



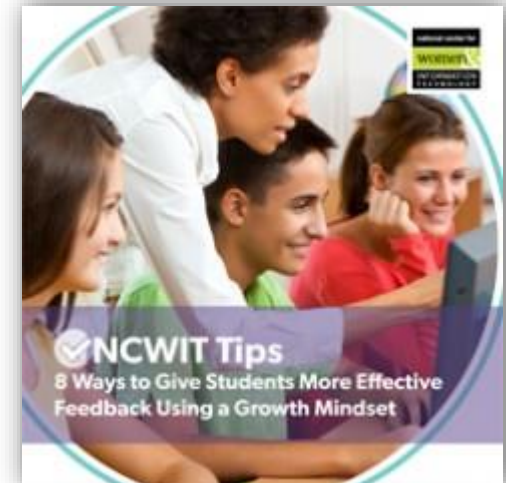
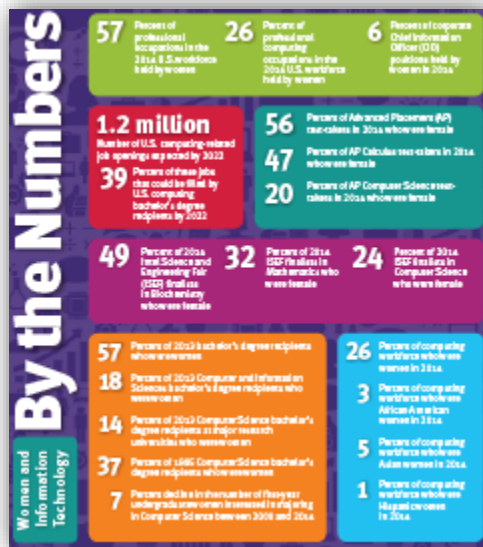
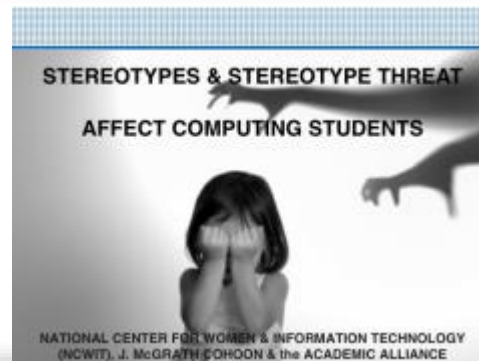
Revolutionizing the Face
of Technology

NCWIT Resources and EngageCSEdu

Gretchen Achenbach

**National Center for Women & IT
University of Virginia**

NCWIT provides free, high-quality, research-based resources





NCWIT resources can help you:

- Inform others about the importance of CS
- Inform others about the need for diversity in CS
- Recruit and retain diverse students in your CS classes
- Find engaging and inclusive class materials

www.ncwit.org

You, (or your child or student) should consider pursuing a degree in computing because:

