Changing the Face of Computing

A Success Story … in CS@Mines

**Tracy Camp
Department Head
and Professor
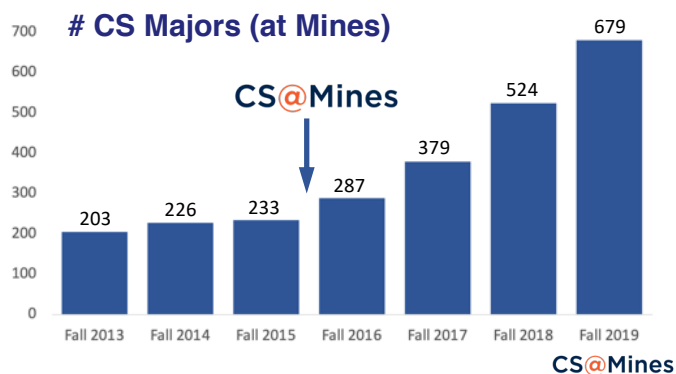Computer Science**

COLORADO SCHOOL OF **MINES**

CS@Mines

	2008-09	2014-15	2018-19
Women (%)	10.8%	12.7%	21.4%

Women at Mines: ~29%

CS@Mines

 # CS Majors (at Mines)

CS@Mines

	2008-09	2014-15	2018-19
# Majors	157	226	524
Women (%)	10.8%	12.7%	21.4%
Women (#)	17	29	112	145

Women at Mines: ~29%

CS@Mines

NCWIT NEXT Grand Prize ($100K ☺)

EXTENSION
NCWIT&
SERVICES

CS@Mines

Changing the Face of Computing Other Success Stories …

UNIVERSITY *of* WASHINGTON

UC Irvine

MICHIGAN STATE UNIVERSITY

Berkeley
UNIVERSITY OF CALIFORNIA

VirginiaTech
Invent the Future

ILLINOIS

University of Colorado Boulder

UNIVERSITY OF MICHIGAN

TEXAS
The University of Texas at Austin

IU UNIVERSITY

NSF | **DEPARTMENTAL PLANS FOR BROADENING PARTICIPATION IN COMPUTER SCIENCE**
A Planning Workshop for Computing Department Leadership
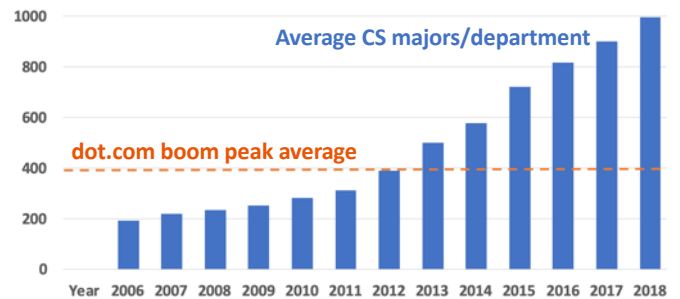
November 13-15, 2019
University of Illinois at Urbana-Champaign

CS Majors (Nationally)

Average CS majors/department

dot.com boom peak average

Year 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

What did CS@Mines do??

CS@Mines

acm's women in computing
acm-w

ACM-W supports, celebrates, and advocates internationally for the full engagement of women in all aspects of the computing field.

http://acm-w.org

PRELIM REPORT: *Identify a person, or create a group specially in charge of Gender Equality inside the organization, in charge of looking at the gender balance …*

Slide 1 (top-left):

national center for
women&
INFORMATION TECHNOLOGY

NCWIT uses a three-pronged strategy to improve awareness and knowledge, and motivate change leaders to act.

CONVENE EQUIP UNITE

PRELIM REPORT: *Evaluation of initiatives is needed, … only 15% of initiatives in the database had been evaluated for effectiveness or impact in terms of outcomes and benefit to participants. Evaluation is essential …*

ncwit.org

Slide 2 (top-right):

national center for
women&
INFORMATION TECHNOLOGY

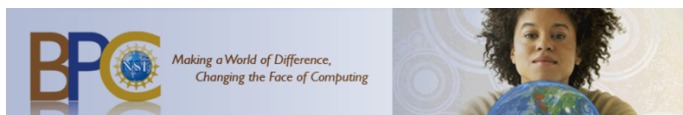NCWIT uses a three-pronged strategy to improve awareness and knowledge, and motivate change leaders to act.

