Accessibility in STEM

Richard Ladner
University of Washington
Stelar 2016

Who are these people?

Christian Vogler

Shaun Kane

Chieko Asakawa

Raja Kushalnagar

Annalu Waller

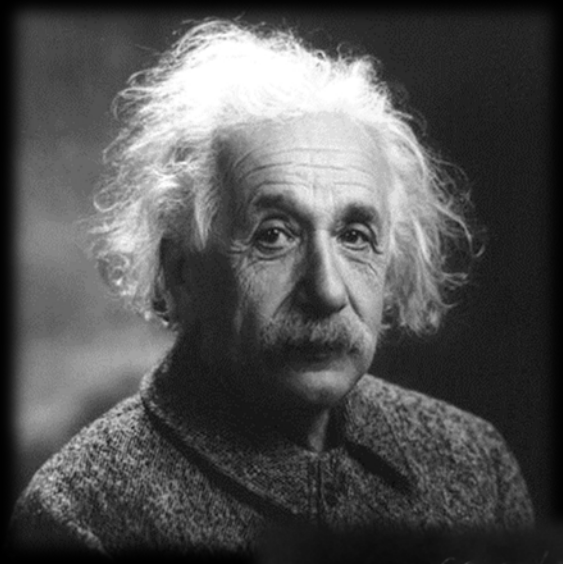
Nicholas Giudice

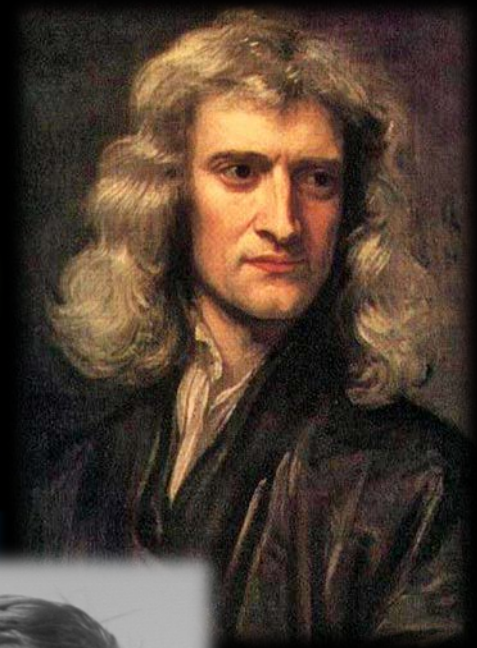
Kavita Krishnaswamy

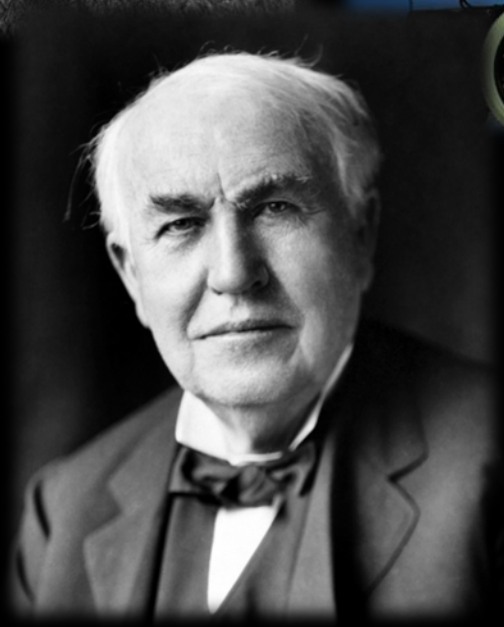
Vincent Martin

Shiri Azenkot

Even More







Meta
Science News

My Message

STEM fields need more people with disabilities because their expertise and perspectives spark innovation.

ITEST Interest

Whatever learning environment is examined, the ITEST program is particularly interested in broadening the participation of students within populations currently underrepresented in STEM-related fields, including women, ethnic minorities, English language learners, veterans, students with disabilities, and socioeconomically disadvantaged students.

Outline

- Who are they?
- Innovations driven by accessibility
- Barriers
- Removing barriers

Who are they?

- 1 billion people world-wide
- 15% of the world's population

Disabilities

- Vision
  - Blind
  - Low-Vision
  - Color Blind
- Hearing
  - Deaf
  - Hard of Hearing
- Speech
  - Ability to speak
  - Stuttering
- Mobility
  - Ability to walk
  - Ability to use limbs
- Cognition
  - Dyslexia
  - Memory loss
- Emotional
  - bipolar
- Multiple
  - Deaf-blindness

World Health Organization

- Disability is thus not just a health problem.
- Overcoming the difficulties faced by people with disabilities requires interventions to remove environmental and social barriers.

Disability in K-12

- Individuals with Disabilities Education Act (IDEA)
  - Individual Education Plan (IEP)
  - 6.4 million in 2010 (13%)
- Section 504 – Rehabilitation Act
  - Provisions for accommodations
  - 1 million more (my estimate based in Washington State)
- Total 15%

IDEA Demographics

Total	**6,400,000**
Learning	2,400,000
Speech/Language	1,400,000
Health	700,000
Autism	400,000
Developmental	400,000
Emotional	400,000
Hearing	80,000
Mobility	60,000
Vision	30,000

NCES Table 204.30

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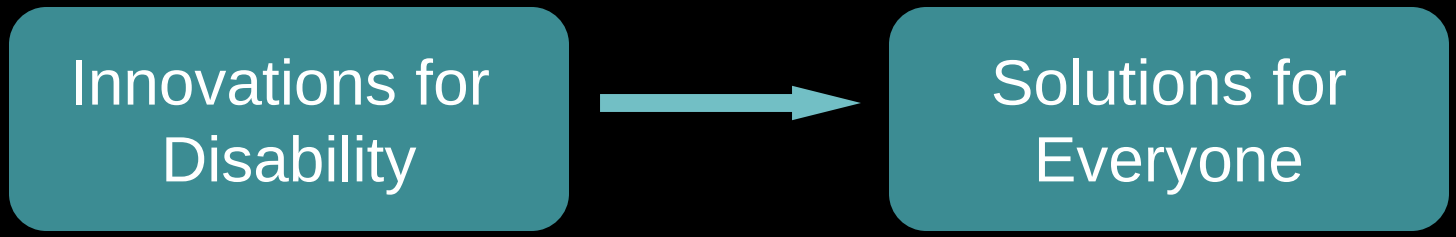
Accessibility Innovations Matter



