# Mobile Speech-to-Text Captioning Services: An Accommodation in STEM Laboratory Courses

Michael Stinson, Pamela Francis,
and, Lisa Elliot
National Technical Institute for the Deaf

# Funding

- National Science Foundation Grants
  - *Analyzing the Use of C-Print Mobile Technology in STEM Lab Settings across Multiple Postsecondary Sites*, HRD-0726591
  - *Supporting deaf and hard of undergraduate hearing students in STEM field settings with remote speech-to-text services*, HRD-0726591

# Goals

- Develop software that enables students to view C-Print captions on mobile devices

- Evaluate the extent to which the use of C-Print on mobile devices aids students' access and learning in STEM labs and other mobile situations

# What is C-Print?

A support service option for access and communication.

- Provides a text display of spoken information in real time for individuals who cannot hear (or individuals who process auditory information indirectly)

- Meaning-for-meaning translation

- Can be used by itself or with another accommodation

- Provides access to information during class and notes afterward

# How Does C-Print Work?

- Service provider produces captions using
  - Standard keyboard
  - Computerized abbreviations

- Service provider uses condensing and summarizing strategies to make message more concise

- Speaker's words displayed on computer screen

- C-Print services can be provided remotely



Speaker (teacher)        C-Print captionist        Student viewing display
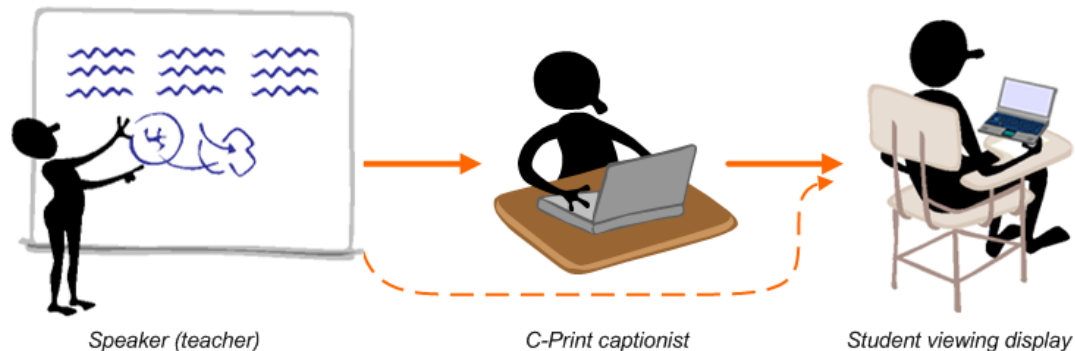
# C-Print abbreviations are primarily based on phonetic rules.
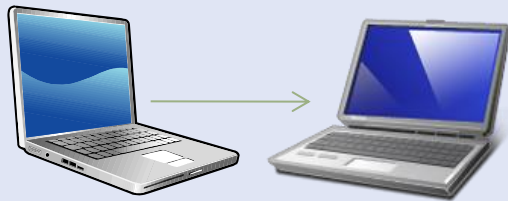
*A captionist types...*

wlkm to t nxl tknkl nsttt f t deaf.
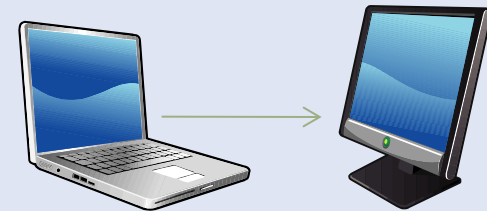
*The information displayed...*

Welcome to the National Technical Institute for the Deaf.
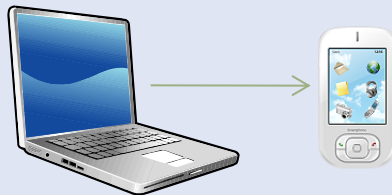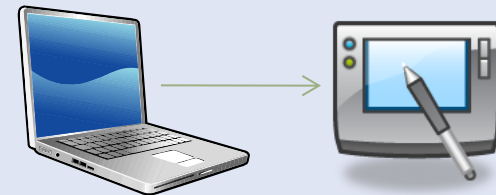
# Display Options

| Laptop-to-Laptop | Laptop-to-Monitor |
|---|---|
|  |  |
| **Laptop-to-Smartphone** | **Laptop-to-Tablet** |
|  |  |

