGO® approach does not directly involve technology that can be seen as intimidating to students, this approach shows promise for increasing participation of diverse audiences.

Implementing this program is strikingly simple because it only requires LEGO® pieces and a basic understanding of how LEGOs® fit together. A base plate and different-shaped LEGO® blocks are easily acquired and a single base plate is sufficient for each participating student or team. Clear language specifications for each type and combination of LEGOs® should be established prior to the onset of the exercise to avoid confusion later; however, a knowledgeable instructor or moderator can quite easily provide some instruction and guidance for each exercise to each participating group.

RESOURCES

Computer Science Teachers Association Resource Site: http://csta.acm.org/Resources/Resources.html

Cynthia Hood and Dennis Hood, "*Teaching Programming and Language Concepts Using LEGOs®*." Proceedings of the 10th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education, 2005. Available from the ACM Digital Library.

The Educator's Reference Desk Lesson Plans in Computer Science: http://www.eduref.org/cgi-bin/lessons.cgi/Computer_Science

For free offline activities for teaching computing concepts, try "Computer Science Unplugged," located at: http://unplugged.com

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NCWIT Investment Partners: National Science Foundation, Avaya, Microsoft, Pfizer, and Bank of America

Snap, Create, and Share with Scratch (Case Study 5)

An Engaging Way to Introduce Computing

K-12 Education **Undergraduate**

WHAT MAKES SCRATCH SO ACCESSIBLE TO NOVICES?

Scratch is a free "media rich programming environment" in which novice programmers can quickly express their creativity while learning computational thinking. Developed by the Lifelong Kindergarten group at the MIT Media Lab, Scratch is used at both the K-12 and undergraduate levels to reduce the barriers created by a programming language's abstract syntactic and semantic rules. Instead, students "snap" together several categories of "building blocks" (e.g., statements, loops, variables) to quickly generate animations, games, and art. The building blocks only snap together if they are syntactically appropriate. Students can work both individually and in small teams.

Scratch is effective as a learning tool because it incorporates several effective practices: it uses hands-on, active learning; it is visually appealing; it allows users to express their own creativity and to build on their own experiences; it gives immediate, understandable feedback; and it allows users to avoid syntax errors without focusing on minutiae, freeing them to focus on processes and concepts.

WHAT COMPUTING CONCEPTS DO STUDENTS LEARN USING SCRATCH?

Educational researchers at MIT Media Lab and University of California-Los Angeles studied Scratch scripts used in 425 programming projects created by 80 girls and boys ages 8-18 to determine which programming concepts they learned. The researchers found that all these projects used sequential execution and 90 percent used threads (multiple scripts running in parallel). About half of the projects included loops and user interaction and about a quarter included conditional statements and synchronization. A smaller set included Boolean logic, random numbers, and variables. The projects tended to include more of these concepts the longer students used Scratch.

ASSESSMENT OF SCRATCH AS TRANSITIONAL TOOL

Although Scratch was originally designed for ages 8-16, several universities are using Scratch in undergraduate courses, including Harvard, Rutgers, and College of New Jersey. Harvard researchers conducted a small classroom-based study on the use of Scratch for entry-level programming at the undergraduate level. The researchers used surveys to gather information about students' prior programming experience, their experiences with Scratch, and the ease of the post-Scratch transition into Java. Most students felt that Scratch positively influenced their ability to learn Java. Of the students who felt Scratch had no influence, all had prior programming experience.

SCRATCH COMMUNITY AND EDUCATOR SUPPORT

The makers of Scratch created a social network of sorts within the Scratch site. Users can post their project and remix others' projects; they can also discuss issues on the Scratch forum in several languages. More than 200,000 projects have been posted on the Scratch web site by novice programmers from around the world. The "top-loved" project has more than 23,000 views and 635 votes of "Love It." More than 26,000 projects have been remixed by other Scratch developers. The website also has a section especially for educators, with videos and other resources for getting started and ongoing support. Find out more here: http://scratch.mit.edu/.

SCRATCH-BASED ONLINE EDUCATIONAL COMMUNITIES

A number of educators have begun posting lesson plans and support materials to share with other teachers around the world. For example, Karen Randall, an elementary school teacher in Minnesota, has created a wiki (at http://wiki.classroom20.com/Scratch) where people can share Scratch materials. MIT Media Lab doctoral student Karen Brennan is creating an online community called ScratchEd, where educators will be able to share ideas, experiences, and curriculum plans with one another (to be launched later this year). Here are other sources of Scratch lesson plans and materials:

- http://nebomusic.net/scratch.html
- http://coweb.cc.gatech.edu/ice-gt/446
- http://www.learnscratch.org/
- http://www.lero.ie/educationoutreach/secondlevel/scratchlessonplans.html

RESOURCES

Malan, D.J., & Leitner, H.H. (2007). Scratch for budding computer scientists. *SIGCSE Bulletin (39)* 1, 223-227.

Maloney, J. H., Peppler, K., Kafai, Y., Resnick, M., & Rusk, N. (2008). Programming by choice: Urban youth learning programming with Scratch. *SIGCSE Bulletin (40)* 1, 367-371.

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Scalable Game Design for Middle School (Case Study 6)

An Engaging Way to Introduce Computing

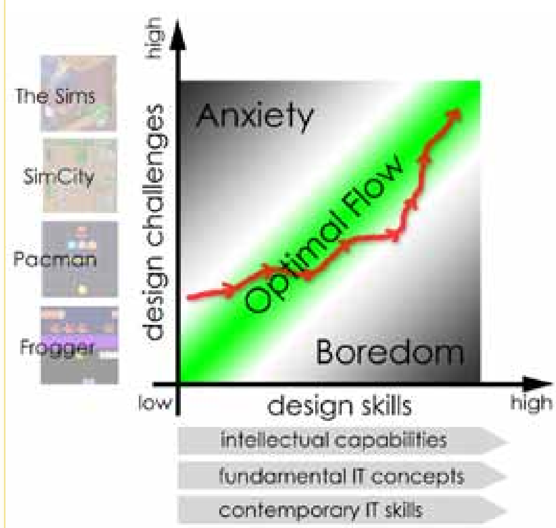
K-12 Education

It's not so easy to build and design a working video game, but a well-crafted learning environment makes it possible and interesting for many students. The middle school computing curriculum in Colorado's Boulder Valley School District (BVSD) uses Scalable Game Design to introduce computer programming in engaging ways and helps students develop IT skills aligned with ISTE'S National Educational Technology Standard of Creativity and Innovation.

In the very first lesson, students make their own Frogger-like game to publish on the web. Over the course of a one- to two-month module, students learn more sophisticated topics in order to create increasingly complex games and computational science applications. According to Len Scrogan, Director of Instructional Technology for BVSD, the results of the BVSD implementation include motivated students, engaged teachers, and excited parents.

THE THEORY BEHIND THE CURRICULUM

Scalable Game Design uses the premise that learning is most successful when students engage in tasks that are difficult enough to be interesting but not so difficult that they become frustrating. The psychological notion of "flow" can help manage this tension. This notion suggests that students learn best when in "optimal flow", where design challenges match design skills and anxiety is relatively low. In this stage, students are highly receptive to guided learning even if the topic appears too difficult. Scaffolding lessons this way helps students progress from simple arcade games to games that require sophisticated artificial intelligence.



Flow balances design challenges with design skills outlined by the National Academies of Science's Fluency with Information Technology (FIT).

EVALUATION: BOTH GIRLS AND BOYS MOTIVATED TO PROGRAM

AgentSheets, a scalable game design product, has been evaluated in two small studies for its effectiveness in motivating middle-school students to learn programming. In a summer elective course, 36 middle school boys and girls used AgentSheets to experiment with programming concepts and create games or animations. Interestingly, while most students expressed a desire to continue with AgentSheets, students with low-technology experience expressed a slightly stronger desire than those with high-technology experience. By the end of the course, girls and boys also expressed similar levels of desire to continue using AgentSheets. Another study using AgentCubes, a 3D simulation and programming tool developed by the creators of AgentSheets, found that all students were able to create a working 3D game in less than five hours. This study was conducted in an afterschool program that included girls, inner-city low-income students, and students in a U.S. technology hub. All students performed well in developing and troubleshooting their creations.