- Telephone
- Personal texting
- Speech recognition
- Personal video chat

The Telephone

- The telephone was invented by A.G. Bell in his efforts “of devising methods of exhibiting the vibrations of sound optically, for use in teaching the deaf and dumb.” (Fay, American Annals of the Deaf, 1887)

A.G. Bell
1880

Texting

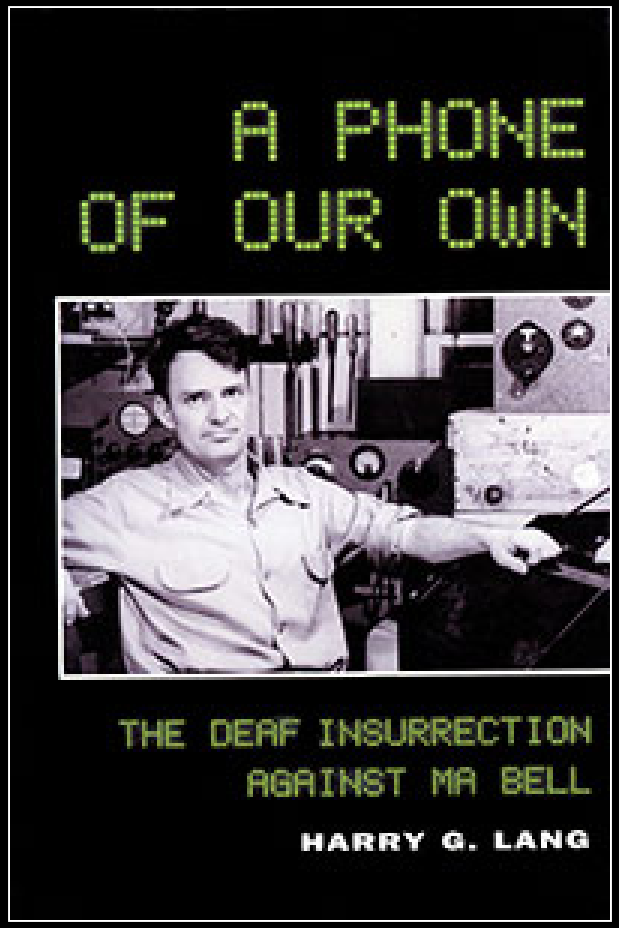
TTY 1950s

TTY with modem 1970s

Robert H. Weitbrecht

Invented the acoustic modem in the 1960s so that he could use the telephone through a TTY.

History of the TTY



Author: Harry Lang

TTY 1980s - 2005

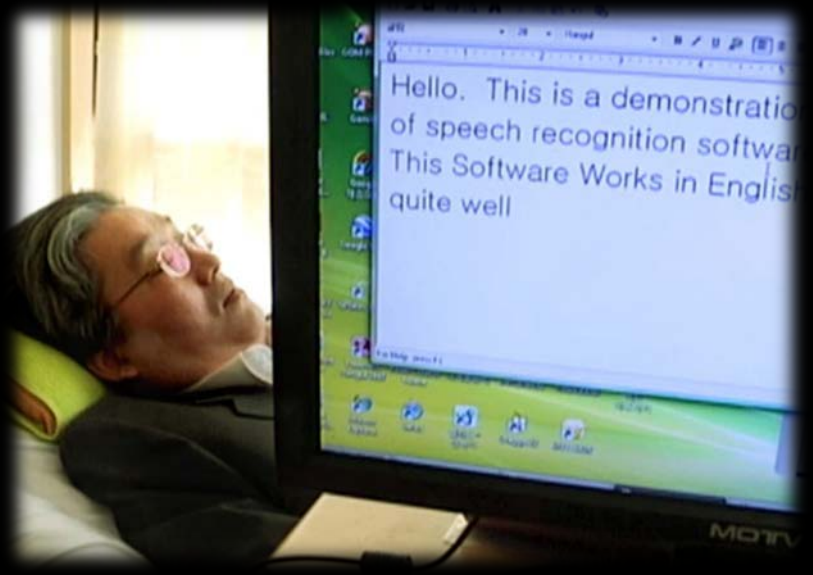
Telecommunications Device for the Deaf (TDD)

