Changing Perceptions of Computer Science

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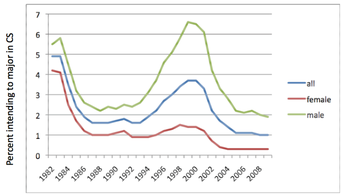
MOTIVATION

A common theme in the field of computer science education is the decline of enrollment rates.



Data source: HERI, Slide: NCWIT

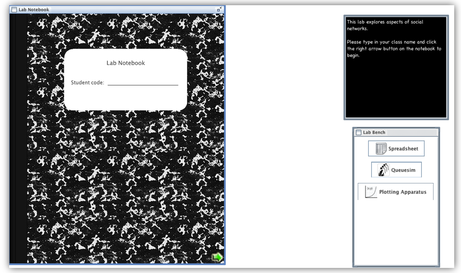
Possible factors affecting enrollment:

- Gender stereotypes
- Lack of exposure to CS field
- Negative social perceptions

How does the Laboratory for Computer Science intend to address these misperceptions? Start early:

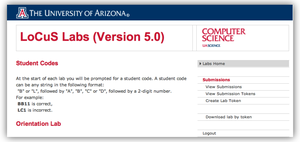
More positive perceptions → Increased interest → Increased enrollment → More degrees earned

This study examines whether interactive online labs created by LoCuS increases students' awareness of and interest in the field of computer science.

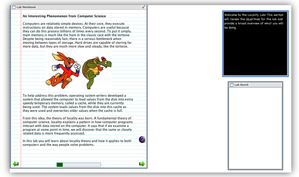


DEPLOYMENT

Teachers choose what type of lab fits their classroom needs

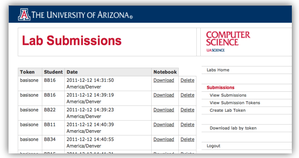


Students download the lab and open the notebook



Students interact with apparatuses in the lab to test their hypotheses

Student notebooks can be downloaded by teachers for review



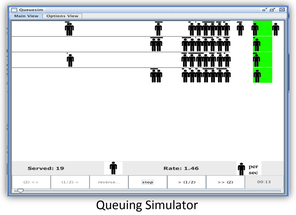
Labs Currently in Development:

- Locality Theory
- Little's Law
- Fitts' Law
- Manhattan World Theory
- Cognitive Load Theory
- Social Network Theory
- Phase Transition Theory

LAB DESIGN

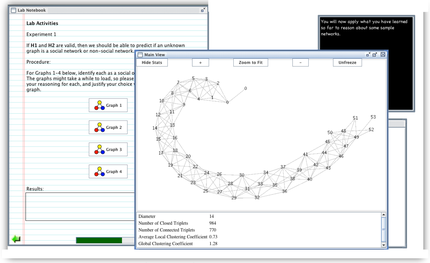
Each lab notebook is designed to emulate the traditional notebook used in classes such as physics and chemistry. There are four distinct parts:

- **Pre-Lab**: The topic is introduced with real-world examples. The student is guided through the basics and answers relevant practice questions.
- **Hypothesizing**: The topics from the pre-lab are explored in greater detail, and the student forms a testable hypothesis.



Queuing Simulator

- **Testing**: One or more apparatuses are utilized in the testing of the hypothesis. Some apparatuses give interactive examples of the material, and others give ways to organize the generated data.



Social Network Apparatus in Use

- **Post-Lab**: The results from the testing phase are analyzed, and the student reflects on their hypothesis. The student's new knowledge is also evaluated in this section.

EVALUATION

There are two phases to our evaluation:

- **Phase 1**: Receive feedback about the content quality. This phase occurred in Fall 2010 for the first two lessons that were developed. This will be repeated for four more labs currently in the development stages.
- **Phase 2**: Gather data through testing the lessons in new classrooms. A Solomon-Four group design (below) is used to determine the effect of the labs on a student's perception of computer science.

Solomon Four Design

Group	Pre-Survey	Lab	Post-Survey
A	X	X	X
B		X	X
C	X		X
D			X

Two ways to evaluate student responses:

- **In-lab questions**: As the student progresses through the interactive lab, practice questions and answers appear.
- **Surveys**: The pre and post survey evaluates the student's interest and perception of computer science. The questions also examine a student's confidence in performing general scientific experiments.

RESULTS

We are still analyzing the effectiveness of the labs to change students' perceptions of computer science.

Two of the free response survey questions asked whether a student felt they could become a scientist or a computer scientist. The following observations were gathered from students' responses:

- Many students supported their response of 'no' to computer scientist with "I am not good with computers."
- There was a strong general interest in other sciences such as chemistry and biology.
- Computer scientists were often negatively characterized as isolated and "being in front of a computer all day."

These results were similar across mixed populations from both schools. A total of 133 students were surveyed.

FUTURE WORK

Testing in middle and high school environments proved to be very hectic and challenging. The students experienced numerous interruptions that made completing a full 50-minute lab a stretch. We are developing more modularized labs that can be completed in smaller chunks over a few class periods.

Additionally, feedback from the students indicated we might be trying to cover too much material in each lab. We are creating lab plans for current and future lessons in the following categories:

- Middle School (50-minute)
- Early High School (50-minute)
- High School AP (90-minute)
- High School AP/College (120-minute)

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