CHARACTERISTICS OF A SUCCESSFUL EDUCATIONAL PROGRAMMING ENVIRONMENT

- Accessible to students without prior programming experience
- Simple enough to make a working game in three hours or less
- Powerful enough to allow implementation of sophisticated artificial intelligence algorithms
- Works for game and computational science applications
- Transitions to traditional programming such as Java

So far, one product on the market combines these ingredients, AgentSheets. Originally developed at the University of Colorado, AgentSheets is available as a ten day free trial at www.agentsheets.com.

RESOURCES

For more information on AgentSheets and related resources, see www.agentsheets.com. AgentSheets is funded by NSF.

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Case Study Contributors: Alexander Repenning, Alexander.Repenning@colorado.edu, and Len Scrogan, len.scrogan@bvsd.org.

ncwit.org **Authors | Catherine Ashcraft and Stephanie Hamilton**

NCWIT Investment Partners: National Science Foundation, Avaya, Microsoft, Pfizer, and Bank of America

Globaloria: Students Designing Educational Games (Case Study 7)

An Engaging Way to Introduce Computing

K-12 Education

Connecting computing to social issues and "real-world" problems is important for increasing all students' interest, but especially girls' interest, in computing education and careers. Globaloria, created in 2006 by the World Wide Workshop, builds on this principle by involving students in collaborative teams that create video games around important educational and social issues. The program, operating in several states, is the country's largest social learning network of schools and community centers using a game design curriculum to develop students' digital literacies, computing knowledge, and global citizenship skills. Generally, students' participation in Globaloria ranges from three to five times per week, for 60-90 minutes per session, over two semesters. In Austin, Texas, one school has implemented Globaloria into its core curriculum for all students from 6th to 12th grade.

The core curriculum is customizable and aligned to language arts, math, and science standards, allowing Globaloria to be implemented in a variety of formats, including after-school programs, electives during the school day, and core academic courses.

EVIDENCE-BASED PRINCIPLES FOR CURRICULUM. Grounded in constructionist learning theories, Globaloria employs the following key elements necessary for successfully engaging students in introductory computing:

- Using active, hands-on, creative, and open-ended learning activities
- Making explicit connections between computing and social issues
- Promoting collaborative teamwork and opportunities for student interaction
- Allowing ample opportunity for student self-reflection on accomplishments and future learning
- Providing students with opportunities to learn and gain feedback from experts

EVALUATION: INCREASING FEMALE ENROLLMENT AND HOME COMPUTING ACTIVITY. Based on a study of West Virginia classrooms, Globaloria has demonstrated initial successes when it comes to girls' involvement in computing courses. Female enrollment in Globaloria elective classes reached 33% in 2010-2011 and 37% in 2011-2012, exceeding the national average for computing courses (20-25%). In addition, initial pre- and post-test analysis revealed that participation in Globaloria classes increased middle and high school girls' *home* computing activities; importantly, many of these activities involved creating and adapting technologies. For middle school girls, it also decreased the gender gap in "thinking up an idea for a technology project" and "making computer games." These trends in home computing experience may be especially important given research showing that, while girls and boys have similar access to computers and computing at school, girls have less access at home than boys.

To what extent these increases in girls' computing activities translate to increased interest in or plans to pursue computing requires further research, but initial feedback from participating girls is encouraging. Consider the following comments from middle and high school girls in the program:

"I thought this class was only for boys; I thought geeks only used computers, but then I really got to see the neat things about it… It's not like boys get to do this or girls get to do this; it's whoever puts their mind to it, their heart to it, and their time, they can do anything." (middle school female participant)

"Globaloria is… letting girls have an opportunity to have a career and make computer games." (middle school female participant)

"I do consider ourselves innovators…at 15-years-old Globaloria has given me a chance to learn computer science and be a computer scientist." (high school female participant)

Future research is being conducted to determine the pervasiveness of these trends and how girls' interest in and plans to pursue computing education and careers change over time. Because some Globaloria sites involve students in the curriculum over the course of several years, these sites offer particularly promising opportunities for exploring longitudinal trends.

RESOURCES

For more information on Globaloria see www.worldwideworkshop.org/programs/globaloria and www.worldwideworkshop.org/reports

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NCWIT Strategic Partners: NSF, Microsoft, and Bank of America; NCWIT Investment Partners: Avaya, Pfizer, Merck, Turner Broadcasting System, Inc., and AT&T

BLACK WOMEN AND GIRLS IN COMPUTING ROUNDTABLE

August 19, 2016 | Executive Brief

Hosted by

national center for women & INFORMATION TECHNOLOGY

Google

ncwit.org National Center for Women & Information Technology
www.ncwit.org | info@ncwit.org | 303.735.6671

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OVERVIEW

On Friday, August 19, 2016, more than 70 people from 40 non-profit, industry, media, education, and policy organizations gathered for a Black Women and Girls in Computing Roundtable hosted by NCWIT and Google in Venice, California. The goal was to connect black women and girls in computing with related organizations in tech, education, government, policy, and media to discuss influence, intersectionality, and media messaging, emerging with a commitment to sustain the community of black women and girls through tangible resources and actions.

After the roundtable, attendees were surveyed to gather their reactions. Participants reported that at the roundtable, they met new people, laid the foundation for future collaborations, increased awareness about how to encourage black women and girls, and were reminded of the importance of supporting this community. In the months following the convening, many attending organizations have been developing collaborative activities to raise awareness and increase opportunities in computing education and tech in the Black community.

FORMAT OF THE EVENT

The event began with a reception the evening prior to the daylong conference, to introduce attendees to each other and lay the groundwork for the following day. Participants divided into pre-set discussion groups with an icebreaker challenge to select one word to summarize the goal for the Roundtable. The words chosen by the five groups were: **Ignite, Actionable, Revolutionary, Reprogramming, and Empowering.**

The next morning began with a welcome by Avis Yates Rivers, Technology Concepts Group International, LLC and NCWIT Board Member, and Hai Hong from Google's K-12 Education Outreach department. Dr. Jamika Burge was the moderator and introduced the three panels: **Student Influences; Creativity, Innovation and Intersectionality; and Media and Messaging.**

After each panel, there were five breakout groups led by trained facilitators to discuss the ideas. These discussions included pre-set questions such as **What influences black girls (and women) to engage and succeed in computing? How might we amplify those influences? How can we help to create culturally-responsive computing environments? What are the opportunities for creating positive images and messages across media for black women and girls in computing?** After small group discussions, attendees returned for a quick recap of discussions and suggestions for calls to action. The third panel was followed by a whole-group discussion, after which the conversation turned to actionable items suggested by the audience. The day ended with a recap by Lucy Sanders, CEO of NCWIT, and a call to action by Kamau Bobb, CISE program officer at the National Science Foundation, and final comments from Dr. Burge.

The facilitators for the roundtable were: Dr. Catherine Ashcraft, NCWIT; Ryoko Yamaguchi, Plus Alpha Research & Consulting, Dr. Jamika Burge, Design & Technology Concepts, LLC; Dr. Wendy DuBow, NCWIT; and Ms. Daraiha Greene, Google.

**A wide range of ideas were discussed throughout the day; to maintain focus, the recap that follows only includes those ideas that directly pertain to black women and girls in computing.*

PANEL 1: STUDENT INFLUENCES

MODERATOR

Dr. Allison Scott, Kapor Center

PANELISTS

Ms. Keila Banks, High School Ninth grader

Ms. Sydney Turner, USC, Incoming CS Undergraduate

Ms. Alona King, Stanford, CS Undergraduate

Ms. Angelica Willis, NCA&TSU, CS Undergraduate

Ms. Jasmine Berry, USC Graduate Student

KEY THEMES FROM THE STUDENT INFLUENCES PANEL

- Parental encouragement
- Practical application of CS
- Change stereotypes of "who does tech"
- Learning to own the space and mitigate isolation
- Change the CS narrative to CS can change the world

THOUGHTS RAISED BY THE DISCUSSION BREAKOUT

The facilitators for this breakout led discussions about how to amplify the influences that encourage black girls and women to persist in computing. Ideas raised were to "manufacture" early encouragement experiences and share them broadly; focus on parent outreach about CS and what a critical role tech can play to alleviate some social and economic problems; make connections between episodic experiences/programs and make the connections and create synergy between formal and informal education; motivate students with careers, skills and potential salaries in tech to gather attention; and use CS as a tool for social issues and activism because it is important to see how tech can be applied. People also discussed the importance of recognizing that although great programs exist, the messaging doesn't always seem to be "for me."