CONVENE EQUIP UNITE

http://ncwit.org

ncwit.org

Slide 3 (middle-left):

PRELIM REPORT: *… gender gap "good practices" database*

BPC — *Making a World of Difference, Changing the Face of Computing*

BPC Portal — http://www.bpcportal.org

Project ended in 2012 ➔ now dead link

Slide 4 (middle-right):

PRELIM REPORT: *… gender gap "good practices" database*

BPCnet RESOURCE PORTAL

BPCNet will continue to evolve in response to community needs. Please check back occasionally.
CONTACT US

Diversity Drives Innovation—
Taking action to Change the
Face of Computing

The BPCnet Resource Portal is a clearinghouse for the community to learn about and engage with ongoing projects to diversify computing. The BPCnet serves two key roles:
• Increase visibility of ongoing broadening participation efforts and community awareness of these efforts.
• Assist NSF PIs in planning meaningful Broader Impact components of their proposals.

Slide 5 (bottom-left):

What is CRA-WP?
Individual & Group Research Mentoring

Undergrads: Undergraduate Research Experiences
Grad Cohort: Group Mentoring of Graduate Students
Academics/PhD Researchers: Group Mentoring for Early and Mid Career

Undergraduates Graduate Students Academic careers Industry/government labs
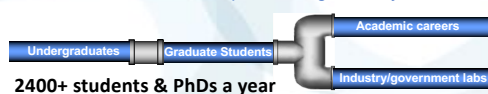
2400+ students & PhDs a year

Stay in touch: cra.org/cra-wp
Twitter: @CRA_WP
Facebook: CRA-WP
Linked-in: CRA-Widening Participation

CRA-WP
Computing Research Association
Widening Participation

Slide 6 (bottom-right):

What is CRA-WP?
Individual & Group Research Mentoring

Undergrads: Undergraduate Research Experiences
Grad Cohort: Group Mentoring of Graduate Students
Academics/PhD Researchers: Group Mentoring for Early and Mid Career

PRELIM REPORT: *Specific meetings or workshops … have role models as invited speakers … training session on … how to publish without perishing …*

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CRA-WP
Computing Research Association
Widening Participation

What is CRA-WP?
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PRELIM REPORT: *The need to increase the perception/ visibility of women's research work in science.*

CRA-WP
Computing Research Association
Widening Participation

What is CRA-WP?
Individual & Group Research Mentoring

RECOGnizing Notable Women/URGs in Computing (RECOG)

https://recog …

CRA-WP
Computing Research Association
Widening Participation

WICArch Directory

We actively maintain a list of women working in the field of computing architecture. We welcome all students, post docs, researchers, faculty members, or hobbyists. If you would like your profile listed, please create an account here. If you need to modify your profile, please login and manage your profile.

Filter by Research Interests	Filter by Profile Type	Search and Reset
Datacenter-Scale Computing		Run Search Reset Filters

Lauren
Database Architect
Carestream Dental/Georgia Tech
Personal URL

Research Statement

Christina Delimitrou
Assistant Professor
Cornell University
Personal URL

Research Statement
Interests

Sally A McKee
Associate Professor
Clemson University
Personal URL

Research Statement
Interests

Yasuko Eckert
Sr. Member of Technical Staff
AMD Research
Personal URL

Research Statement
Interests

What is CRA-WP?
Individual & Group Research Mentoring

Writing Wikipedia Pages for Notable Women in Computing
https://www2.cs.duke.edu/csed/wikipedia/

Women in Computing Cards

What is CRA-WP?
Individual & Group Research Mentoring

Undergrads: Undergraduate Research Experiences

Grad Cohort: Group Mentoring of Graduate Students

Academics/PhD Researchers: Group Mentoring for Early and Mid Career

https://cra.org/cra-wp/

CRA-WP
Computing Research Association
Widening Participation

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acm's women in computing
acm-w

CRA-WP
Computing Research Association
Widening Participation

national center for
women&
INFORMATION TECHNOLOGY

Changing the Face of Computing

A Success Story … in CS@Mines

What did CS@Mines do??

Activities/Programs

Recruitment programs
Retention programs
Welcoming culture (space/activities)
Visible signs that diversity is important
Transfer efforts
etc.

Recruitment

DECtech
DISCOVER · EXPLORE · CREATE
http://tech.mines.edu

PRELIM REPORT: *Strategies to implement include: to offer courses on popularization/applications of science in secondary school; to fight against preconceived idea that science is a subject not suited for girls; to encourage girls to study science; to organize summer camps in science for girls …*

DECtech
DISCOVER · EXPLORE · CREATE
http://tech.mines.edu

Million Women Mentors®
Advancing Women and Girls in STEM Careers Through Mentoring