E-Mail / Instant Messaging

Sidekick

Blackberry

Speech Recognition for Hands Free Access

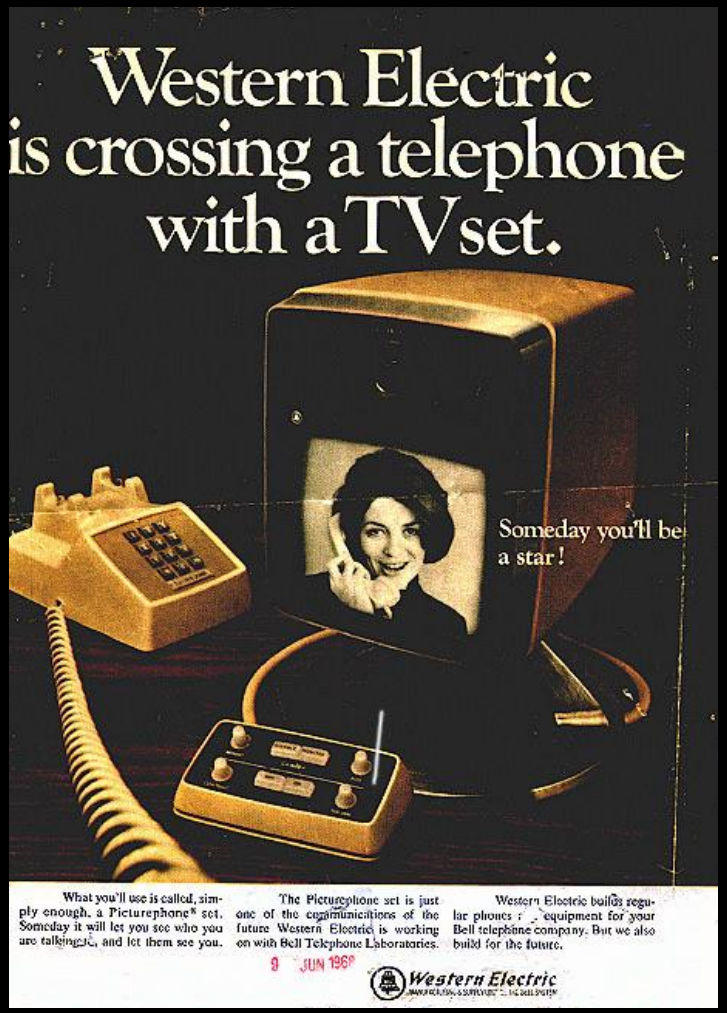


Sang-Mook Lee

Speech for Eyes Free Access

Apple Siri

Picturephone



"Picturephone" demonstrated by AT&T at the 1964 World's Fair

- › Required too much bandwidth for phone system
- › Deaf world excited then disappointed

Video Phone

Set top box
Sorenson 2002

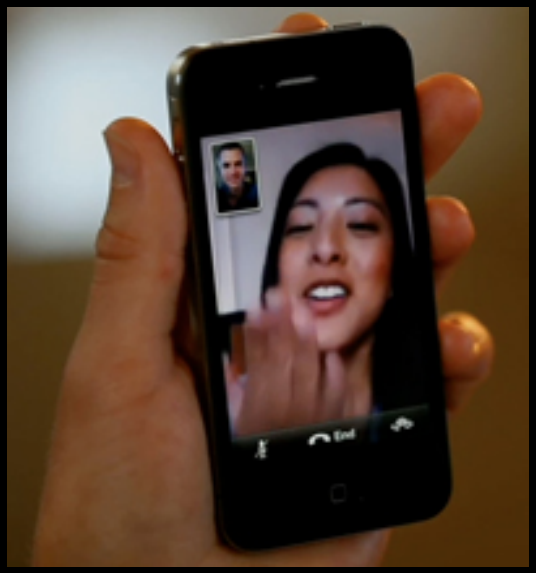
Purple 2010

Ubiquitous Video Phone

Skype

Google Hangouts

Mobile Video Phones



Facetime for the iPhone 2011

Skype Mobile 2012

My Message

Disability and technology innovation are intertwined

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- Who are they
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Barriers

- Attitudinal
- Physical

Historical Attitudes

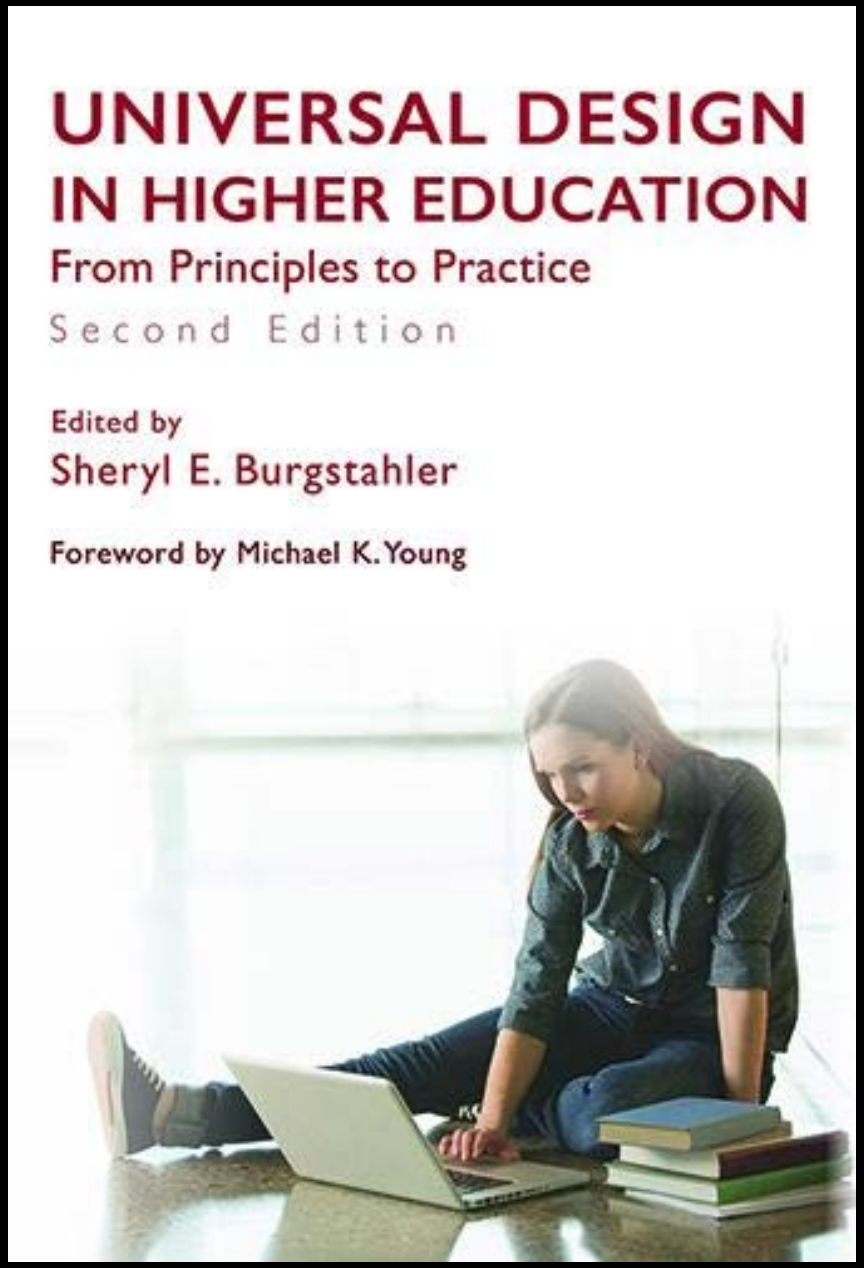
- Exclusion
- Accommodations
  - Reactive add-ons
- Universal Design
  - Proactive