ACTIONABLE IDEAS

- **Connect to parents**
    - Reach parents on Snapchat or Facebook; use social media.
    - Get the families to learn with their students. But make it inclusive, don't assume deficiencies. Make it easy for parents to take part in simple, low bar, low entry small actionable steps.
    - Reach parents where they are - include churches, barber shops, hair salons.
    - Create a DIY Packet for Parents.
    - Normalize Computer Science in households.
- **Bridge school and industry**
    - Build a pilot program that bridges the pipeline from school all the way to industry, so individuals can take it back to their communities to invite in more girls.
    - Have a program where we pay students to work in research labs and include the transportation.
    - Reach out to industry professionals. One identified need: black men and mentors from industry.
    - Use messaging and outreach to make companies seem less intimidating. It is important to realize that although programs exist, the messaging doesn't doesn't always seem to be "for me."
- **Scale informal education**
    - Especially important in communities where there are fewer outside school programs and opportunities.
- **Highlight and connect role models**
    - Near peer mentoring - get girls to reach back to connect to others and build community.
    - Personal outreach to tell girls "CS is for You."
    - Encourage women and girls to create role model profiles on Fab Fems.
        - » Activate your networks to add role models to the website and raise awareness to connect others to use it as a resource.

PANEL 2: CREATIVITY, INNOVATION, & INTERSECTIONALITY

MODERATOR

Dr. Quincy Brown, White House Office of Science and Technology Policy

PANELISTS

Mr. Solomon Russell, El Camino College

Ms. Whitney O'Banner, Dev BootCamp

Dr. Kimberly Scott, CompuGirls

Ms. Trina Fletcher, National Society of Black Engineers

KEY THEMES FROM THE CREATIVITY, INNOVATION, & INTERSECTIONALITY PANEL

Intersectionality

- Asset vs deficit education approaches
- "Supporting" vs. "saving"
- "Culture" is a critical thread for the black community
- Systemic change is needed to address and acknowledge intersectionality
- Are there real differences between groups? When is it a good idea to move beyond race & gender?

Ideas for Inspiration/Persistence

- Tell accurate stories, change the narrative
- Form communities
- Be authentic; eliminate fear

Innovation & Creativity - Better Technology

The facilitators for this breakout engaged attendees in a discussion about how we might improve tech environments in our schools and workplaces. Thoughts raised in the discussion included but were not limited to: creating culturally responsive computing environments and building awareness to create an activation of allies; put an intentional focus on women and pay attention to what happens after college since degree attainment is not in itself a hurdle; educate the majority and create new patterns of decision-making; create an experience that mimics the black women/girls in computing lived experiences (e.g., the game of Life).

ACTIONABLE IDEAS

- Focus on alliance building.
- Streamline messaging in media where kids are already engaged.
- Invest in academics as much as in athletics.
- Take advantage of media channels to reach younger girls: YouTube, Snapchat
- Create/ add to a collection of resources about:
  - Gender, race, class, accessibility, geography, language, culture, identity
  - Mentorship, near-peer, project-based learning

PANEL 3: MEDIA & MESSAGING PANEL

MODERATOR

Dr. Knatokie Ford, White House Office of Science and Technology Policy

PANELISTS

Ms. Beverly Bond, Black Girls ROCK!

Ms. Madeline Di Nonno, Geena Davis Institute on Gender in Media

Dr. Yalda Uhls, Common Sense Media

KEY THEMES FROM THE MEDIA & MESSAGING PANEL

Narratives & Storytelling

- Behavior & career aspirations impacted by the media
- Can't change the landscape overnight
- Don't forget about music

Current Messaging/Image

- Often dehumanizing towards women
- Often defaults to stereotypes
- Black women not realistically included in media
- Limited possibilities presented in media

This panel was followed by a whole group discussion lead by Julie Ann Crommett and Daraiha Greene from Google that started with **What are the opportunities for creating positive images and messages across media for black women and girls in computing?** Ideas generated included: celebrating and affirming role models; creating tools for data collection and research in media and the production jobs inside media; try to get the media to shift mainstream norms about what represents someone who is popular & smart and interrupt the status quo of the white male chosen to represent the techie; small businesses should tell their stories; there should be resources and messaging about hiring practices; create a Youtube channel to promote positive messaging around black women and girls in tech; produce a song about STEM-technology (created by kids for kids or by a major artist); companies should put pressure on their vendors for higher standards.

IDEAS GENERATED BY ATTENDEES IN ALL-GROUP DISCUSSION

- Create a landing page that connects to alliances that build girls/women holistically. Below is an initial list based on information attending organizations provided.
    - Coalition of Black Women and Girls in Computing - http://blackwomenincomputing.org/
    - Information Technology Senior Management Forum (ITSMF) - http://www.itsmfonline.org/ - host events around the country all year and when in a city, they invite local high school and college students to come participate to see what the opportunities are.
    - EmpowHer Institute - http://empowher.org/
    - AAFAI *African American Female Achievement Initiative
    - National Society of Black Engineers
    - Black Girls ROCK! - is a nonprofit organization, that has been committed to enriching girls through leadership, education, and positive identity development since 2006.
    - Black Girls Code - empowering girls of color ages 7 to 17 to become innovators in STEM fields, leaders in their communities, and builders of their own futures through exposure to computer science and technology.
    - Kapor Center for Social Impact aims to make the technology ecosystem and entrepreneurship more diverse and inclusive.
    - National Center for Women & Information Technology (NCWIT) - https://www.ncwit.org/ - with over 700 member organizations and 300+ informational and educational resources to encourage and promote diversity and equity in tech including these resources to help encourage girls in CS
    - Geena Davis Institute - announced a tool that employs video- and audio-recognition technology, along with algorithms, to identify gender, speaking time and additional details about characters presented in films, television shows and other media

- Hidden Figures - Use the launch of this movie as an opportunity to celebrate black women in computer science and highlight role models as well as create connections to engage women and girls in computer science.
    - Create a screening companion toolkit about organizing a local film viewing that teaches community members how to get involved in STEM learning activities and connect students and parents to existing opportunities.
        - In addition to the premiere of the movie - these tools can be used for the release of the DVD and when it is available to stream and in February for Black History month
        - Add resources for next steps after viewing film - NCWIT's resources to help encourage girls in CS plus links to where people can go to learn CS
        - Activities to integrate in a screening:
            - Panel discussions
            - Celebrity appearances
            - CS Education Activities
            - Livestreaming panels of STEM professionals and/or students
        - Organizations that have already expressed interest:
            - Intel
            - ASU's Center for Gender Equity in Science and Technology
            - National Society of Black Engineers
            - Coalition of Black Women and Girls in CS
            - Blaze Mobile
        - Set up STEM booths every weekend at theaters.
            - Google and Geena Davis Institute possibly to get STEM booths at AMC and Arclight
            - Provide resources to get women and girls engaged and involved
                - Develop a promo card that sends people to a site with linked resources, organizations and events for next steps
        - Tie trailer or promotional items for the film to a YouTube channel that promotes positive messaging of black women and girls in computing.

» NCWIT is planning an awareness campaign around "Hidden Figures" to begin during CSEdWeek (December 5, 2016). This campaign will highlight the stories of black women in tech. The awareness campaign will target girls and their adult influencers to encourage aspirations in computing by describing the benefits of a computing career, engaging ways to study computer science and engineering, and more. The multi-phase campaign, lasting through Black History Month, will leverage several NCWIT communications channels and networks (e.g. dedicated website, social media, newsletters, etc.).

