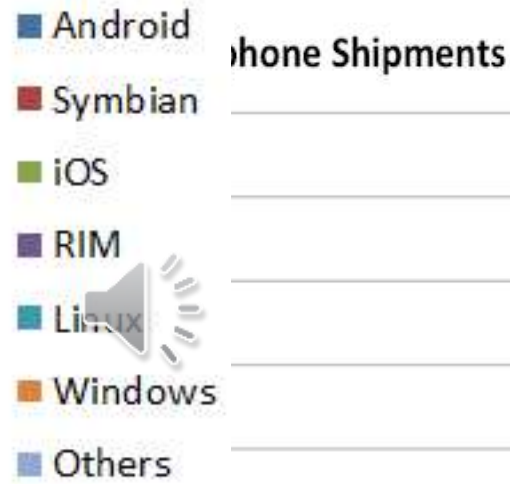
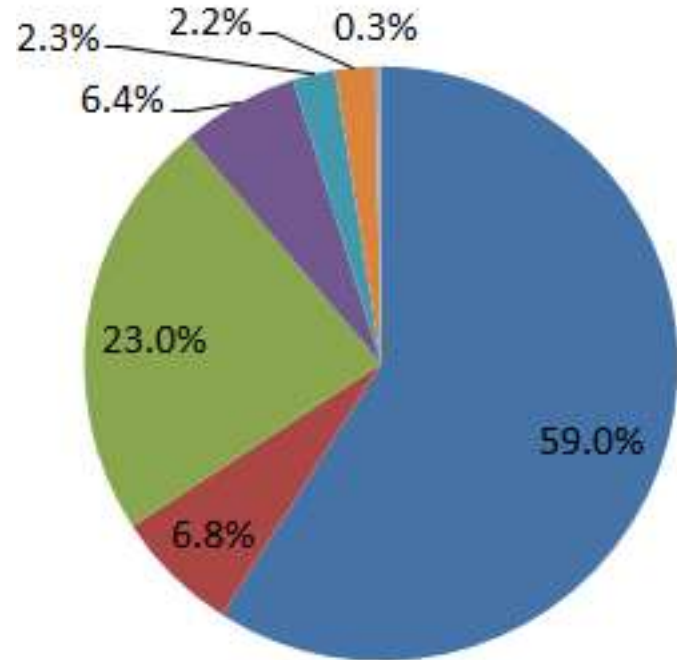