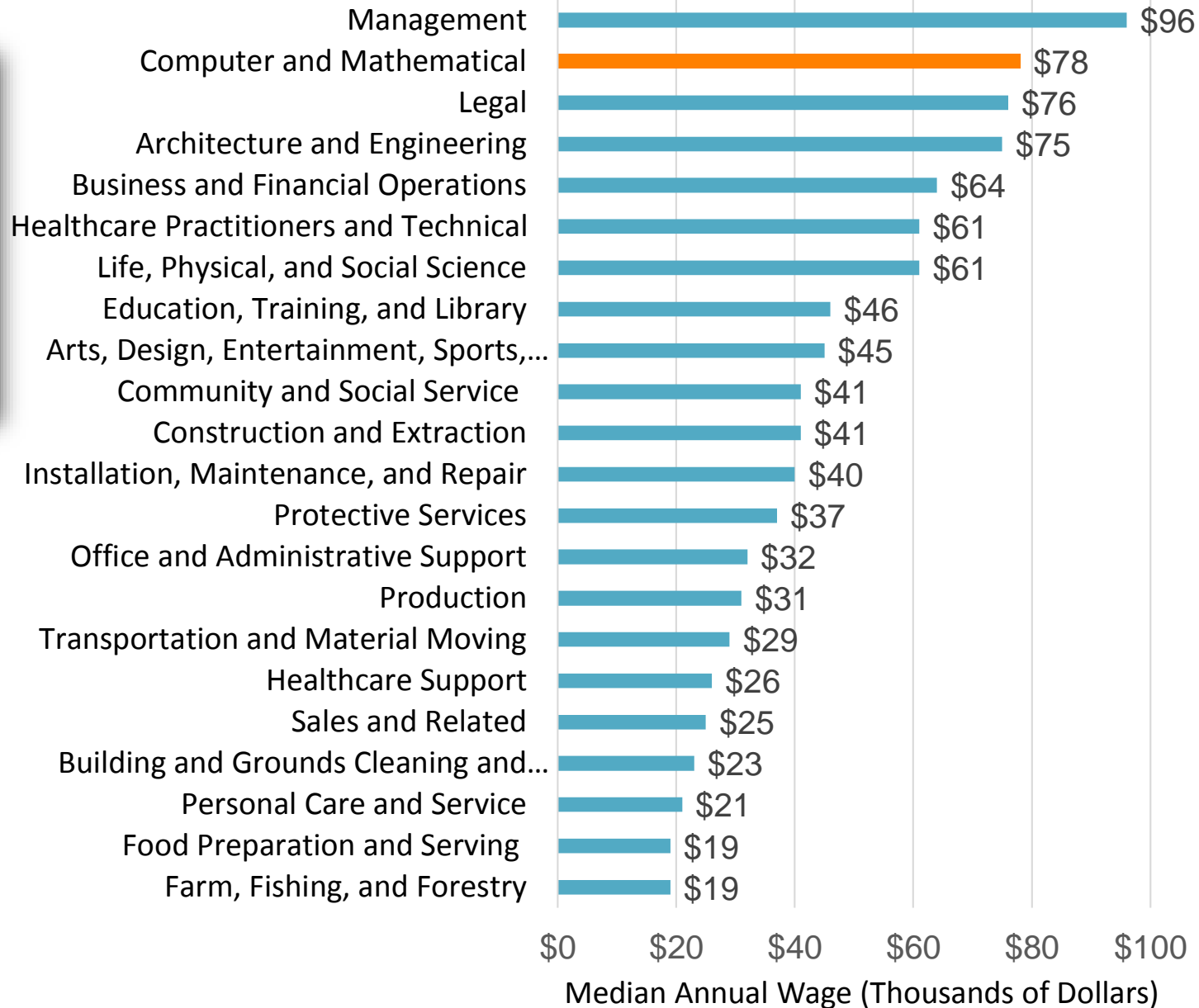
There are good jobs in computing

You, (or your child or student) should consider pursuing a degree in computing because:



**Computing
pays
well**

(U.S. Bureau of
Labor Statistics, 2014)