Examples of Accommodations

- Extra time on tests
- Proctored exams
- Materials in alternative format
- Alternative assignments
- Moving to accessible classroom
- Sign language interpreter
- Note taker

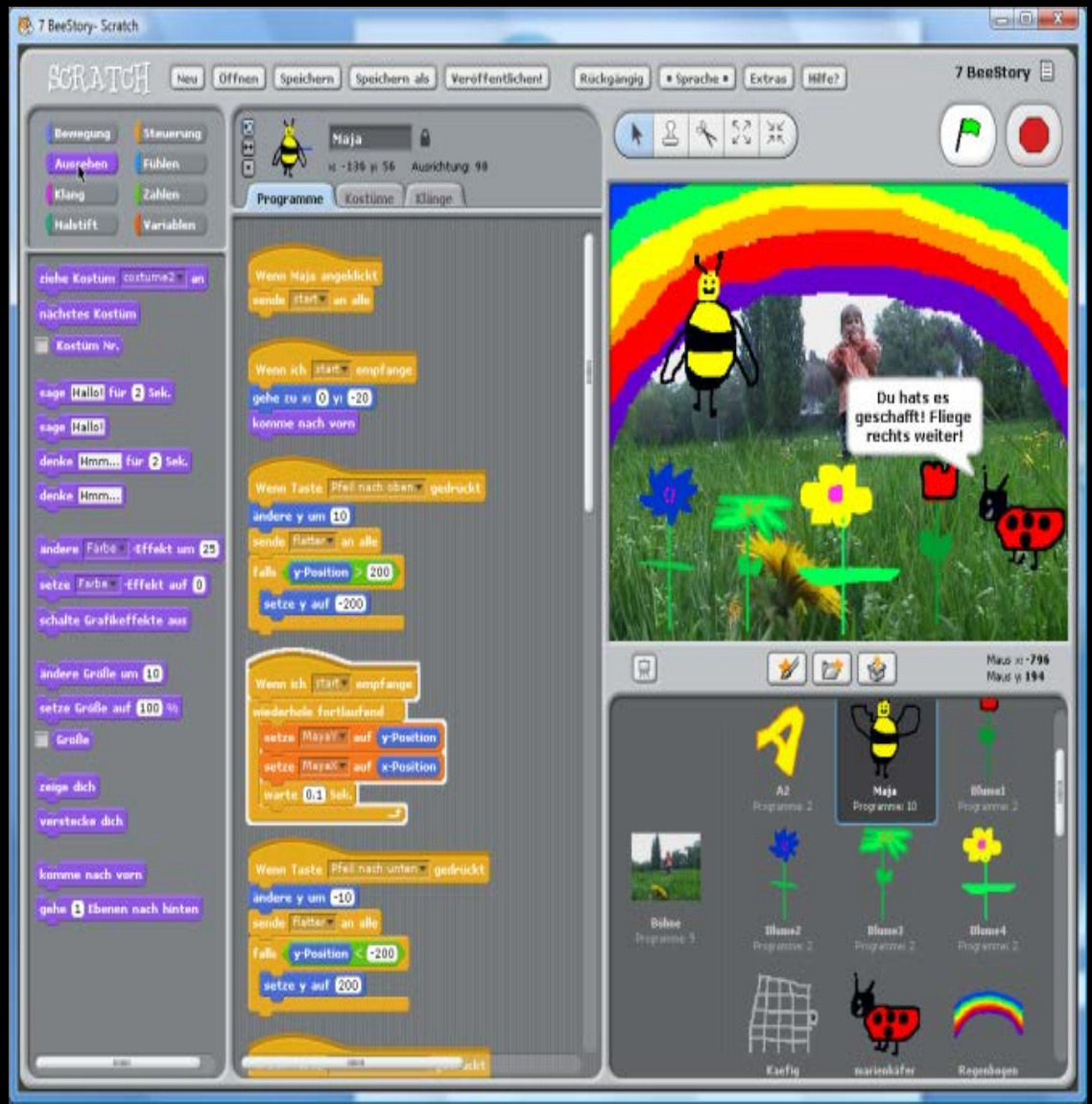
Examples of Universal Design

- Multiple ways of assessment
- Multiple explanations of concepts
- Clear expectations
- Scaffolding
- Worked examples
- Captioned videos
- Accessible web pages
- Just good teaching


UNIVERSAL DESIGN
IN HIGHER EDUCATION
From Principles to Practice
Second Edition
Edited by
Sheryl E. Burgstahler
Foreword by Michael K. Young

The Raina story

Block Based Languages



Raina's Technology

Power wheel chair

Joy Stick

AAC Device

Large Monitor

Key Guard

Outline

- Who are they
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Teacher Attitudes