- Girls' STEM day/week
    - Get support from all industry partners
    - Outreach to universities
    - Lab visits - coordinate one week of funded lab visits
    - Engineers week - Girls' day already exists
- Create a hashtag that all attendees can coalesce around
- Disruptive measures around media
    - Consumers: demand better images
    - Support positive media, call out bad examples

ACTIONS ALREADY IN PROGRESS (AS OF OCTOBER, 2016)

- There will be a film screening on Black women engineers at Grace Hopper
- @GodComplx - Digital/ YT web series starring Shameless Maya about a black.
    - Reach out to Daraiha to organize a screening of GodComplx. (rayag@google.com)
    - Subscribe to YouTube channel: goo.gl/DDvTXR
- Google has launched Careers with Code, a free magazine that inspires students to use problem solving CS skills to create the future. Created in partnership with Google and Refraction Media, Careers with Code redefines stereotypes around what a computer science career can be. Check out the virtual magazine here and the accompanying educator user manual.
- Google is creating a Black student brief on Google Gallup report on *Diversity Gaps in Computer Science: Exploring the Underrepresentation of Girls, Blacks and Hispanics* and *Trends in the State of Computer Science in U.S. K-12 Schools*. (i.e., detailed cut of data on Black students and access to / perceptions of Computer Science). Break out data on Black students slated for February.

Question Still to Consider: How do we engender mutual learning, unification, as a philosophy? How do we leverage good intentions of those who want to help but may not look like black women and girls?

NEXT STEPS

The goal of the Roundtable was to connect black women and girls in computing with related organizations in tech, education, government, policy, and media. After the roundtable, attendees were surveyed to gather their reactions. Participants reported that at the roundtable, they met new people, laid the foundation for future collaborations, increased awareness about how to encourage black women and girls, and were reminded of the importance of supporting this community.

To continue the conversation and continue building relationships:

- Google and NCWIT have been invited to join the Black Women and Girls in Computing Coalition.
- Opportunities for women and girls in computing were shared via email to the people who attended the meeting
- A Slack group was started to facilitate communication between attendees
- All attendee emails and organization websites were shared with attendees.

IN ATTENDANCE:

FIRST NAME	LAST NAME	ORGANIZATION
Leslie	Aaronson	National Center for Women & Information Technology (NCWIT)
Morgan	Agee	King Drew HS student
Catherine	Ashcraft	National Center for Women & Information Technology (NCWIT)/ facilitator
Phillip	Banks	Banks Networking
Carole	Banks	Los Angeles Unified School District
Keila	Banks	Student Panel Speaker
Tony	Baylis	Lawrence Livermore National Laboratory
Jasmine	Berry	University of Southern California
Kamau	Bobb	National Science Foundation
Beverly	Bond	BLACK GIRLS ROCK!
Quincy	Brown	White House OSTP
Lesley Slaton	Brown	HP Inc
Kimberly	Bryant	Black Girls CODE
Jamika	Burge	Design & Technology Concepts, LLC

Helen	Butapetch	King/Drew Magnet High School
Sultanah	Corbett	AAFAI *African American Female Achievement Initiative and Oakland Unified School District
Tiffany	Crawford	CREATE
Julie Ann	Crommett	Google
Madeline	Di Nonno	Geena Davis Institute on Gender in Media
Wendy	DuBow	National Center for Women & Information Technology (NCWIT)
Cyntrica	Eaton	Norfolk State University
Layne	Eskridge	Netflix
Lauren	Ewing	Google
Dori	Farah	National Center for Women & Information Technology (NCWIT)
Jannie	Fernandez	National Center for Women & Information Technology (NCWIT)
Michelle	Fisher	Blaze Mobile
Tina	Fletcher	DC Govt
Trina	Fletcher	The National Society of Black Engineers (NSBE)
Knatokie	Ford	White House OSTP
Lisa	Gelobter	The White House/U.S. Dept of Education
Gabriela	Gonzalez	Intel Corporation
Daraiha	Greene	Google
Hai	Hong	Google
Lee	Wills	
Rhonda	James	Intel Corporation
Michael	Jenkins	Blacks in Technology (BIT)
Sandra	Johnson	SKJ Visioneering, LLC
Elva	Jones	Winston-Salem State University
Keyonna	Keith	EmpowHer Institute
Alona	King	Stanford University (Student)
Betty	LaMarr	EmpowHer Institute
Errika	Mallett	IT Senior Management Forum
Viola	Maxwell-Thompson	IT Senior Management Forum
Omar	McGee	High School Principal

Lauren	Mims	White House Initiative on Educational Excellence for African Americans
Lori	Mitchell	Black Women in Technology
Whitney	O'Banner	Dev Bootcamp
Jacqueline	Paredes	Augustus F. Hawkins High School
Qiana	Patterson	QP Advisors
Stephanie	Rodriguez	NSF (AAAS S&T Policy Fellow)
Janae	Royston	SpaceX
Solomon	Russell	El Camino College
Iman	Saint Jean	Emery Unified School District
Lucy	Sanders	National Center for Women & Information Technology (NCWIT)
Kimberly	Scott	ASU-Center for Gender Equity in Science and Technology
Allison	Scott	Kapor Center for Social Impact
Jim	Stanton	Massachusetts Computing Attainment Network (MassCAN)
Yalda	T. Uhls	UCLA, Common Sense Media, author
Jakita	Thomas	Auburn University, Social Change Youth Foundation, Inc.
Constance	Thompson	The National Society of Black Engineers (NSBE)
Sydney	Turner	USC - student speaker
Zanetta	Tyler	North Carolina A&T State
Richunda	Wideman	Augustus F. Hawkins High School
Angelica	Willis	North Carolina A&T State
Ryoko	Yamaguchi	Plus Alpha Research & Consulting
Avis	Yates Rivers	NCWIT/TCGi
Shaela	Young	King Drew HS student

In tech, some bemoan the rise of 'brogrammer' culture

By Doug Gross, CNN
Updated 10:32 AM ET, Mon May 7, 2012


"The Social Network," which chronicled Facebook's rise, is attributed with bringing tech culture to the mainstream.

- At tech startups, some bemoan the rise of 'brogrammer' culture
- The term is a satirical one to describe computer pros with a fraternity party mind-set
- Critics say the emerging style shuts out women and others who don't fit in
- It can also have consequences, by alienating customers and potential hires

At one of the world's biggest gatherings of Web culture, a 28-year-old executive talks about landing a tech job by sending a CEO "bikini shots" from a "nudie calendar" he created.

On campus at Stanford University, a hot startup attracts recruits with a poster asking if they want to 'bro down and crush some code.'"

And the world's largest Internet registration company entices Web entrepreneurs with a Super Bowl ad in which two female celebrities paint its logo onto the body of an apparently naked model.

Forget what you think you know about the benignly geeky computer programmer who lives for the thrill of finding a single misplaced semicolon in thousands of lines of code.

And welcome to the world of the "brogrammer."

As tech startup culture increasingly enters the mainstream consciousness through movies like "The Social Network" or headlines about the latest 20-something to cash in a dorm-room idea for millions of dollars, the field is attracting a whole new host of personality types.

And some in the tech community complain that its anything-goes structure and sky's-the-limit earning potential has turned the environment at some companies into something akin to your worst stereotype of a booze-soaked frat party.

"There is always built into a lot of startups the mentality of the barbarians at the gate ... the disruptive nature that the startup ethos is supposed to be all about," said Tasneem Raja, the digital-interactive editor for Mother Jones magazine. "It's sort of lame that it's being expressed as kegs at the office and beer pong and, unfortunately, also sexism."

The term "brogrammer" (a mash-up of "programmer" and "bro," the stereotypical fraternity-house salute) has sprung up recently as a sarcastic take on this new breed of Silicon Valley (or New York, or Chicago, or wherever else techies assemble) computing entrepreneurs.

Witness a thread on Quora where members of the site satirically submit answers to the question, "How does a programmer become a brogrammer."

One answer:

"Lots of red meat, push-ups on one hand, while coding on the other, sunglasses at all times, a tan is important, popped collar is a must. It's important that you can squash anyone who might call you 'geek' or 'nerd' and that you can pick up girls, but also equally important that you know the "Star Wars" movies by heart, and understand programming ideas, like recursion and inheritance."

'A sexier industry'

The evolution of software has played a part in opening up the field to people who haven't necessarily devoted themselves to a computer science degree or spending years hunched over a keyboard.

"Ten years ago, it required somebody who was much more technical," said Steve Spurgat, the CEO of VYou, a New York-based social video site. "When you were writing [code], it was much less abstracted layers where it would take a much longer time to build something that would take a couple of days now."

Spurgat cites some positive effects of that trend, saying that creative types who maybe aren't as detail-oriented as early coders can now join in. But in the 10 years since he started working in startups, he's definitely noticed a culture shift.