Computing Across the Disciplines: Using Cell Phones in Experiments



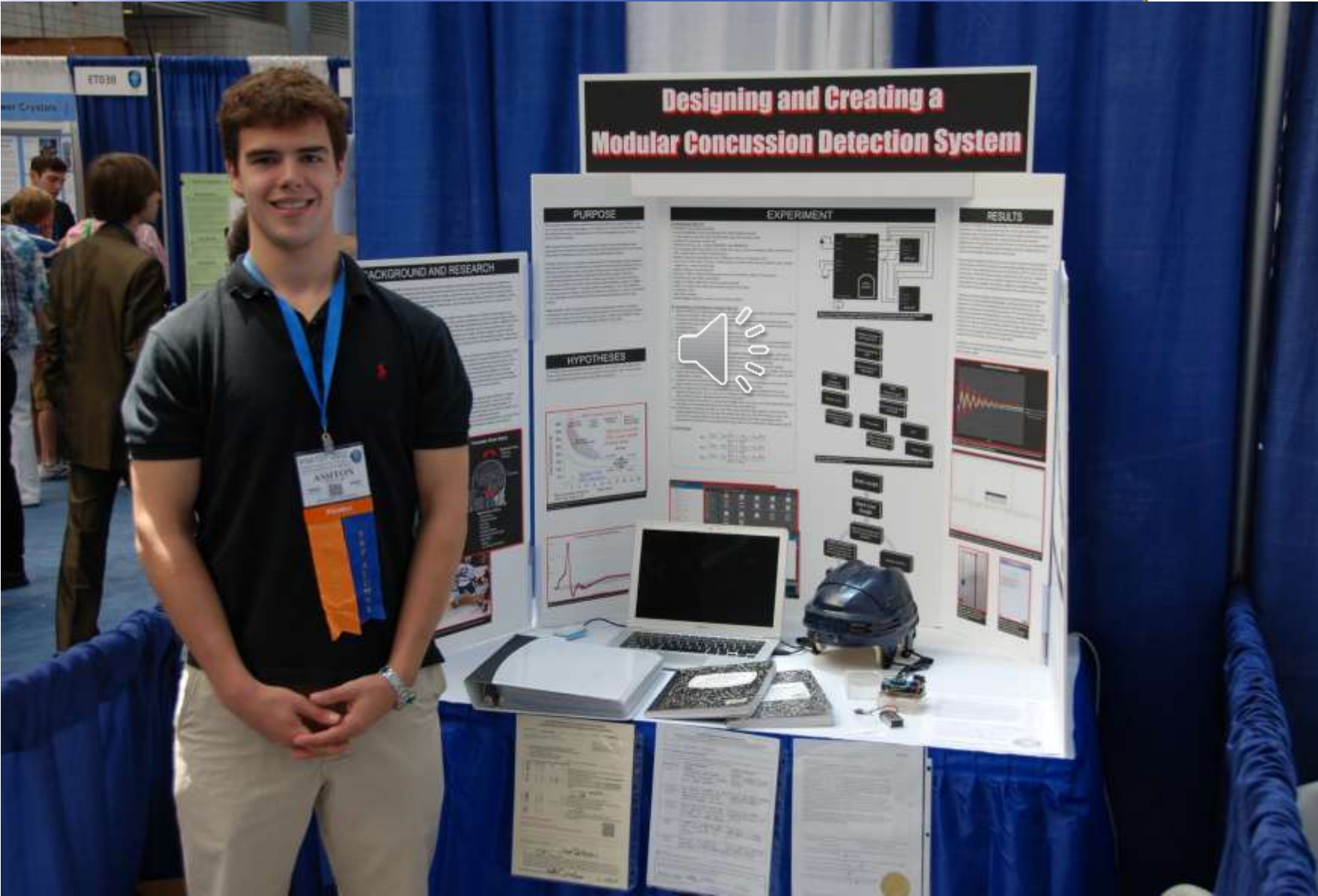
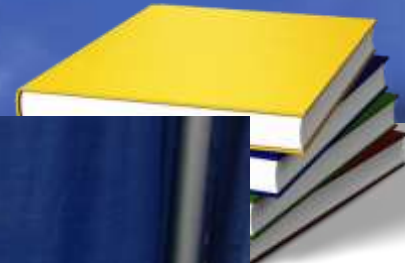
Robert Juranitch
University School of Milw.
rjuranitch@usmk12.org

Apology



Source: Gartner, Strategy Analytics, Company Estimates, IDC, Business Insider Intelligence Estimates