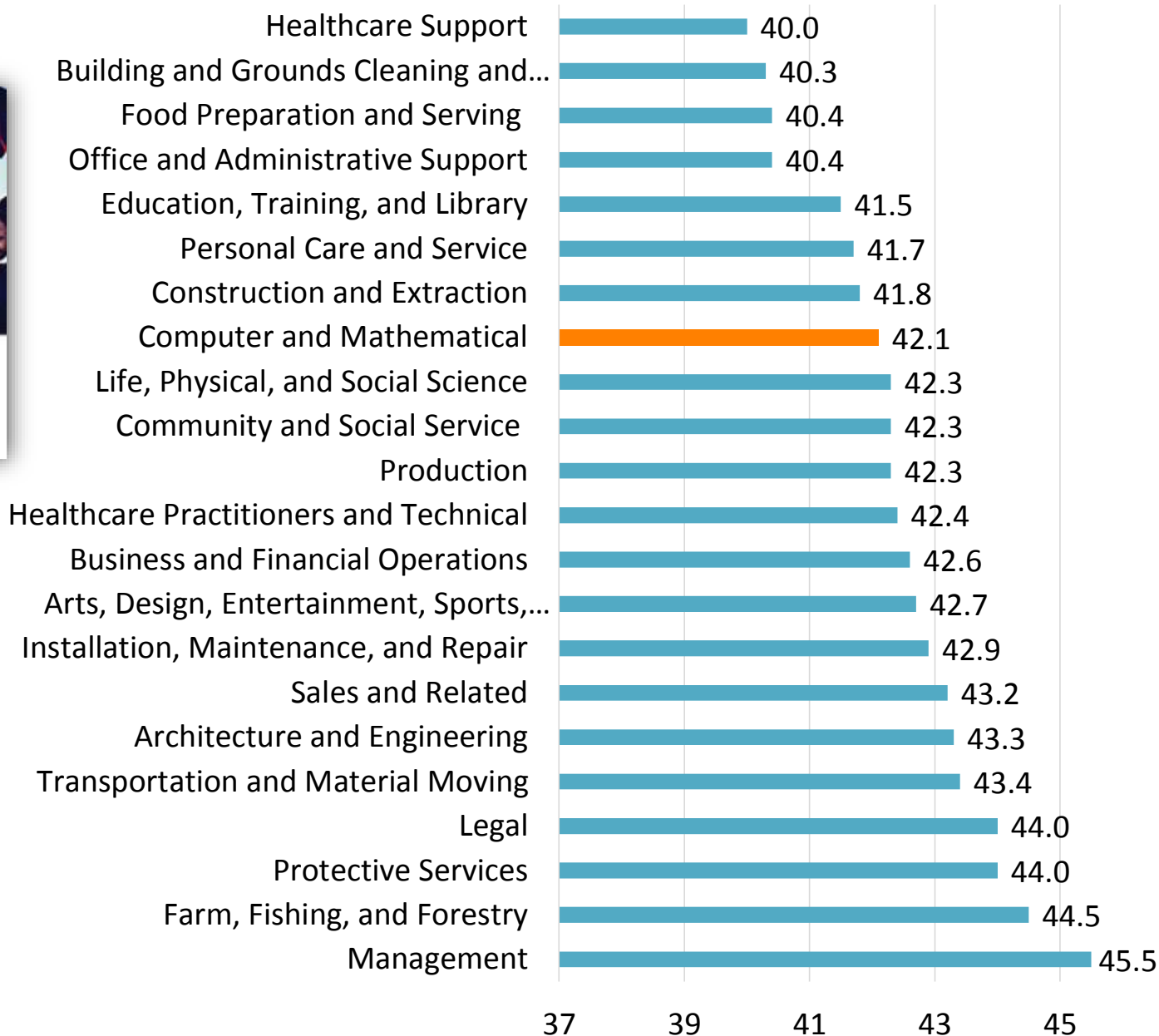


You, (or your child or student) should consider pursuing a degree in computing because:



**Computing
offers
reasonable
hours**

(U.S. Bureau of
Labor Statistics, 2014)



High school CS lacks gender diversity:

There aren't many girls in my CS class

High School CS lacks gender diversity:

You can use slides from the
**NCWIT Scorecard: A
Report on the Status of
Women in IT**

SECONDARY EDUCATION

Disproportionate Numbers Among CS AP-Takers

In 2013:

- 56% of 2.2 million U.S. AP exam-takers were female
- BUT only 19% of those who took a computer science AP exam were female

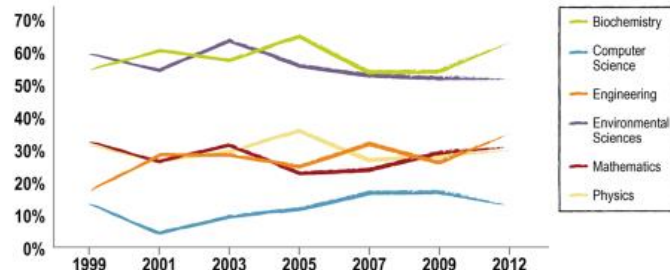
Make a Difference
REACH OUT

Present a hands-on activity to middle-school students using *Outreach-in-a-Box*
www.ncwit.org/outreach
ncwit.org/scorecard

SECONDARY EDUCATION

Fewer Girls Doing CS in Science Fairs

FEMALE PERCENTAGE OF PARTICIPANTS, INTEL SCIENCE AND ENGINEERING FAIR (ISEF), 1999-2012



© NCWIT. Source: Intel ISEF Participation Statistics (unpublished).