- Compliance vs. Welcoming
- Low bar vs. high bar

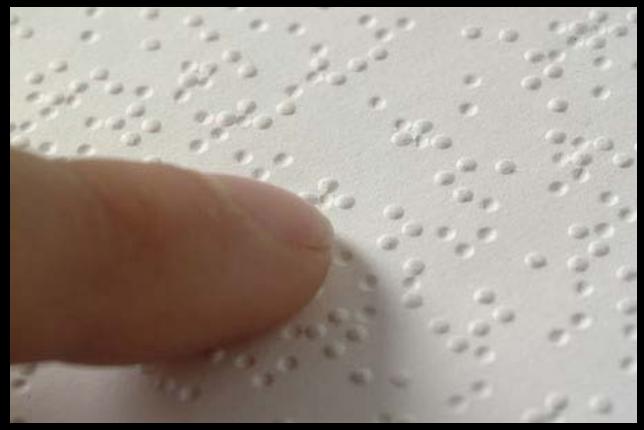
VISION DISABILITIES

Screen Reader for Blind Students

- Allows non-visual access to screens

Braille

- Braille Translation
  - Duxbury
  - Braille 2000



- Braille Printers

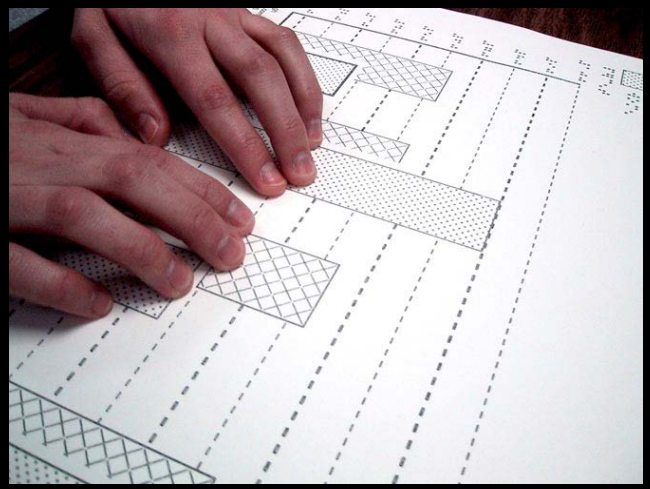
Braille Displays

Notetakers

Large Display

Small Braille I/O

Tactile Graphics