A High School Student



Cell Phone Saturation



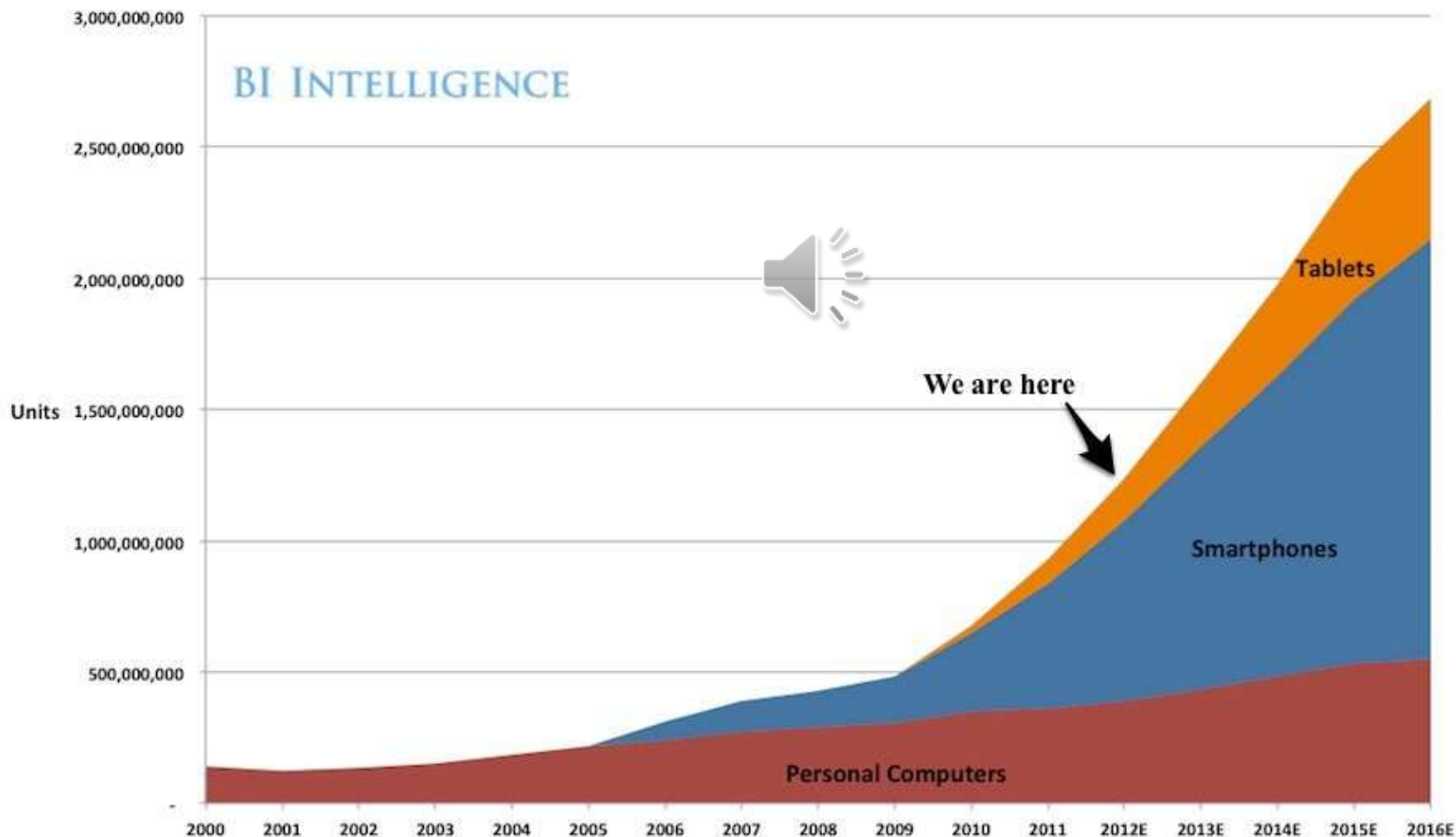
- 31 percent of teens between 14 and 17 years old have a smart phone.
- Usage has tripled every two years.
- Uses
 - 26% use them to make phone calls
 - 63% prefer texting over calls, face to face, social networking and IMs.
 - 6% prefer email

Authentic trend



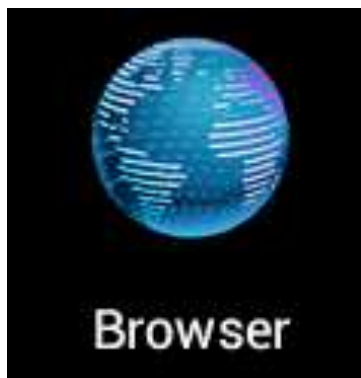
Global Internet Device Sales

BI INTELLIGENCE

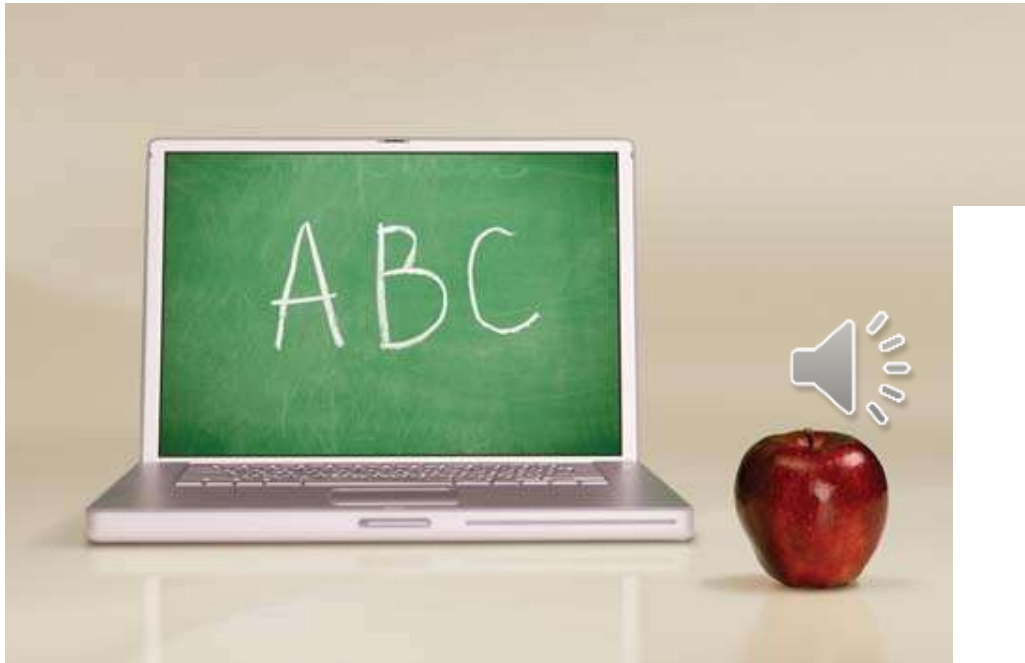


Source: Gartner, IDC, Strategy Analytics, company filings, BI Intelligence estimates