ncwit.org/scorecard

and for more information see
**Girls in IT:
The Facts**



Talking Points cards

Sample topics:

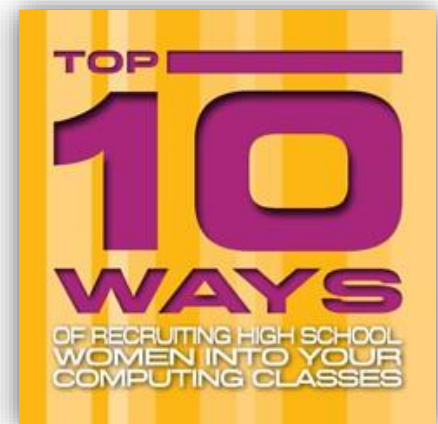
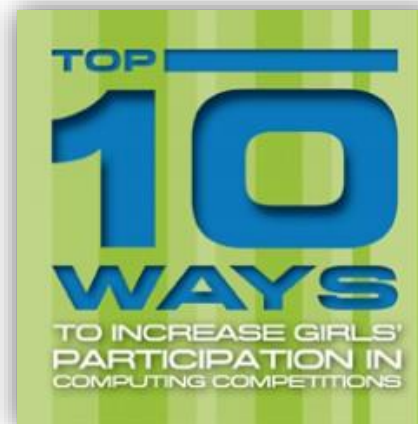
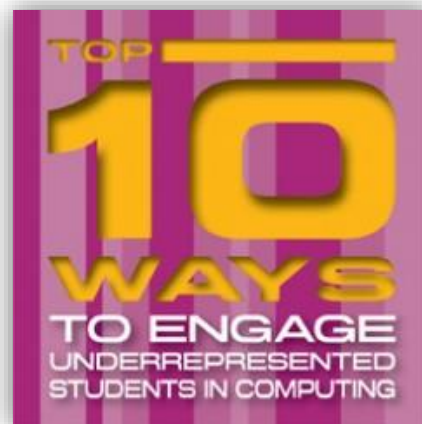
- Why Should Young Women Consider Careers in IT? (also in Spanish)
- Moving Beyond Computer *Literacy*: Why Schools Should Teach Computer *Science*
- Talk with Faculty Colleagues about Stereotype Threat
- Comparing U.S. K-12 Students' Math and Science Performance Internationally



Top 10 Ways

- Families can Encourage Girls' Interest in Computing (also in Spanish)
- To Increase Girls' Participation in Computing Competitions
- Of Recruiting High School Women into Your Computing Classes

To Engage Under-Represented Students in Computing



Promising Practices and Case Studies

Sample topics:

- Evaluating Software for Gender Bias
- Inclusive Strategies for Teaching Students with Disabilities
- Design Physical Space with Broad Appeal
- Change the Gender Composition of High School CS courses
- Encouragement Works
- Pair Programming
- Stereotype threat
- Scratch
- Alice
- CS Unplugged

National Center for Women & Information Technology
PROMISING PRACTICES

Better Approaches to Well-Intentioned, but Harmful Messages (Case Study 1)
Overcoming Stereotype Threat to Improve Retention

K-12 Education Undergraduate Graduate

EXPERIMENTS WITH STEREOTYPE THREAT DEMONSTRATE BEST PRACTICES
Students often approach education as a search for their inherent talents, rather than development of new abilities, because they believe that intelligence is unchanging. This belief leads students to drop challenging subjects when faced with initial difficulties or stereotype threats. A successful intervention designed to short-circuit this process was studied by Good et al. (2003). The intervention had four steps:

1. College students mentored seventh-graders and taught them that intelligence can be increased.
2. Mentors attributed any learning difficulties to the situation instead of students' shortcomings.
3. Mentors gave the seventh-graders access to information about how the brain forms new connections over time.
4. The middle-school students communicated what they had learned about the expandable nature of intelligence to others.