"I will boldly say that tech is the new music. It's becoming a sexier industry," he said.

"Think about how much time people are spending with technology. Ten years ago, kids were going to hang out and listen to CDs in their bedrooms. Now they're going to hang out and play 'Words With Friends' and 'Draw Something' and be on Facebook."

But sometimes the growing allure of a tech career can manifest itself in ugly ways.

Raja wrote a piece for Mother Jones about her experience at South by Southwest Interactive when she attended a panel titled "Adding Value as a Non-Technical No Talent Ass-Clown."

During the talk, she wrote, Matt Van Horn, a 28-year-old executive at social-media site Path, talked about landing his first job, at web-aggregator site Digg, by sending editors "bikini shots" from a "nudie calendar" he'd created.

She continued, saying that he advised attendees to avoid what he called "gang-bang interviews" and compared the recruiting process to his college fraternity trying to "attract the hottest girls."

The South by Southwest Interactive festival in Austin, Texas, is a meeting of Web minds, but partying also plays a role.

Raja and some others in attendance -- both men and women -- got up and left. After her article ran, she said she received more than 100 messages from tech professionals who said they'd had similar experiences.

"I've gotten e-mails from women in this space who say 'I see it. I'm really disheartened by it. It makes my job harder,' " she said.

For his part, Van Horn says he regrets having played a part in that perception.

"I just feel terrible about this whole thing," Van Horn told CNN Friday, noting that, flying in the face of the "brogrammer" stereotype, he's a married man (he live-streamed his proposal online). "I'm so sorry that I offended anyone."

He called his comments at South by Southwest "a bad attempt at humor and a poor choice of words during a talk, particularly when taken out of context."

"I don't think the words represent a true reflection of my true feelings and character," he said, adding that at the sometimes free-wheeling festival, he "was trying to have a provocative discussion about non-tech contributors making an impact on tech companies."

He added that the calendar he mentioned was, in fact, a college charity project to aid tsunami victims in Southeast Asia and featured both male and female models."

'Bro down and crush some code'

But it's not the only instance that critics cite of the "brogrammer" mentality.

Klout, an app that seeks to judge users' effectiveness on social-media platforms like Facebook and Twitter, has recruited programmers at Stanford University with a poster reading: "Want to bro down and crush some code? Klout is hiring."

That poster, which critics say sends the message that anyone that doesn't share a party-boy mentality need not apply, was "an unfortunate judgment call by a former Klout employee" when the company only employed 10 people, said spokeswoman Lynn Fox. It now employs 70 and 20% of them are women, according to Fox.

In March, daily deals aggregator Squoot advertised a Boston hackathon that promised (along with massages, access to a gym and "kick-ass cupcakes") this tidbit: "Need another beer? Let one of our friendly (female) event staff get that for you." The site has apologized.

And then there's GoDaddy, the web registrar that some call the godfather of the "brogrammer" mind-set.

Jennifer 8. Lee, a journalist and author who, among many projects, works with Web startup Upworthy, said the aforementioned Super Bowl ad, and others like it, show that a "brogrammer" mind-set can have consequences for the company involved.

"They called me the other day and said they just wanted to check in," said Lee (whose numerical middle initial invokes Chinese numerology and was intended to set apart her otherwise common name). "I said, 'Oh yeah, that reminds me ... I thought your Super Bowl ads were sexist and I want to change my registrar. Thanks for reminding me.'"

"We do have power," she added. "There are totally consequences."

The image of beer-swilling coders is a stereotype that far from describes the majority of men in tech startups, those in the industry say.

"There are plenty of people in this industry who ... came up because they were interested in tech and computer programming and maybe some of the more traditionally geekier aspects of this work," Raja said. "Now, I'm hearing people talk about being concerned about the number of quote-unquote 'idea people' flooding the field.

"For me, this is an industry that's really wrestling with how it defines its own professionalism."

CTE
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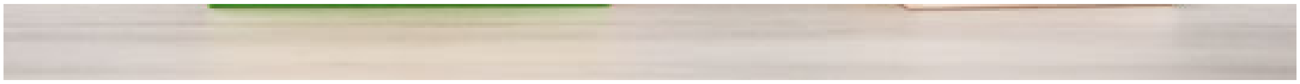
Addressing a "Threat in the Air": How Stereotypes Affect Our Students and What We Can Do About It



“It is a peculiar situation, this double-consciousness, this sense of always looking at one’s self through the eyes of others…”

- W.E.B DuBois “The Souls of Black Folk”

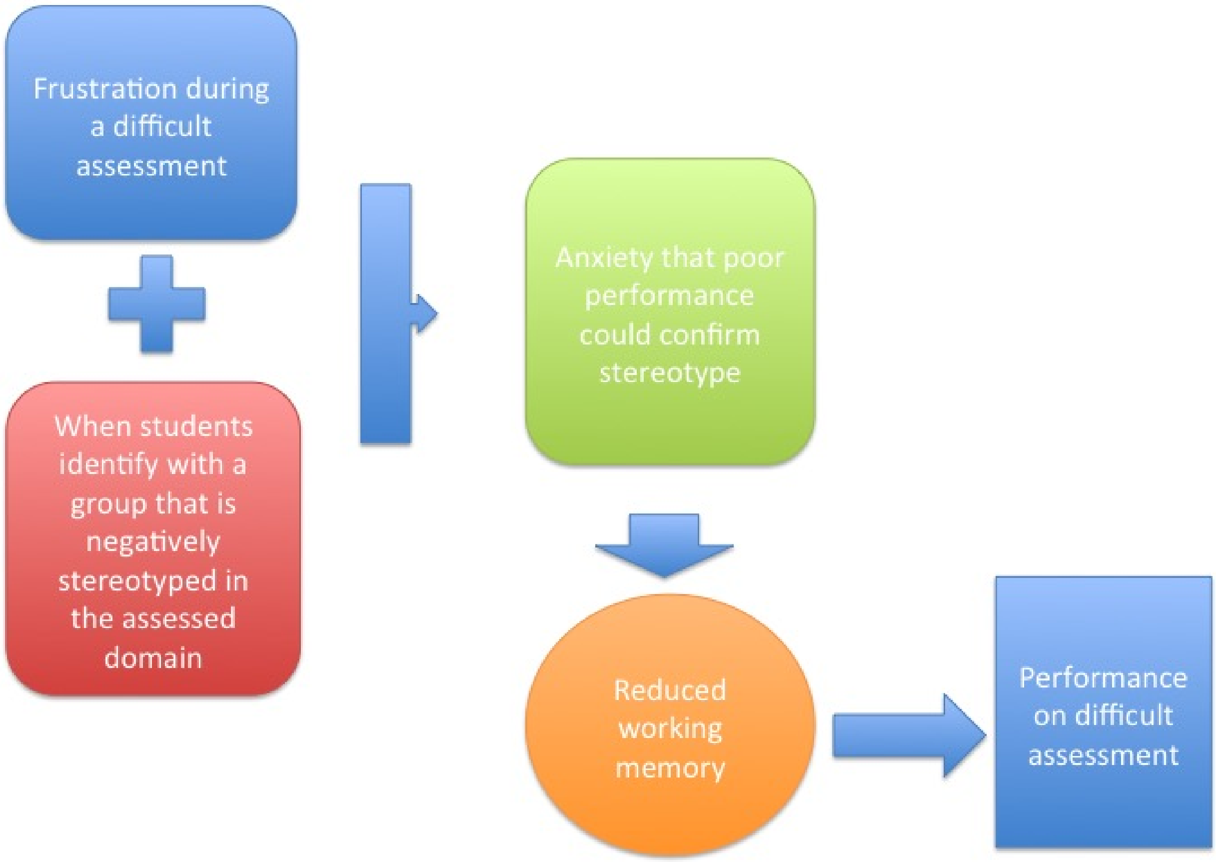
Our sociality - our interactions with others and our social environment - are central to the learning process[1]. Yet while our sociality is foundational to the learning process, it is this very sociability that can also hinder our learning. Cultural stereotypes, social identity, and the social environments of college and universities shape students’ motivation, identity, and academic success.

In today’s post I want to focus on the sociability of learning with a look at what the research tells us about how stereotypes affect student learning and performance in our classrooms and the ways in which we can address situational factors and mitigate the negative effect of stereotypes.