My SmartPhone Use



My Smartphone Use



Apollo 11 Guidance Computer



	Apollo 11	Nexus
Speed	0.001 GHz	2 x 1.2 GHz
Memory	2kB + 32 KB	1 GB + 28 GB



How we teach/taught



How we teach/taught



Continuum of Inquiry



A Rubric to Characterize Inquiry in the Undergraduate Laboratory (Bruck et al., 2008)

Characteristic	Level 0: Confirmation	Level ½: Structured inquiry	Level 1: Guided inquiry	Level 2: Open inquiry	Level 3: Authentic inquiry
Problem/Question	Provided	Provided	Provided	Provided	Not provided
Theory/Background	Provided	Provided	Provided	Provided	Not provided
Procedure/Design	Provided	Provided	Provided	Not provided	Not provided
Results analysis	Provided	Provided	Not provided	Not provided	Not provided
Results communication	Provided	Not provided	Not provided	Not provided	Not provided
Conclusions	Provided	Not provided	Not provided	Not provided	Not provided

More authentic inquiry?



COMMON CORE STATE STANDARDS INITIATIVE

PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

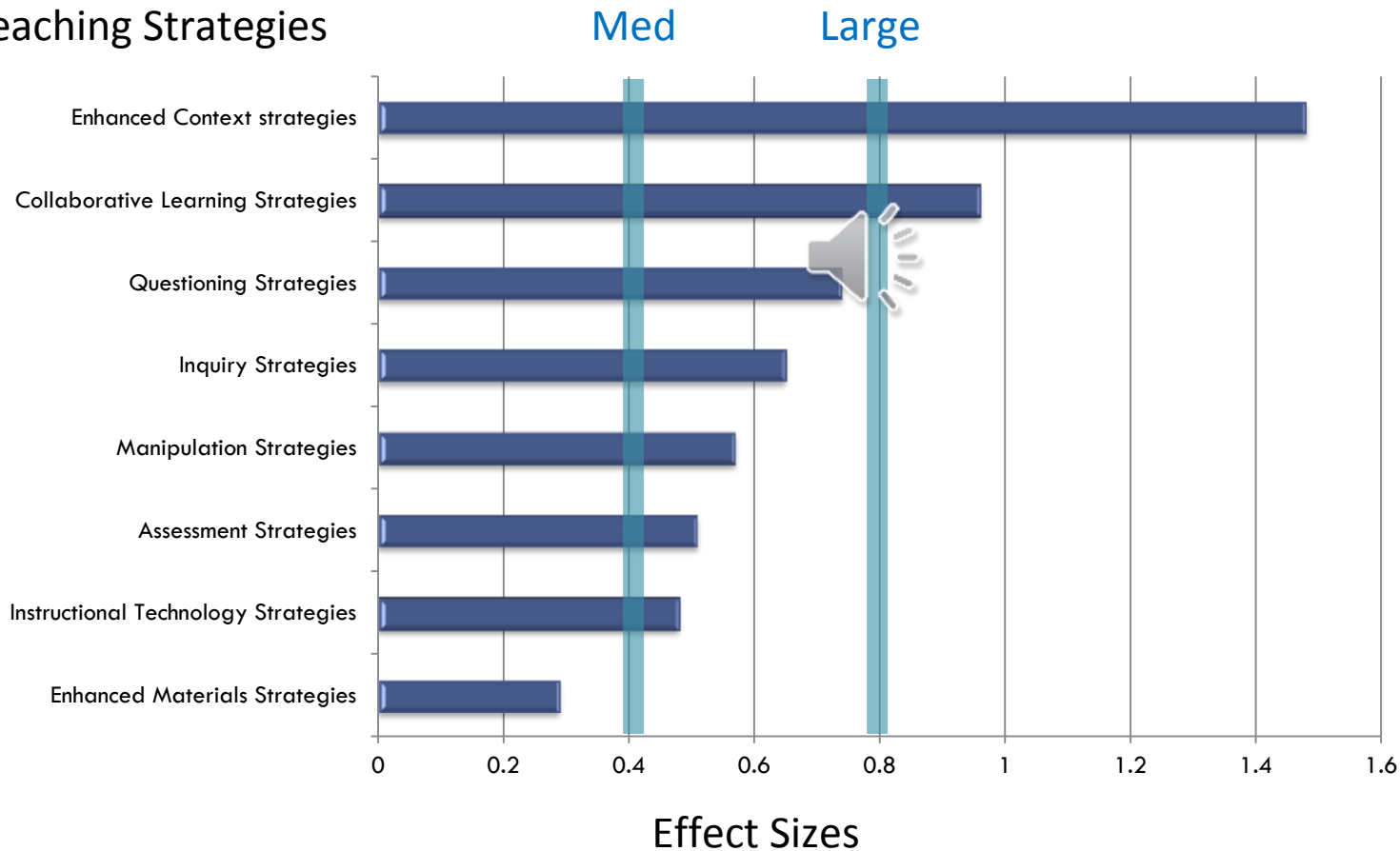
1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics, Information and Computer Technology, and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtaining, evaluating, and communicating information