Results of this experimental intervention included improved test performance and no gender gap in test performance. Other interventions produced similar results when students were encouraged to believe that intelligence increases through practice and effort. And some experiments showed that in certain situations, it was enough simply to tell students that the test they were about to take had never shown gender differences in outcomes.

TRUE STEREOTYPE THREATS FROM COMPUTING EDUCATION — AND RECOMMENDATIONS FOR AVOIDING THEM
Calling attention to women's underrepresentation in computing can cause stereotype threat, even when it is well-intended. These true stories illustrate problems and suggest solutions.

TRUE STORY	POSSIBLE SOLUTION
During orientation for new computer science undergraduate majors, a woman who was comfortable in computing because her mother is a computer scientist hardly noticed the typical gender composition of her cohort. She was the only woman in her group of fifty new students, an unfortunate, but familiar situation. Then the woman was approached by a solicitous counselor who intended to encourage her by gushing, "You are so brave to major in computer science! I really admire you." The new student had not been worried until that moment.	Builds Community: The counselor might simply have introduced herself to students, and students to each other, perhaps revealing shared values by asking them why they chose this major. Initiating conversations in this way could begin forming community and put everyone at ease.
An instructor sent students an end-of-course email saying, "Women earned three of the top four course averages in the class... The course average for you seven women was 2.6 points higher than for the thirteen men. You're showing that women can do just fine in CS good work!" (What did he expect?)	Avoids Invoking Negative Stereotypes: The instructor might have sent an email congratulating the top students on their performance. The message could also have included a grade distribution, so students could compare themselves with classmates. This information would allow the women to see how well they had done without making their achievement seem unusual.

RESOURCES
Good, C., Anderson, J., & Judd, M. (2003). Problems in the pipeline. *Journal of Applied Developmental Psychology* 24(1), 17-28.
Good, C., Anderson, J., & Judd, M. (2003). Problems in the pipeline. *Journal of Applied Developmental Psychology* 24(1), 17-28.

NCWIT offers practices for increasing and benefiting from gender diversity in IT at the K-12, undergraduate, graduate, and career levels.
This case study describes a research-inspired practice that may need further evaluation. Try it, and let us know your results.

ncwit.org Author: J. McGrath Cohoon
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NCWIT Investment Partners: National Science Foundation, Axya, Microsoft, Pfizer, and Bank of America

In-A-Box – everything you need to know to get started with:

- Pair Programming
- E-Textiles
- CS Unplugged
- Agent Cubes – Introducing Computing through Game Design



Latinas & Tecnología de la Información

Resources
Profiles of Latinas in Tech
Videos
Links



PERFILES



Yolián Amaro-Rivera

Estudios de licenciatura, Ingeniería en computación

www.ncwit.org/latinas-information-technology





An online collection of CS1/CS2 course materials to help retain and recruit diverse students



www.engage-csedu.org

What's special about EngageCSEdu?

- 1500+ peer-reviewed course materials... and growing
- Easy to browse and search
- All materials employ research-based Engagement Practices
- Linked to NCWIT resources and research



Course Materials include:

Projects

Homework Assignments

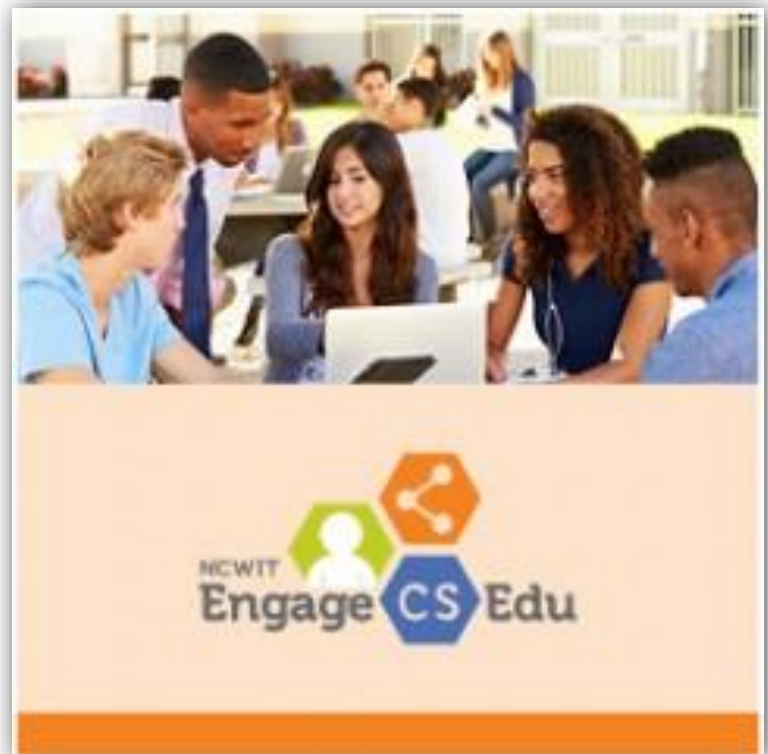
Tutorials

Labs

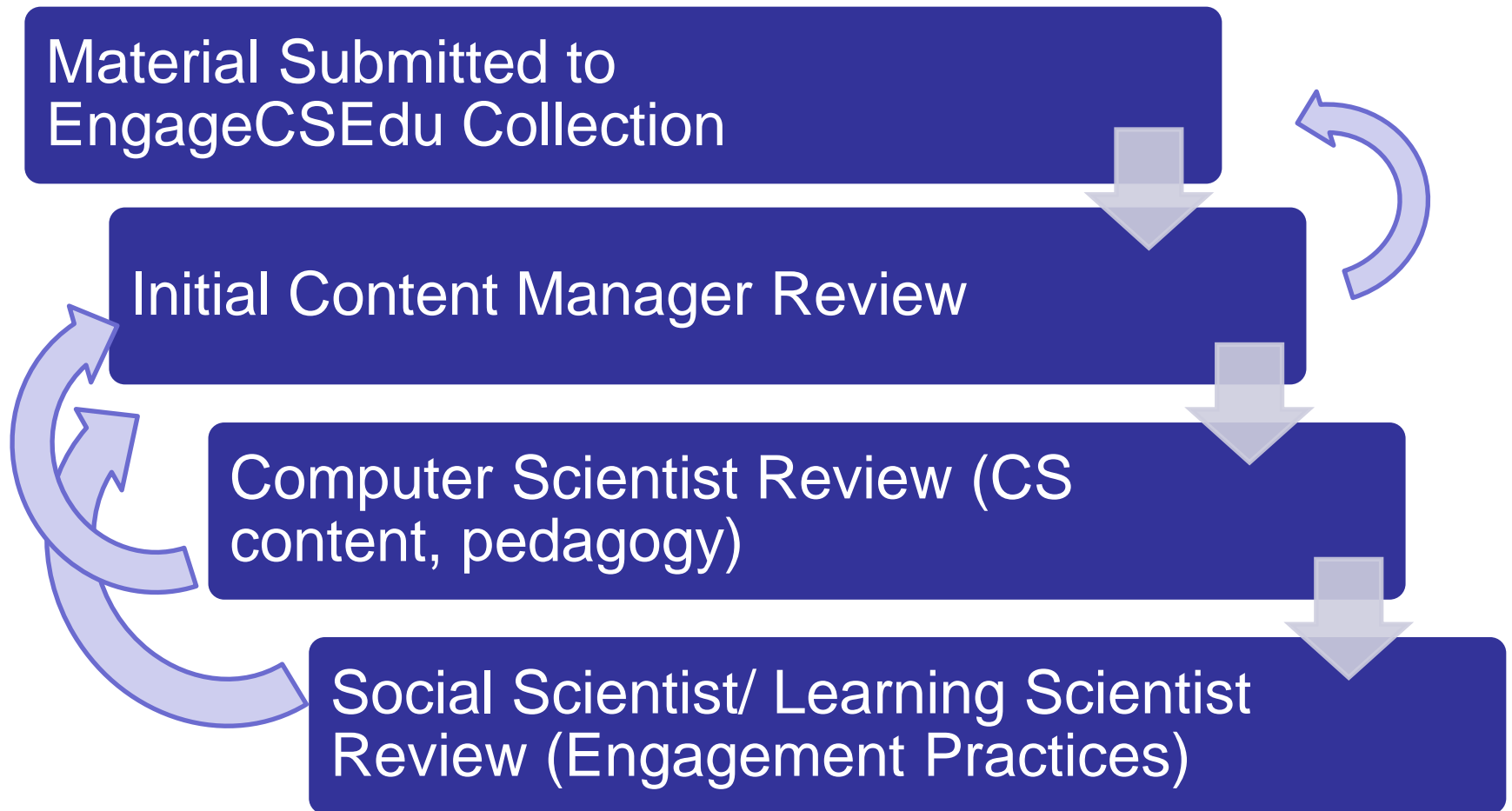
Assessments

Lecture Notes

Exercises



The Materials Peer Review Process



Search for materials by:

Course Level

CS1, CS2

Material Type

Assessment, assignment, lecture slides, lab, etc...

Programming Language

C, C#, C++, Java, JavaScript, Python, etc...

Engagement Practices

Meaningful and relevant context,
Address misconceptions about CS,
Effective encouragement, etc...

Engagement Practices

Improve Students' Perception of CS

- Provide Meaningful and Relevant Content
- Address Misconceptions About the Field of CS
- Make Interdisciplinary Connections to CS

Improve Students' Experiences FORMAL STRATEGIES

- Group Students by Level of Experience
- Use Problem- and Project-based Learning
- Implement Pair Programming
- Use Peer Instruction
- Employ Process Oriented Guided Inquiry Learning (POGIL)
- Provide Worked Examples
- Offer Student-Focused Assessment
- Incorporate Student Choice

Improve Students' Experiences INFORMAL STRATEGIES


- Provide Effective Encouragement
- Avoid Stereotypes and Mitigate Stereotype Threat
- Encourage Student-Student Interaction
- Facilitate Student-Faculty Interaction

Engagement Practices

- Each engagement practice defined
- Brief examples of the practice
- Links to relevant NCWIT resources
- Links to other resources and research

[Browse Materials](#) [Engagement Practices](#)

[Sign in](#)



Retaining undergraduate CS students with engaging open curriculum resources for intro CS courses.




www.engage-csedu.org


EngageCSEdu is | EngageCSEdu - Google Chrome


← → ↻ 🔒 https://www.engage-csedu.org


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Sign-in

 Browse Materials

 Engagement Practices



Find and share engaging materials for introductory computer science (CS) courses

EngageCSEdu is:

Designed to help faculty engage ALL of their students