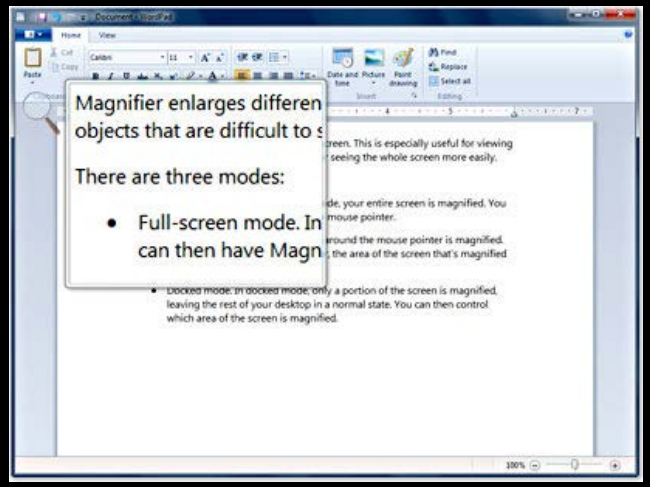


Embosser

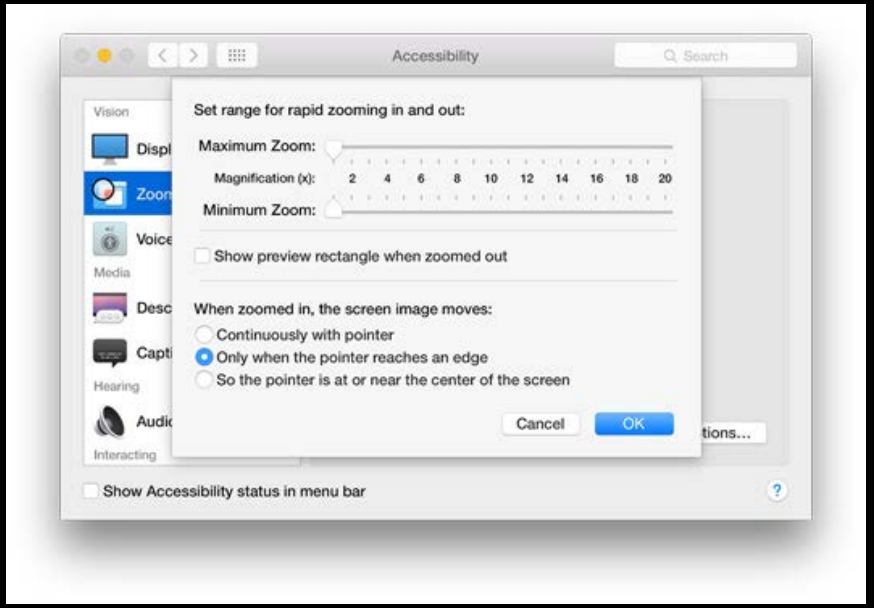
Swell paper

Built-in Magnification

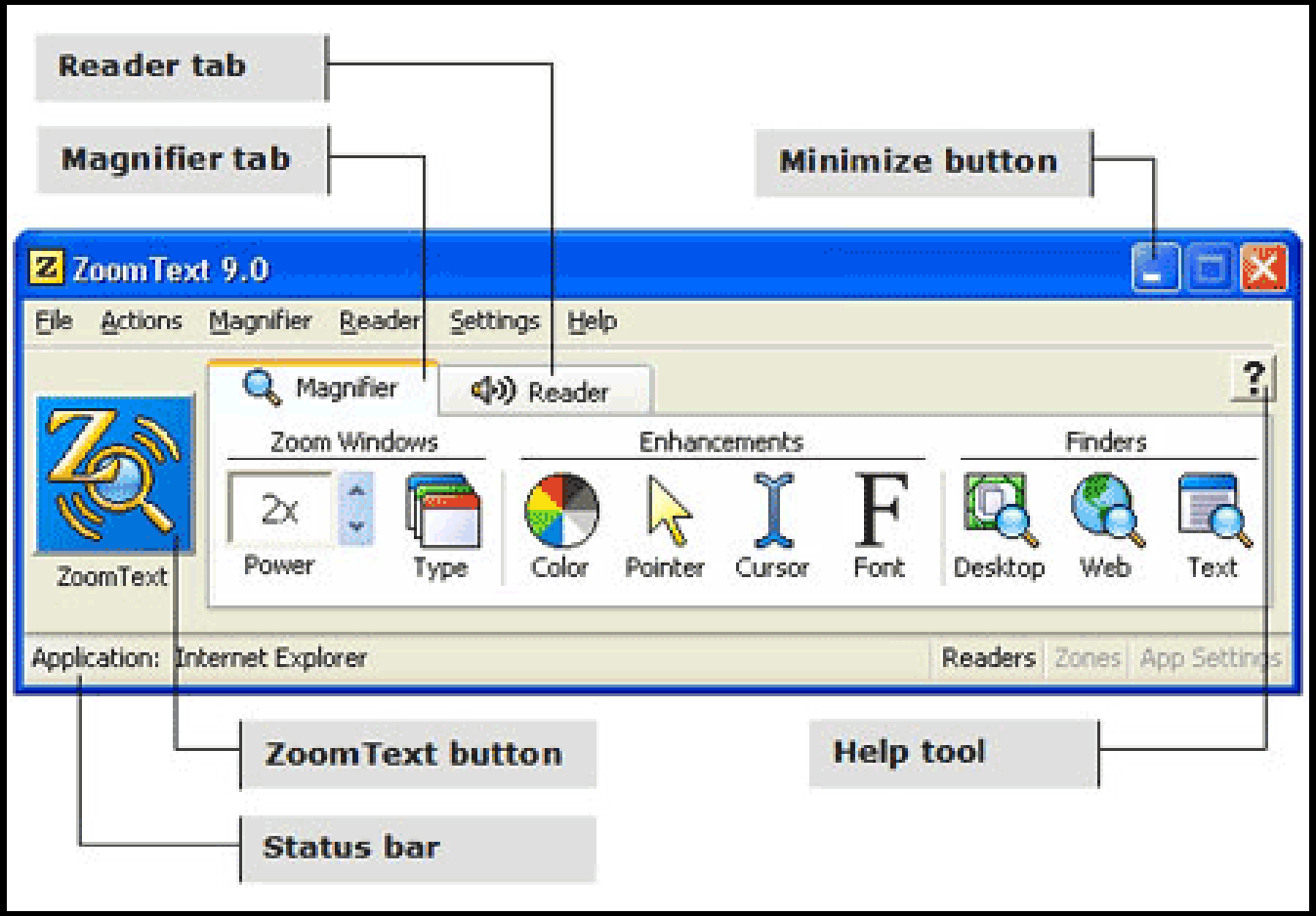
- Window magnifier



- Apple zoom



Internal Magnification



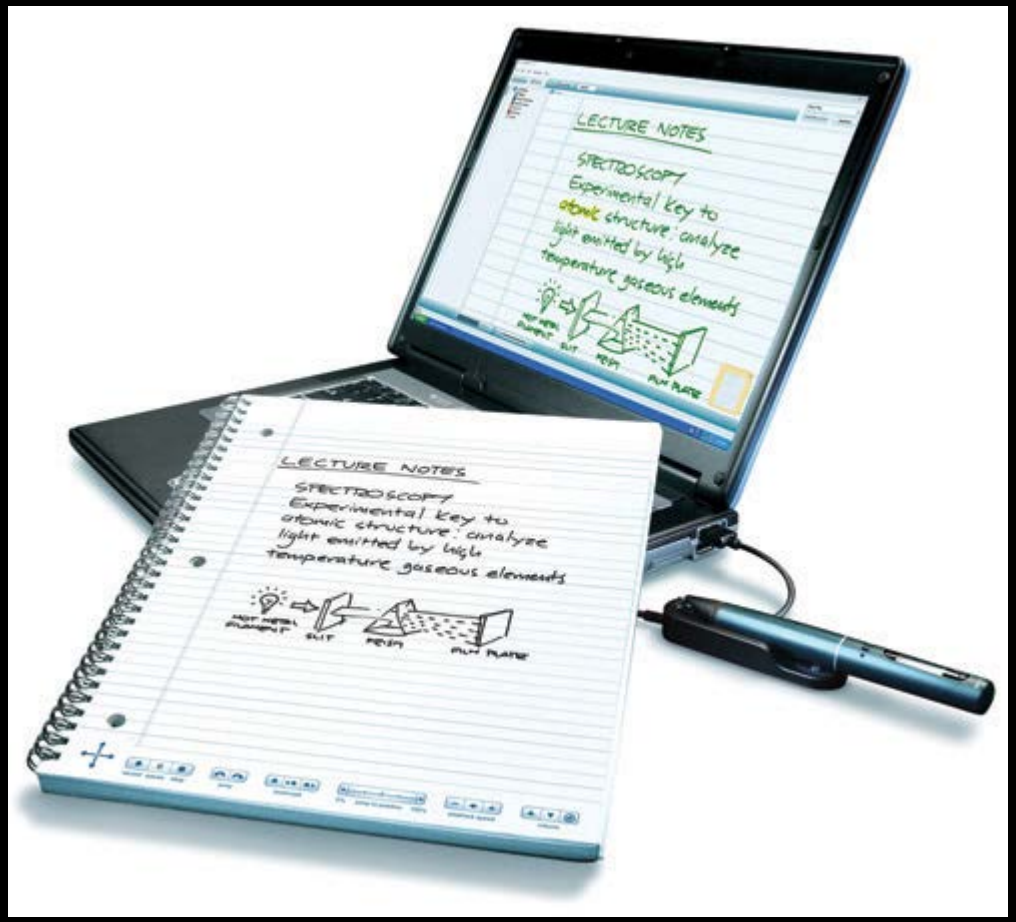
ZoomText

External Magnification

IPEVO VZ-1 HD

LEARNING DISABILITIES

Note Taking Technology

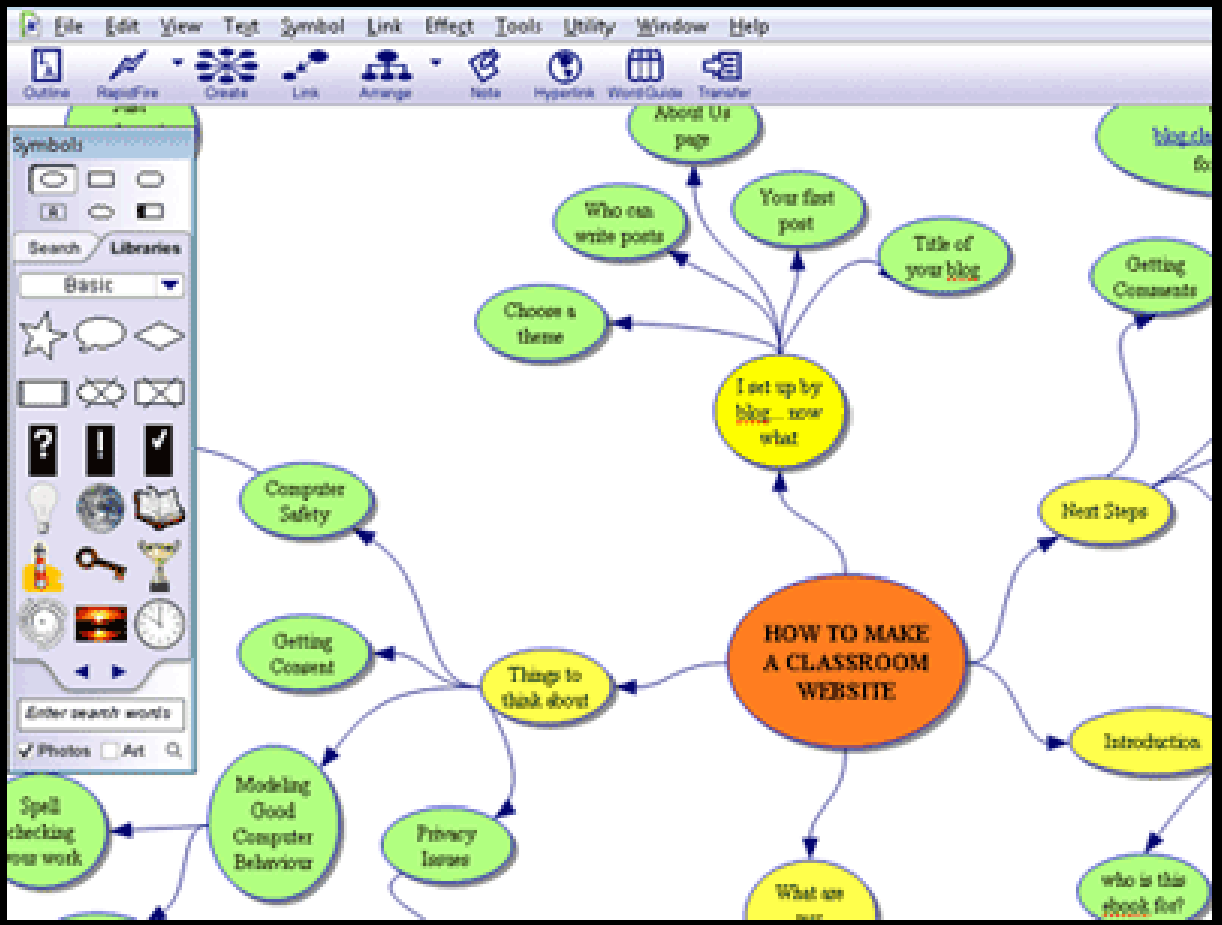