Pedagogy Matters

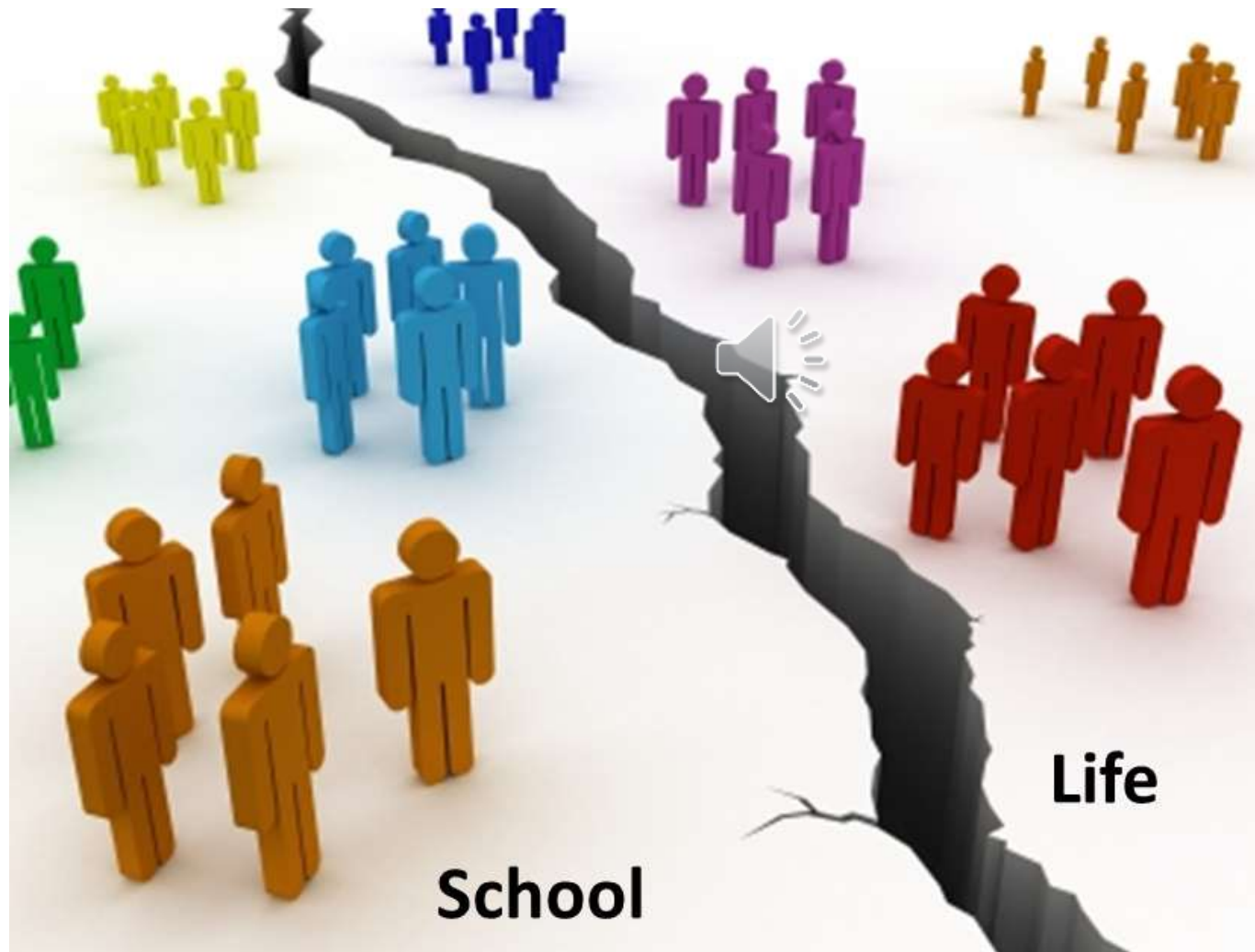


Meta-analysis of 61 studies (orthogonal to previous meta-analyses)