Stand Up for STEM Award

DECtech
DISCOVER · EXPLORE · CREATE
http://tech.mines.edu

PRELIM REPORT QUESTION:
What is the ideal ratio of boys to girls in programs designed to motivate girls in science?
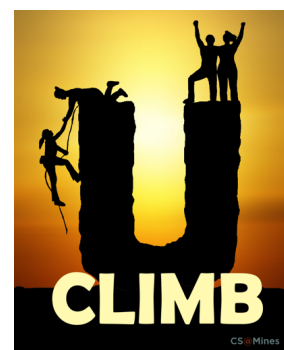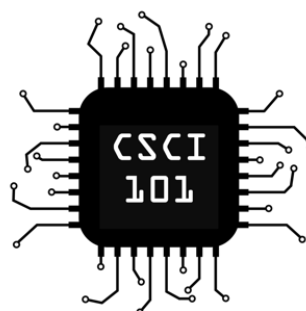
"need simple majority"
"need 2/3"

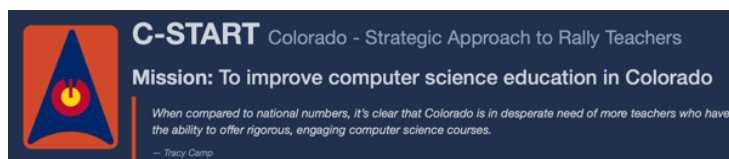DECtech summer camps: all girls, all boys, mixed

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CS@MINES ON TOUR

https://csontour.mines.edu

CSCI 101

U CLIMB
CS@Mines

C-START Colorado - Strategic Approach to Rally Teachers

Mission: To improve computer science education in Colorado

When compared to national numbers, it's clear that Colorado is in desperate need of more teachers who have the ability to offer rigorous, engaging computer science courses.
— Tracy Camp

https://cstart.mines.edu

Retention

acm's women in
computing

acm-w

student chapter

CS@Mines

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acm's women in
computing

acm-w

ROCKY MOUNTAIN | *celebration of* women *in* computing
An ACM Celebration Event

http://rmcwic.org

CS@Mines

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acm's women in
computing

acm-w

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CS@Mines

DECtech
DISCOVER · EXPLORE · CREATE

CLIMB
CS@Mines

CS@Mines

Welcoming Culture

"Hello World"
CS@Mines

Welcoming Spaces
Funch or Fike
10 Truths and a Lie

Community

Celebrate Successes

Computing Innovation Fair

CS@Mines

Changing the Face of Computing

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Overall Process

1. Set Goal(s)
2. Understand your environment/data
3. Implement activities strategically
4. Feedback loop

CS@Mines

Overall Process

1. **Set Goal(s)**
2. Understand your environment/data
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CS@Mines

Set Goals

20% by 2020
25% by 2024
30% by 2030

Implement 90% of NCWIT's "best practices"

CS@Mines

NCWIT Activity Reference Sheet

https://www.ncwit.org/sites/default/files/file_type/nextawards_activityreferencesheet.pdf

Categories	Number of Activities	Number Implemented
Increase enrollments	15	15
Teaching / Pedagogy	20	18
Curricular Interventions	8	8
Peer and Faculty Support	16	15
Institutional Policy and Support	11	10
Evaluation and Tracking	11	8
Total	**81**	**74**

CS@Mines

Overall Process

1. Set Goal(s)
2. **Understand your environment/data**
3. Implement activities strategically
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CS@Mines

Understand your environment:

Evaluate your students/community

NCWIT Student Experience of the Major (SEM)
CRA Data Buddies

Faculty/Staff (work/life)
Cultural Issues
Inclusive Instruction

Understand the Data

In the literature
In your university
In your department

e.g., 2.5% male attrition vs. 12% female attrition

e.g., 21.2% accept vs. 16.7% enrolled (females)

Overall Process

1. Set Goal(s)
2. Understand your environment/data
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Overall Process

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A few final thoughts …

Computing has made progress
… but we have a long way to go
Progress requires
- **commitment within your department**
- **commitment from your admin**
- **Commitment from the broader community**
- **constant focus**

What questions can I answer?

OTHER SLIDES

Students from Underrepresented Groups

National Data (U.S.)

57.3%: Bachelor's awarded to women
18.7%: Bachelor's awarded to women in CS
(~1/3)

23.2%: Bachelor's awarded to URG
17.0%: Bachelor's awarded to URG in CS
(~3/4)

Thanks to Betsy Bizot at CRA

	2008-09	2014-15	2018-19
# Majors	157	226	524
Women	10.8%	12.7%	21.4%
URG	7.6%	13.9%	21.8%

Women at Mines: ~29%
URG at Mines: ~17%

Scholarship funds for academically talented low-income students to study CS at Mines

PATHS Scholarship Program
Pursue PATHS to a Bright Future . . .

http://paths.mines.edu