Livescribe Smartpen

Speech Output

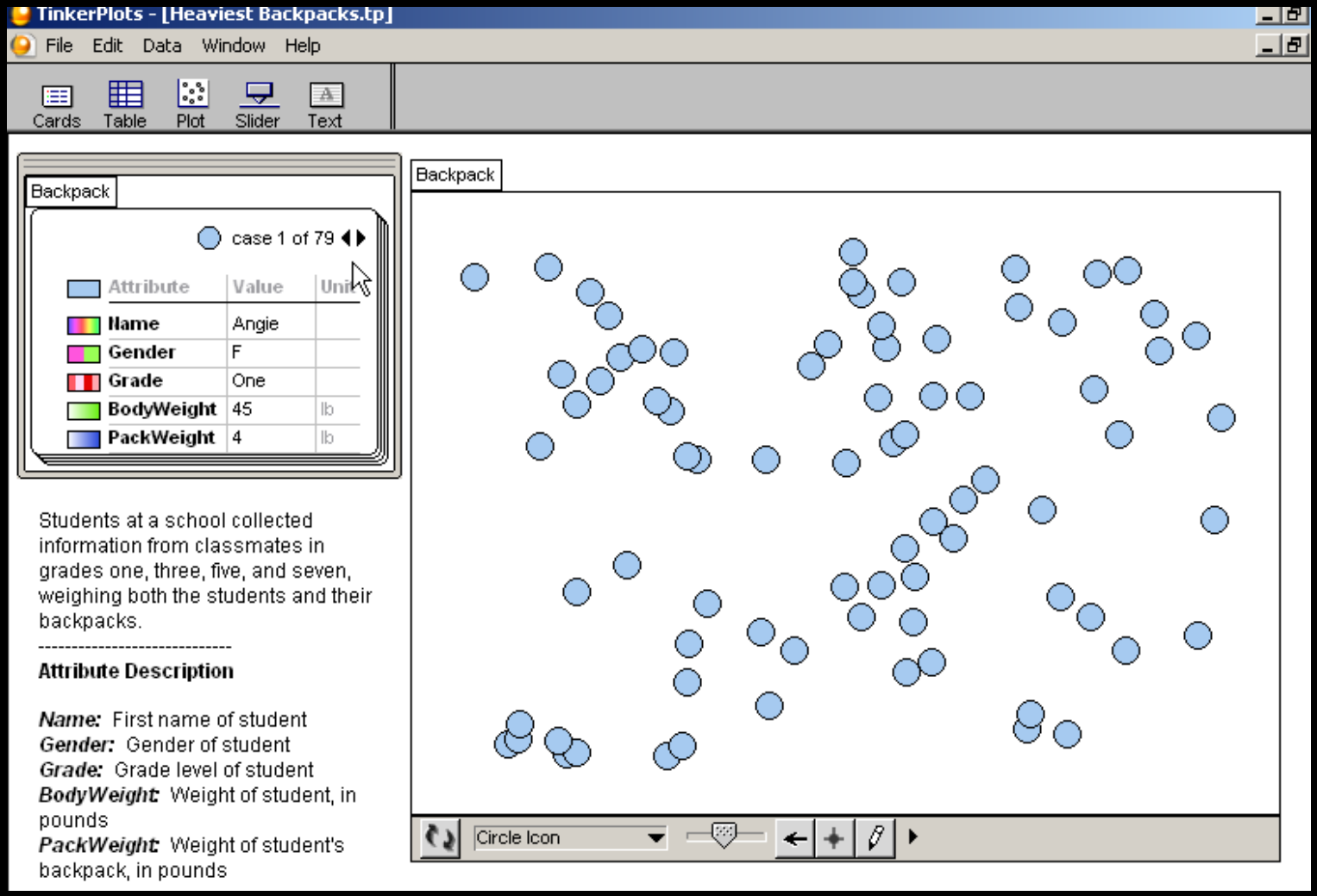
Dragon Naturally Speaking

Visual Thinking Tool



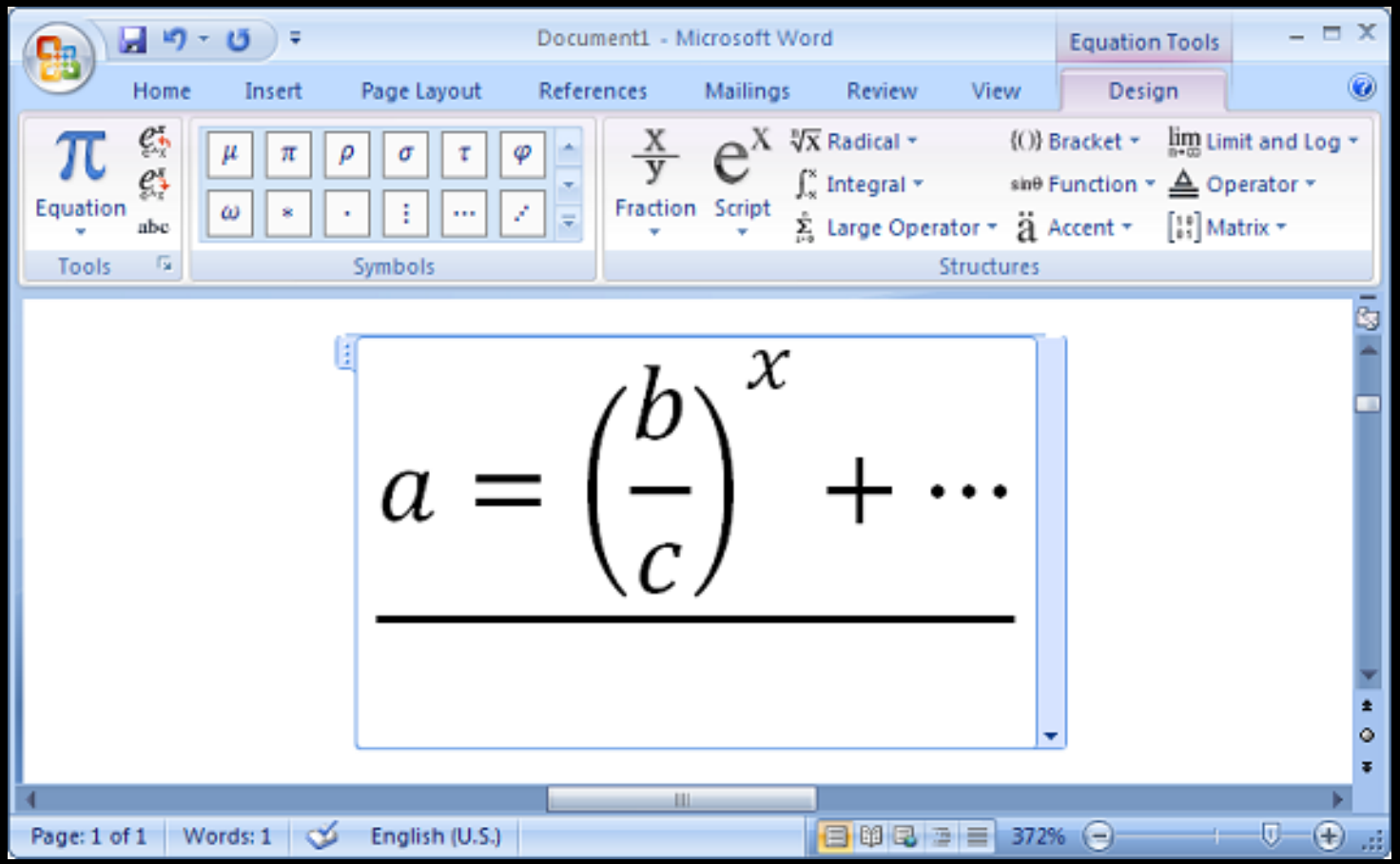
Inspiration

Visual Analysis Tool



TinkerPlots

Equation Editor



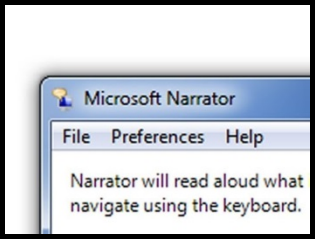
Microsoft Equation Editor

Accessibility is Becoming Mainstream

- VoiceOver for iOS

- Talkback for Android

- Narrator for Windows



- Ctrl+ for Browsers

Acknowledgements

Founded 2006
CNS-1539179

Founded 2014
CNS-1440843
CNS-1440878

Any opinions, findings, and conclusions or recommendations expressed in this material are mine and do not necessarily reflect the views of the NSF.

My Message

STEM fields need more people with disabilities because their expertise and perspectives spark innovation.

We can make it happen!!