The goal of EngageCSEdu is to help grow a more diverse computing workforce by supporting the retention of women and other underrepresented groups in undergraduate computing education. Many things influence whether a student chooses to study computing but having a great experience in introductory courses is key.


A living collection of materials from the CS community

The collection was "seeded" via a nationwide search of US colleges and universities with openly available CS1/CS2 materials. Now faculty can directly contribute their course materials to the collection. Simply set up an account to add material to EngageCSEdu.

pair_programming-in....zip

NCWIT-NGCP_Final.ppt

febwebcast11.mov
Canceled

 Show all downloads...

www.engage-csedu.org

Browse Materials:

EngageCSedu - Google Chrome

<https://www.engage-csedu.org/find-resources>

NCWIT Engage CS Edu

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Search this site Search

Browse Materials Engagement Practices

Filters ▾

Search Materials

Engagement Excellence

Course Level

CS 1

CS 2

Knowledge Unit

Select All

Algorithms and Design

Development Methods

Data Structures

Programming Concepts

Material Type

Select All

Assessment

Assignment

Lecture Slides

Lab

Project

Teaching Example

Tutorial

Other Material Type

Programming Language

Select All

C

C++

C#

Java

JavaScript

Python

Racket (DrScheme)

3_DNA: Mini Gene Finder

DNA

Wheaton College (Norton, MA)

Mark D. LeBlanc

Average: 5 (1 vote)

0 Bookmarks

This is the third of five programming assignments in a semester-long CS-1-like course named DNA to introduce students to programming within the context of genomics: the analysis of DNA within a single cell of an organism. Originally, the course targeted students in the life sciences but it now attracts students across the academy. The goal of these assignments is to prepare students to obtain enough confidence with scripting and associated scientific write-ups to conduct a small computational experiment in a final project.