Stereotypes about the academic potential of students of color and women are pervasive and persistent in our society. For example, a few months before his death at the end of 2015 Supreme Court Justice Antonio Scalia, referring to race conscious affirmative action policies, remarked that non-white students are at risk for being “pushed into schools that are too advanced for them[2].” Yet even as de jure and overt racism/sexism are receding, research shows that our implicit biases - unconscious beliefs underlying negative stereotypes -continue to influence our assumptions about people and behavior. Stereotypes are powerful because they not only shape how we view others, but how we view ourselves.

The sociologist W.E.B. DuBois, in his 1903 publication *The Souls of Black Folk,* described a concept he called *double-consciousness* whereby he argued that black Americans lived in a society that not only devalued them but required them to devalue themselves: to measure “one's soul by the tape of a world that looks on in amused contempt and pity.” He argued that as a result the lives of black Americans were shaped by the dominant culture’s stereotypes about them. Almost a century later, in their 1995 paper in the *Journal of Personality and Social Psychology* titled "Stereotype threat and the intellectual test performance of African Americans," Claude Steele and Joshua Aronson documented that little has changed. In their pioneering study they found that when a verbal test was introduced as diagnostic of academic ability, blacks tended to perform worse than whites[3]. They called this phenomenon “stereotype threat” and argued that the threat of possibly satisfying or confirming a negative stereotype attached to ones identity can interfere with a subject’s academic performance. Something as simple as filling out a questionnaire highlighting one’s race or gender prior to taking a test may be enough to trigger stereotype threat.

What does it mean to have an identity that evokes devaluation in the very setting that one learns? Everyone feels some level of anxiety and stress when taking a difficult test or performing a complicated task. Yet those who face negative stereotypes about their abilities and intelligence have an added stressor that increases the cognitive load they are under. It is thought that the primary mechanism behind stereotype threat is the anxiety one feels about their performance confirming a stereotype and the subsequent reduced capacity of working memory. Interestingly, the research shows that the effects of stereotype threat are only visible (even if they are still present) when the task or assessment is [difficult](#) and when the cognitive load is great. In other words, when student's identity is under threat and they are engaged in a difficult task their cognitive energy is divided between the task at hand and self-evaluative concerns.



Stereotype Threat Mechanism

Adapted from POD 2015 Pre-conference Workshop "Inclusive Teaching and Learning in Science, Technology, Engineering, and Mathematics" by Beth Fisher and Regina Frey

Since the Steele and Aronson study over 300 articles have been published on the topic and majority of subsequent studies have replicated and extended the stereotype threat effect on multiple populations and under various measures of performance. Some examples are:

- Women on difficult math tests;
- Whites with regard to appearing racist;

- Students from low socioeconomic backgrounds compared to students from high socioeconomic backgrounds on intellectual tasks;
- Men compared with women on measures of social sensitivity;
- Whites compared with Asian men in mathematics; and,
- Whites compared with Blacks and Hispanics on tasks assumed to reflect natural sports ability.

Anyone can be triggered by the situational factors that produce stereotype threat. However, the consequences of exposure to a "threat" depend on a person's beliefs, attitudes, and self-concept. To be clear I am not saying that individuals are at fault for how stereotypes affect them and that they need to just have the wherewithal to 'overcome the stereotype[4]'. What I mean is that the stronger one identifies with the stereotyped group and the stronger their sense of belonging to the domain in which their performance will be assessed, the greater "threat" the stereotype poses. For instance, a 2002 study demonstrated that when women's gender identity was linked to their performance on a test, women with high gender identity performed worse than men, but women with low gender identity performed equally to men. Another study looking at young women's' performance on math assessments found that the stereotype threat was more prevalent for women who strongly identified as being 'good at math.'

Early research on stereotype threat focused on identifying the process, the consequences, and who was affected. In addition, early studies also showed that the most widely replicated effect of stereotype threat is underachievement on assessments[5]. But the consequences of stereotype threat are not limited to assessments and performance. For example, disengagement and altered professional identities have been documented and linked to the gender and racial inequities in STEM fields. And increasingly the research is pointing to the ways in which the learning process itself is affected.

So, what can we do in our classrooms and our interpersonal interactions with students to create identity safe environments? Current research provides evidence for the effectiveness of targeted classroom interventions that can be used to change the situational factors that elicit stereotype threat, mitigate the effects of stereotype threat, and teach adaptive methods. The following is a list of what I have found to be some of the most compelling evidence-based strategies for addressing stereotype threat in our college classrooms.

1. **Teach about stereotype threat.** Identifying and naming stereotype threat can buffer the performance of students most likely to be affected. A 2005 study found that when women were taught about stereotype threat prior to taking a difficult math test their performance was similar to men's (while it was lower in the control group). The authors conclude that when women were able to attribute their anxiety to stereotypes about women's math abilities they were better able to reduce its detrimental effects.

2. **Provide students with a sense of belonging and external attributions for anxiety.** A 2012 study tracked college students over a three-year period from their first year through their third year of college. In this field trial they provided college students in their first year with narratives

from older students that framed social adversity as common and short lived. This encouraged students to attribute anxiety to the college adjustment process and not unique to themselves or their ethnic group. Over three years this intervention raised Black students' GPA relative to the control group and halved the achievement gap.

3. **Provide opportunities for self-affirmation and priming positive aspects of the self that are not related to performance in the classroom.** The social psychologists Geoffrey Cohen and David Sherman have written extensively about the benefits of "values affirmation" in counteracting the effects of stereotype threat and providing students with a greater sense of global adequacy. In their research they found that when students engage in a values affirmation activity during a time of significant stress it gives them a more expansive view of themselves so that one threat does not loom as large. For example, in two double-blind experiments where students wrote about the importance of a personal value and its role in their lives, black students earned a higher GPA at the end of the course relative to the control group and those earning a D-grade or below was cut in half.

4. **Provide positive role models and examples of individuals that have performed successfully in your field or discipline.** In a 2012 study Shaffer and colleagues found that presenting *positive group- based information* regarding women's success and progress in STEM fields resulted in women performing as well as men on a math test, despite being in a stereotype threat situation. Interestingly this intervention had no effect on men's performance indicating that highlighting the contributions of minority groups does not have a detrimental effect on the majority group.

5. **Give "wise feedback."** Combine high standards and specific feedback with expressed confidence that all can achieve. In three double-blind field experiments Yeager and colleagues (2013) introduced interventions that encouraged students to attribute the critical feedback they received to their teachers high standards and belief in their potential to reach those standards. In a series of three studies on this "wise feedback" intervention they found that black students were more likely to turn in revised essays, makes changes suggested by the teacher, and write better revisions and there was a significant reduction (40%) in the racial achievement gap.

Other ways to address stereotype threat:

- **Reframe the task.** Include a brief statement about the fairness of the assessment and emphasize that the test is "gender-fair" or "race-neutral."
- **De-emphasize threatened social identities by removing or changing the location of demographic information.** If you must ask about gender, race, and/or ethnicity with an assessment, ask for this information at the end.
- **Promote diversity and diverse perspectives**. Explain the value of diversity by emphasizing that it stimulates fresh thinking and new solutions to issues.
- **Create an inclusive environment in the classroom** through course content and interactions between students and faculty.
- **Avoid referring to students' performance as reflective of "natural" ability or talent**. Perceptions of a "growth-mindset" environment can help students maintain a sense of belonging in a field even when they encounter negative stereotypes. Research has even shown than an awareness of a stereotype that links identity to ability or

> intelligence can depress students' performance, even when a stereotype is not explicitly invoked or "primed."

The vast body of research on stereotype threat demonstrates that our beliefs about others and ourselves hold powerful influence over lives - and more specifically our academic opportunities and outcomes. Stereotype threat is a pervasive and persistent problem in our society, our college campuses, and our classrooms. The strategies and interventions I have described may strike you as too simple to have an effect on something so entrenched as stereotypes. You may be asking yourselves if an intervention as straightforward as being explicit about the fairness of a test or asking for demographic information at the end of a test can really address the threat that stereotypes pose for our students. The research shows that they can.