# Benefits of C-Print

- Provides information that is permanent and complete

- Succinct delivery of spoken information

- Manageable transcript

- Visually accessible (visual emphasis)

- Model of language usage

# Challenges of Using Laptop

- Traditional classroom captioning services provided on a laptop in laboratory settings:

  - May result in deaf students missing essential information

  - Are cumbersome because it is difficult to carry and read an open laptop while moving around the laboratory

  - Take up too much space in work area

# Deaf Students Using C-Print Mobile in Molecular Biology Lab at RIT

# Text Transmission with C-Print Mobile

When using the C-Print Mobile technology, spoken information is captioned using the C-Print Pro software and the resulting text is sent via WiFi or cellular network. The student views the text display on a mobile device, i.e., a Smartphone or tablet.

Teacher          Captionist          Student
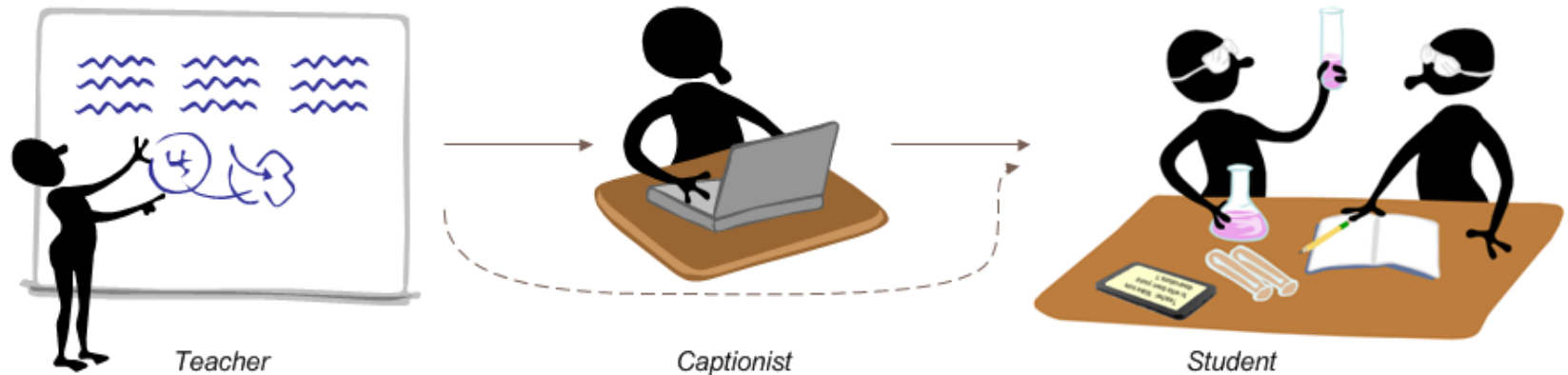
# Devices Students use to View Text with C-Print Mobile

# Participants

| Mobile Device Group (n=33) | Control Group (n=19) |
|---|---|
| Advanced Computational Techniques (n=1) | Anatomy & Physiology (n=2) |
| Anatomy & Physiology (n=1) | Biology (n=3) |
| Biology  (n=5) | Circuit Theory (n=1) |
| Circuit Theory (n=1) | Circuits I Lab (n=1) |
| Comparative Animal Physiology (n=2) | College Physics (n=2) |
| Developmental Biology (n=2) | Food Microbiology (n=1) |
| Introduction to Digital Systems (n=1) | Geoscience (n=1) |
| Manufacturing Processes (n=1) | Microbiology (n=1) |
| Molecular Biology  (n=9) | Network Forensics & Security (n=1) |
| Network Fundamentals (n=3) | Programming for Technology (n=1) |
| Organic Chemistry (n=2) | Server Side Programming (n=1) |
| Packaging Materials (n=3) | Software Engineering (n=1) |
| Quantitative Chemistry Analysis (n=1) | Transportation Engineering (n=1) |
| Zoology Survey (n=1) | University Physics (n=1) |
|  | Web Design Using Photos (n=1) |

# Participants

| Descriptor | Mobil Device Group (n=33) | Control Group (n=19) |
|---|:---:|:---:|
| Gender | | |
| Female | 22 | 9 |
| Male | 11 | 10 |
| Age Group | | |
| 17-18 | 5 | 3 |
| 19-21 | 21 | 9 |
| 22-25 | 5 | 6 |
| 26-35 | 1 | 1 |
| 36-45 | 0 | 0 |
| 46 or older | 1 | 0 |