CS1 • Fundamental Programming Concepts • Assignment • Teaching Example • Python • algorithm • arithmetic expression • conditionals (if/else) • dictionary • divide-and-conquer algorithms • functional decomposition • functions • module • strings • problem decomposition • Meaningful and Relevant Content • Interdisciplinary Connections to CS

Array: Bingo

15-121: Introduction to Data Structures and Algorithms

Carnegie Mellon University

Victor Adamchik

Average: 5 (1 vote)

0 Bookmarks

This assignment asks CS2 students to implement a version of the game of Bingo using two-dimensional arrays with input read from a text file. The rules of Bingo are explained, specifically the conditions for a winning card. Starter code provides Java code that uses a two-dimensional array to represent a Bingo card, an array to hold the random sequence of numbers to simulate the numbers called during the game, and an array that simulates the marking of numbers on a card.

CS2 • Fundamental Data Structures • Assignment • Java • file i/o • random

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www.engage-csedu.org

Engagement Practices:

EngageCSEdu - Google Chrome

https://www.engage-csedu.org/engagement

NCWIT Engage CS Edu

Sign-in

Search this site Search

Browse Materials Engagement Practices

Address Misconceptions About the Field of CS

Students' misconceptions may prevent them from taking classes or pursuing a career in computer science. For example, they may have overly narrow ideas of what computing is about, or they may believe they lack the skills or prior experience needed to succeed. Address these misconceptions by illustrating the diversity and breadth of the field, and by emphasizing that proficiency in computing comes from practice and study.

Examples NCWIT Resources Additional Resources

- Make connections to other fields: Address students' overly narrow ideas about computing by using examples that connects computer science to other disciplines. For example, highlight the uses of computing in biology, music, and art.
- Be practical: Combat students' overly narrow ideas about computing by connecting the topics covered in an activity to a real-world application. For example, show how abstract data types can be used in a program that analyzes Twitter trends or how hash maps used in natural language processing to predict what a user will type into a search engine.
- Make it matter: Many students want careers where they can "make a difference." Help your students see how the problems that computer scientists tackle can have important social, economic, and cultural impacts on the world.
- Expand students' Ideas about who does computer science by using examples that include diverse people doing computing, bring in speakers or use videos of interviews with women and minorities in computing.
- Foster a 'Growth Mindset': Reinforce that computing knowledge and skills can be acquired with practice and study, and by avoiding language that implies that only "smart" or "talented" individuals can succeed.

Effective Encouragement

Engagement Practices

- Address Misconceptions About the Field of CS
- Effective Encouragement
- Group Students by Level of Experience with CS
- Incorporate Student Choice
- Inquiry-Based Learning [T&LS]
- Interdisciplinary Connections to CS
- Meaningful and Relevant Content
- Mitigate Stereotypes and Stereotype Threat
- Pair Programming [T&LS]
- Peer Instruction [T&LS]
- Problem-Based Learning [T&LS]
- Process Oriented Guided Inquiry Learning [T&LS]
- Project-Based Learning [T&LS]
- Student-Faculty Interaction
- Student-Focused Assessment
- Student-Student Interaction
- Worked Examples (w/ Subgoals) [T&LS]

pair_programming-in....zip NCWIT-NGCP_Final.ppt febwebcast11.mov Canceled

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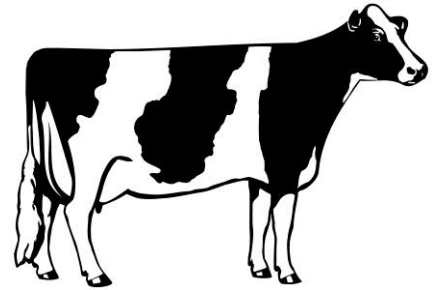
www.engage-csedu.org

Find:

An assignment on *data structures*

That uses *Java*

And will expand your knowledge of cow pedigrees



What breed of cow does it concern?

Where is the breed association's headquarters?

Hint: you will need to open the actual assignment

www.engage-csedu.org

Find:

The engagement practice *Student-Student Interaction*

What three NCWIT resources could you go to for more information?





Thank you!