I hope that as you look over the list of interventions I outlined above you see a few things you can easily implement in your own classes and interactions with students. And it is likely that if you are reading this post you probably see a few things you already do. Hopefully you see ways that you can start or continue to address the threat that many of our students are under, because the simplicity of these interventions also reveals the cumulative and ubiquitous effect of negative stereotypes on our students' learning and performance.

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[1] The scholarship on teaching and learning backs me up on this.

[2] He was referring to the "mismatch theory." However, current research demonstrates that minority students are in fact not mismatched, but with the right support and interventions they can excel with "affirmative meritocracy."

[3] Corrected for SAT scores – this aspect of the research has challenged by some but has gained little traction.

[4] In fact this attitude can result in what Claude Steele calls "over-efforting" in his book *Whistling Vivaldi*, whereby students expend great energy and effort, but often find themselves falling behind other students that appear to work less. Steele points to their social isolation from other students, due to their fear of confirming stereotypes, as one factor that requires them to work harder and without the resources that social networks can bring – such as study groups.

[5] This alone produces significant inequities when viewed in light of the relationship between test scores and the racial and ethnic inequality in higher education.

Posted on June 6, 2016 by Robin Paige.

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SEARCH

Top 10 Ways to Engage Underrepresented Students in Computing

1

Select curricula that will engage students who are new to computing.

Game design, socially relevant assignments, and digital media are promising ways to engage students. Many faculty have had success using Alice, Scratch, or other user-friendly programs that enable students to learn difficult computer science concepts before they are introduced to coding.

2

Encourage all of your students.
Simple written and verbal comments can make the difference between students taking another computing class or staying in the major, or not. Students are more likely to engage in tasks that they believe they can perform successfully, so focus encouragement on student progress, persistence, and effort, rather than just being "smart" or demonstrating prior computing experience.

3

Make the physical environment in your classroom and department inviting.
The physical environment conveys messages to students about who belongs in computing and who doesn't. Rooms decorated with images and objects associated with "geeky" stereotypes are typically less appealing and welcoming to women than are gender-neutral rooms. Knowing this, you can craft an environment that makes a broad range of people feel welcome.

4

Be sure your teaching style is inclusive.
Your instructional practices can level the playing field for underrepresented students who may come in with different prior experiences with and knowledge of computing. Inclusive instructional practices improve learning outcomes for all students, so rather than lecturing, hold interactive discussions. Invite student feedback on ways the classroom dynamics may inadvertently exclude some individuals or groups.

5

Include many opportunities for collaborative learning in your classes.

Collaborative learning, such as pair programming and peer-led team learning, can improve learning outcomes, retention rates, critical thinking, appreciation of diversity, and development of social and professional skills. In addition, research shows that female students feel more confident in classes using pair programming.

6

Meet students where they are.

Educational researchers emphasize the importance of linking educational materials and curricular programs to students' existing knowledge and experiences. Building on existing competence and putting the concepts of computing in appealing contexts can reduce entry barriers and provide those with limited experience an equal chance to succeed.

7

Minimize stereotype threats.

When stereotypes are invoked in the classroom, "stereotype threat" can occur, where students may fear that their behavior will confirm negative stereotypes about their "group," or about themselves as members of that group. This harms performance and motivation by reducing feelings of competence, belonging and trust. Create an environment where students feel recognized for their achievements, explicitly state that diversity is valued, and promote a growth mindset about intelligence.

8

Avoid gender bias.

Even individuals committed to equality harbor unconscious biases that impact everyday decisions and interactions. Experiments consistently show that women and their work are misperceived as less valuable than men, even when their demonstrated ability is identical. Women at all levels of computing have to work harder and often violate norms about feminine behavior to build authority and demonstrate belonging.

9

Provide role models for underrepresented students.

Letting students hear from a variety of role models helps to ensure they find someone to whom they can relate. Role models should share the techniques they used to overcome obstacles in their educational and career paths to help students see what is possible. When local role models are unavailable, you can use audio or video interviews with successful women and other underrepresented minorities in computing.

10

Connect students to support networks.

Student groups, clubs, or other formal get-togethers can help underrepresented students feel less isolated than they otherwise might and increase their sense of belonging. Research has shown that peer and near-peer mentoring can double the retention rate of female students in male-dominated courses.

Related Resources

EngageCSEdu (www.engage-csedu.org/)

How Can Encouragement Increase Persistence in Computing? Encouragement Works in Academic Settings (Promising Practice): (www.ncwit.org/academicencouragement)

How Does the Physical Environment Affect Women's Entry and Persistence in Computing? Design Physical Space that has Broad Appeal (Promising Practice): (www.ncwit.org/physicalspaceuw)

How Do You Recruit or Retain Women through Inclusive Pedagogy? The Conversational Classroom (Promising Practice): (www.ncwit.org/conversationalclass)

How Do You Retain Women through Collaborative Learning? Pair Programming and Peer-Led Team Learning (Promising Practices): (www.ncwit.org/pairpractice) and (www.ncwit.org/pltl)

How Do Stereotype Threats Affect Retention? Better Approaches to Well-Intentioned, but Harmful Messages (Promising Practice): (www.ncwit.org/stereotypethreatmessages)

How Can Reducing Unconscious Bias Increase Women's Success in IT? Avoiding Gender Bias in Recruitment/Selection Processes (Promising Practice): (www.ncwit.org/biasselection)

Give Students More Effective Feedback Using a Growth Mindset: (www.ncwit.org/feedbackstudent)

Entrepreneurial Heroes Interviews (Audio Recordings): (www.ncwit.org/heroes)

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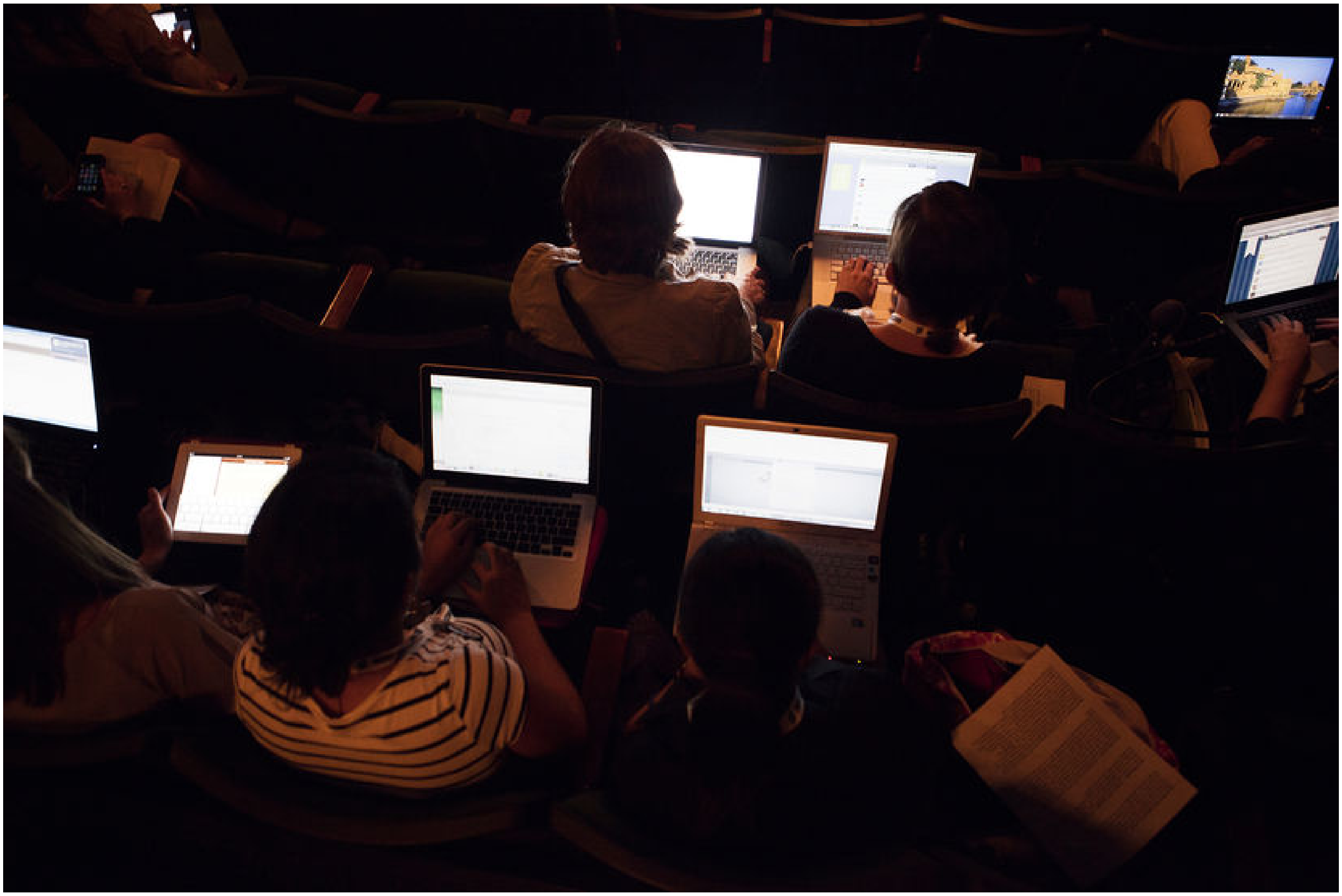