# Benefits

- Size
  - *It is small and does not take up space that is needed for lab work.*
  - *The best thing was the phone doesn't take up all of the work space which we need for our labs. It is small and easy to carry and easy to read!*

- Portability
  - *I was able to carry it around the lab with me, to hold it in my hand while the instructor is talking, and was able to scroll up and down to see what was previously said.*
  - *The best thing about using C-print on the mobile device is that I can carry the device with me when my instructor is in the front of the classroom, not near my lab table, whenever I need a question.*

- ## Usability

  – *It was easy to carry around if I needed to, and easy to connect! I could connect it myself and not have to wait for the captionist to stop typing and then connect—less missed information.*

  – *It was easy to read, especially white on black makes it easier. The print was big enough for me to sit back and read.*
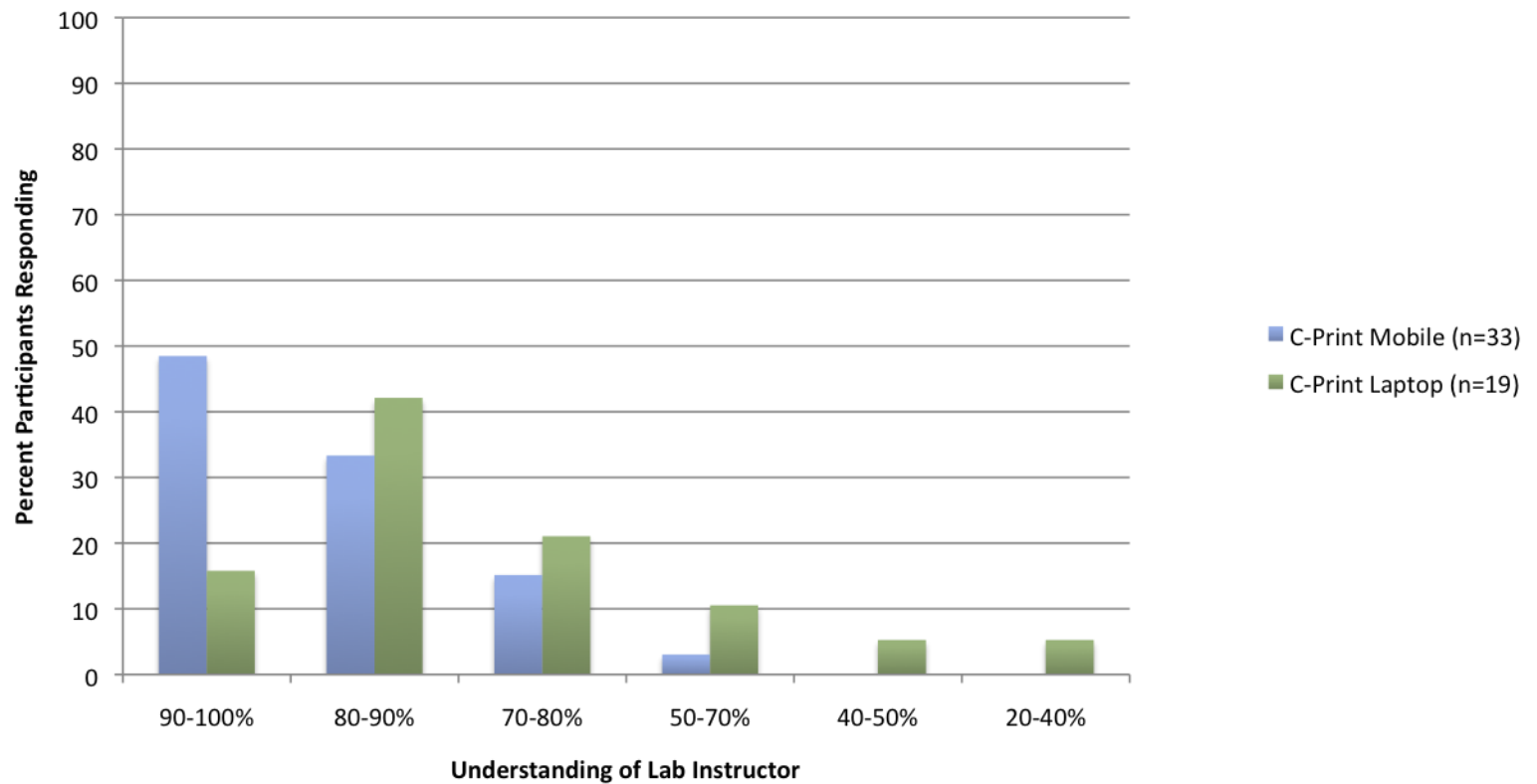
# Benefits: If I could use C-Print in my other labs, it would help me complete my major.
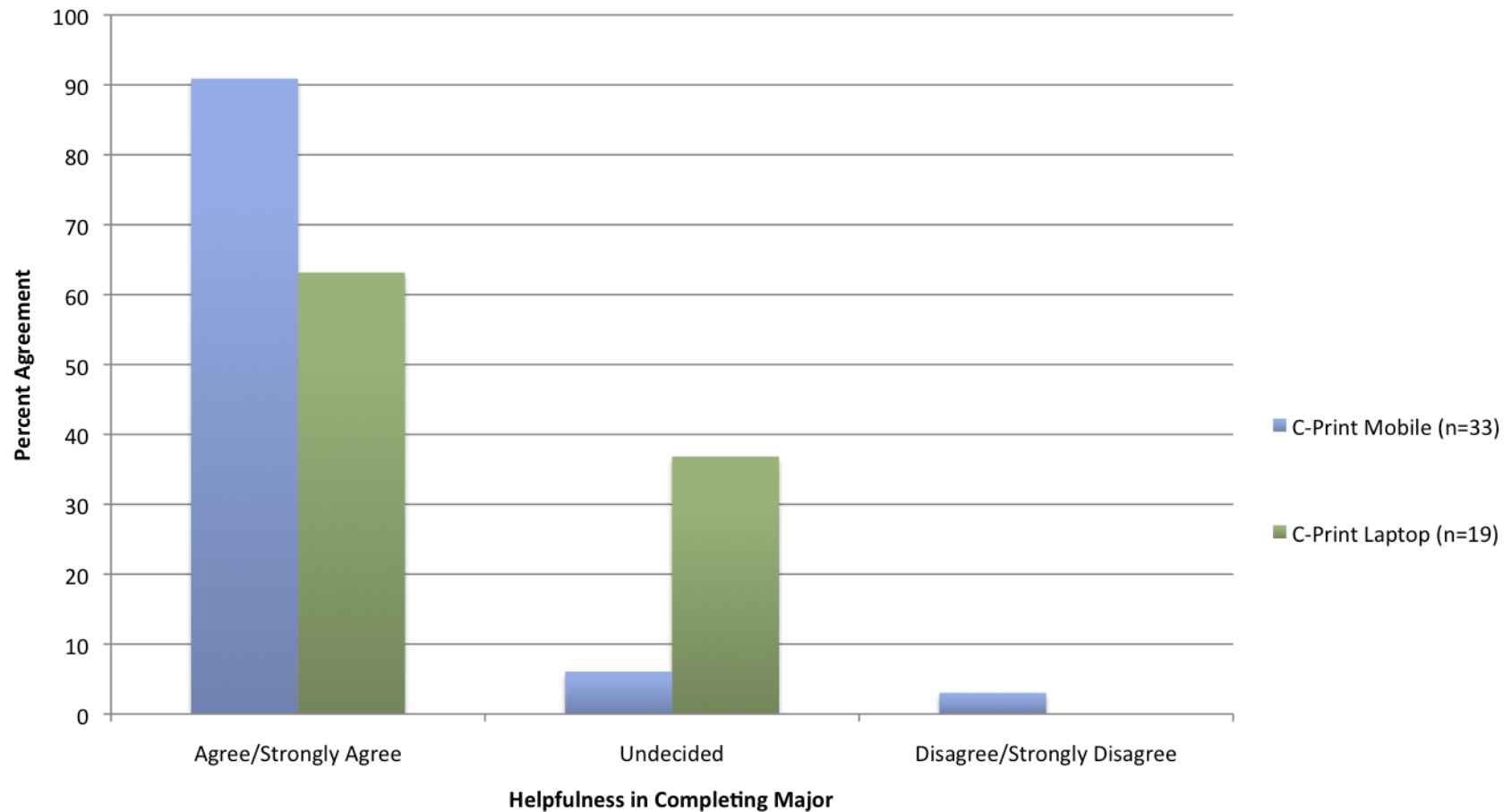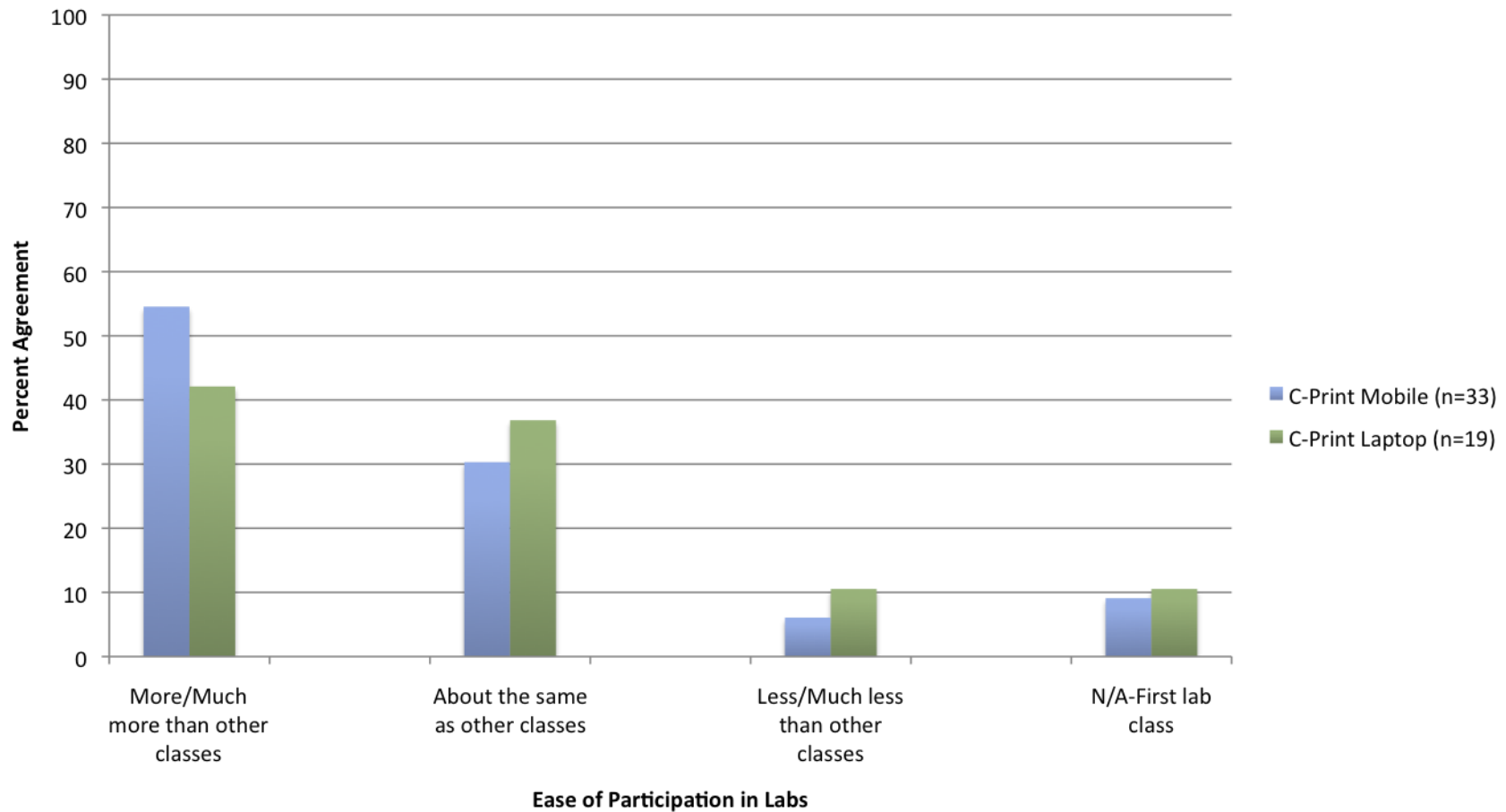
# Benefits: Using C-Print helps me feel confident that I can succeed in this class.
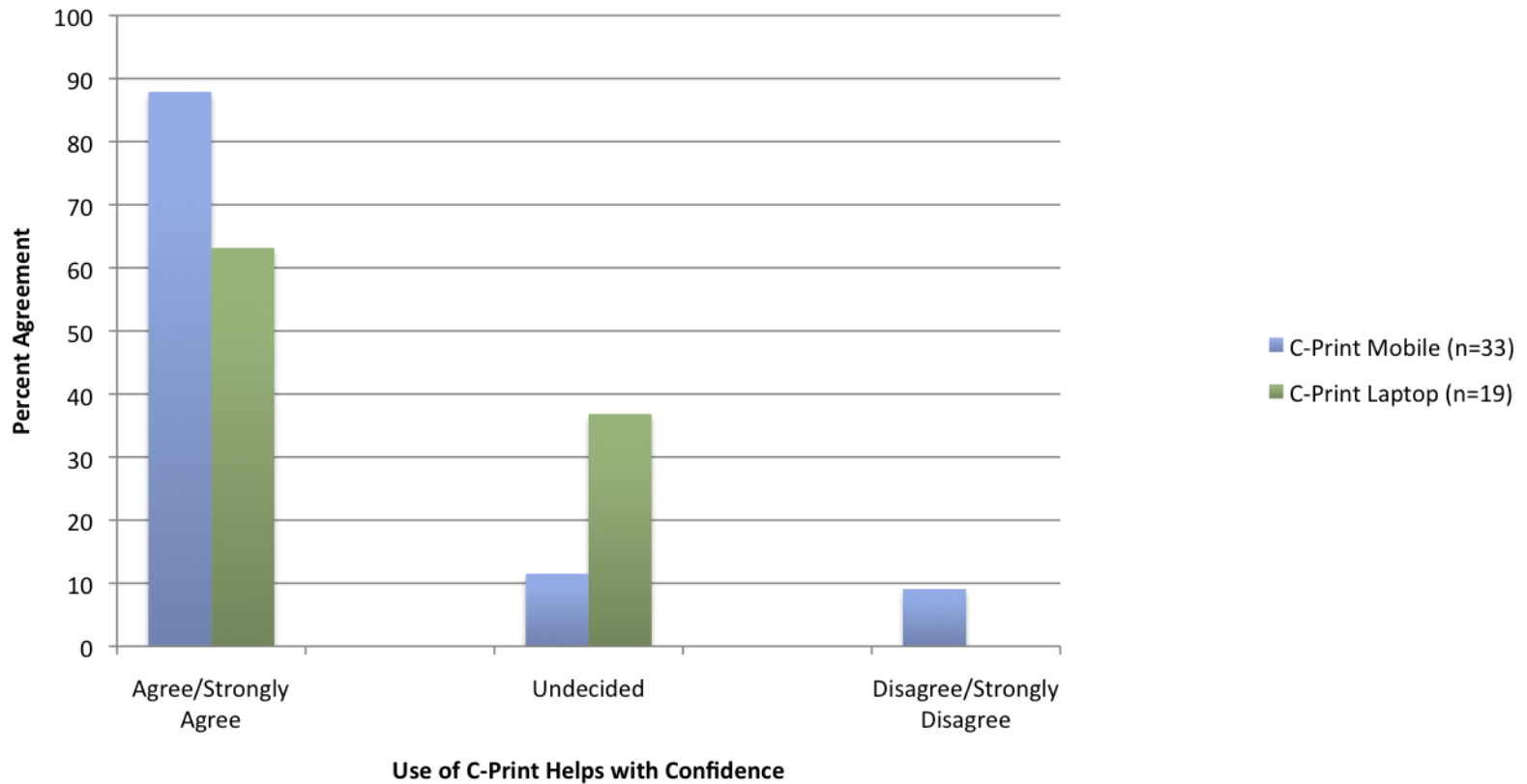
# Benefits: How much of the laboratory instructor's comments did you understand using C-Print?

# Benefits: How easy was it for you to participate in this lab compared to other labs?

# Limitations & Challenges

- Small sample—but getting bigger

- Recruiting control participants

- Connectivity issues

# C-Print Research Contact Information

## Email

- cprint@rit.edu

## Web

- http://www.ntid.rit.edu/research/cprint_home.php

## Phone

- 585.475.7557 (voice/TTY)