People work on their laptops while attending a lecture. **Photo by Martin Adolfsson/Gallery Stock**

Why there aren't more Latinos in the tech industry

08/26/14 08:37 AM – UPDATED 08/26/14 09:03 AM

By Maria Teresa Kumar

Last week, Apple was the latest in a string of Silicon Valley titans to release data that continues to prove how white, male, and Asian the tech industry really is. It's not exactly a shock. Before Google released its own data in May – leading other companies to follow suit – there was already a growing belief that the tech industry needed to diversify. This need has never been more imperative.

Of course, this issue extends beyond Apple and Google. Currently only 6% of all U.S. tech workers are African-American and 7% are Latino. This is contrast to the 16% of tech workers who are Asian Americans and 71% who are white.

Related: Join a Twitter chat on diversity in tech with msnbc & Voto Latino Tuesday, Aug 26 at 2 pm ET

At my organization, the national nonprofit Voto Latino, we have leveraged technology to engage and empower Latino Millennials to find solutions to the most pressing issues facing Latino communities. Voto Latino's experience tells us that the dismal number of Latinos in high-paying science, technology, engineering, and math (STEM) careers exists not because of a lack of interest, but a lack of access to tech tools, training, and mentors — and that lack of access starts long before this demographic gets to college.

Although Latino high school graduates entered college in 2012 at a higher rate than their white counterparts, Latinos made up less than 9% of computer science and engineering college graduates in 2013. Nationally, Latinos are also less likely to take Advanced Placement (AP) math, science, and computer science exams than their white and Asian peers. And in California, the hub for American tech companies and the state with the largest Latino population, Latino students represented less than 1.3% of computer science AP test takers in 2013. Latinos are simply not enrolled in the classes that set them up for careers in STEM, which puts them at a disadvantage in today's competitive job market.

To understand why this is the case, we have to look back. In the 1990s and 2000s, when American households increasingly gained access to home computers and the internet, Latinos lagged far behind largely because both were luxuries their families could not afford. While Facebook's Mark Zuckerberg and Napster's Sean Parker were learning to code in middle school, too many Latinos their age did not even have access to a home computer.

Access and exposure to tech tools at an early age is a major factor in driving creativity and sparking interest in STEM. Along with that, it's important for Latino kids to see others who look like them succeeding in these fields. When our kids are not exposed to these opportunities, they are less likely to pursue careers in the competitive — and highly lucrative — tech world.

Although the effects of this gap are most visible today with the release of employee demographic data, studies show Latinos are some of the fastest adopters of new technologies. Latinos over-index on the use of smart phones and social media, and they're more likely than their peers to own the latest smartphone or tech gadget. Latinos' increasing interest in tech and lagging numbers in the tech workforce were two of the reasons the South by Southwest Interactive conference in Austin, Texas, this year featured a three-day program about Latinos in tech.

The lack of resources to pursue tech fields is one of the reasons Voto Latino, in partnership with the John D. and Catherine T. MacArthur Foundation, HASTAC and Google, launched the VL Innovators Challenge. It is a tech competition that will regrant $500,000 to 10 to 15 Millennial-led tech projects. Each idea must propose an innovative tech solution to a problem in the Latino community.

Applications will be accepted through October 15, the last day of Hispanic Heritage Month. The VL Innovators Challenge does not require previous technological experience or a college degree. Winners of the VL Innovators Challenge will receive access to mentors, training, and other resources to develop their tech project and learn new skills along the way. What we value most are the ideas we know this group has.

The long-term goal is to contribute to a pipeline of young, Latino innovators who can help tech companies reimagine what it means to "think different." Doing so will not only benefit the tech industry and the Latino community, but the nation as a whole. That is because today, the average Latino worker makes $34,000 annually, about $40,000 less than the average U.S. tech worker. With the Census projecting that minorities currently make up at least half of all children younger than 5, in the coming decades, America's workforce will be made up of the very people who need the training, mentorship, and resources to pursue high-paying careers in tech. Their future success in STEM will fuel American innovation and sustain an economy that will benefit us all.

María Teresa Kumar is the President and CEO of Voto Latino

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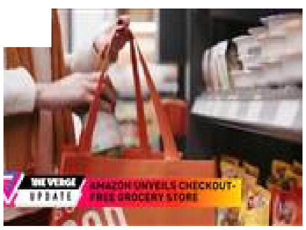

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Men of IT

- Michael Fields (Oracle, KANA)
  - http://archive.fortune.com/magazines/fortune/fortune_archive/1997/08/04/229688/index.htm
  - http://www.sterlinghoffman.com/newsletter/articles/article279.html

- John Henry Thompson (XObjects)
  - http://www.johnhenrythompson.com/bio
  - http://www.jamaicaobserver.com/magazines/career/Jamaican-invents-programming-language_11535571

- Mark Dean (IBM)
  - https://www.engadget.com/2015/02/06/mark-dean-pc-pioneer/
  - http://www.pcworld.com/article/2859478/the-tablet-is-my-device-of-choice-why-pc-creator-mark-dean-has-largely-abandoned-his-electronic-chi.html

- Jordi Muñoz (3D Robotics ~ drones)
  - http://www.inc.com/will-yakowicz/35-under-35-jordi-munoz-co-founder-3d-robotics.html
  - http://www.wsj.com/articles/a-consumer-drone-pioneer-were-learning-as-we-go-1428511868

- Leandro Graciá Gil (Google)
  - https://www.cnet.com/es/noticias/leandro-gracia-gil-google-cardboard-20-latinos/ [can be translated into English]

- Rafael Camargo (Google)
  - https://www.cnet.com/news/google-project-ara-hands-on-rafa-camargo-interview-modular-phones/

- Justin Edmund (Pinterest)
  - http://www.usatoday.com/story/tech/2014/10/30/justin-edmund-pinterest-diversity-silicon-valley-ferguson-african-americans-hispanics-technology/17832781/

Women of IT

- the 6 female ENIAC programmers
    - 20min video at https://vimeo.com/ondemand/eniac6

- Radia Perlman (creator of STP)
    - http://www.theatlantic.com/technology/archive/2014/03/radia-perlman-dont-call-me-the-mother-of-the-internet/284146/

- Adi Tatarko (Houzz)
    - http://www.forbes.com/sites/georgeanders/2014/10/15/houzzs-founders-have-become-techs-newest-power-couple/#23d9caa6788a
    - https://techcrunch.com/2013/09/10/adi-tatarko-of-houzz-bootstrapping-was-the-best-thing-that-ever-happened-to-us/

- Leah Busque (Taskrabbit)
    - http://lifehacker.com/im-leah-busque-founder-of-taskrabbit-and-this-is-how-496031842
    - https://www.technologyreview.com/lists/innovators-under-35/2013/entrepreneur/leah-busque/

- Michelle Zatlyn (CloudFlare)
    - http://www.techrepublic.com/article/cloudfares-michelle-zatlyn-co-founder-cloud-pioneer-limo-driver/

- Cindy Alvarez (Yammer)
    - http://www.cindyalvarez.com/

- Manuela Veloso (robotics / robot soccer)
    - http://spectrum.ieee.org/geek-life/profiles/manuela-veloso-robocups-champion)

- Ileana Rivera (Cisco)
    - http://hispanicexecutive.com/2015/ileana-rivera/