Teaching Strategies



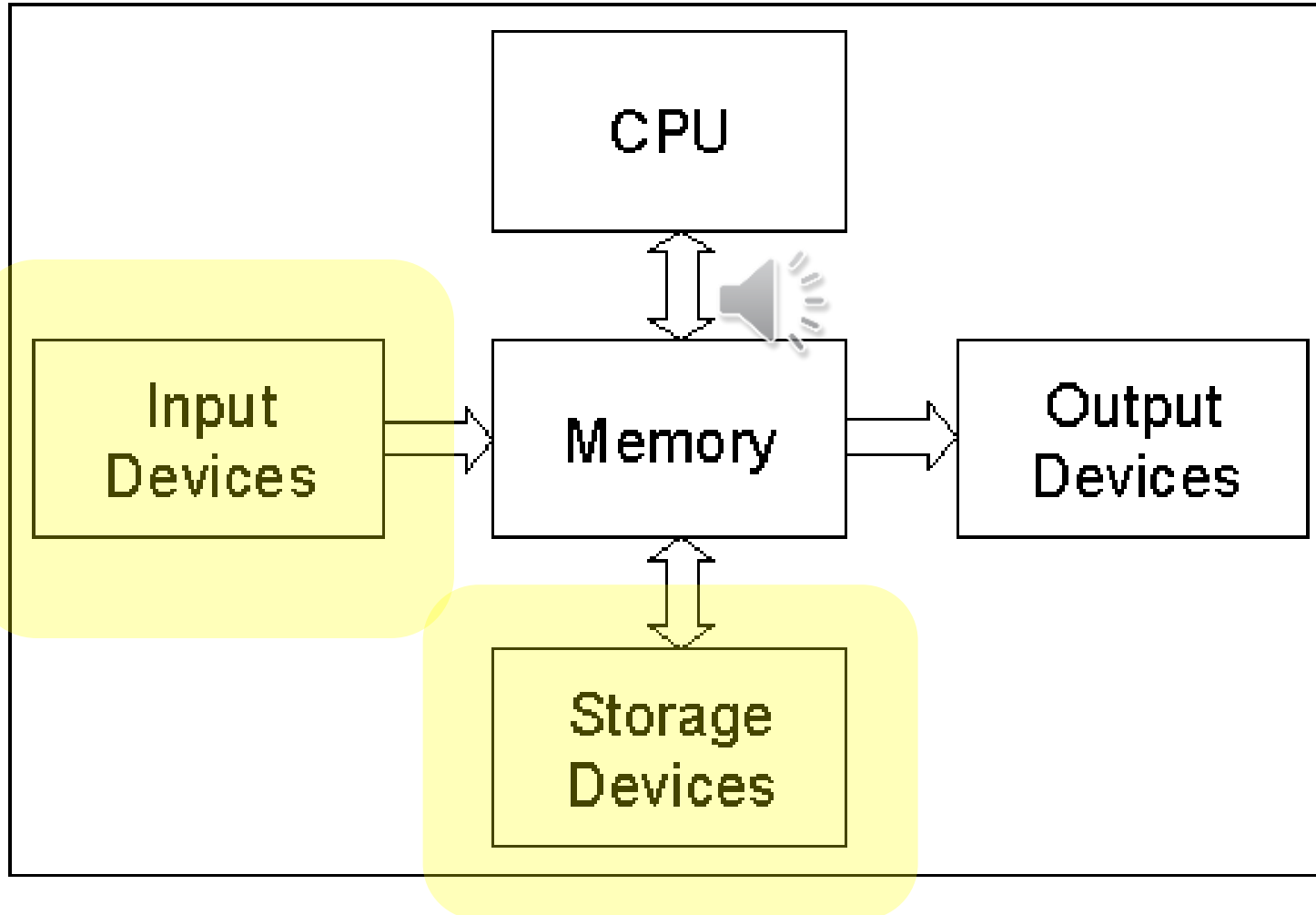
Can we do better?



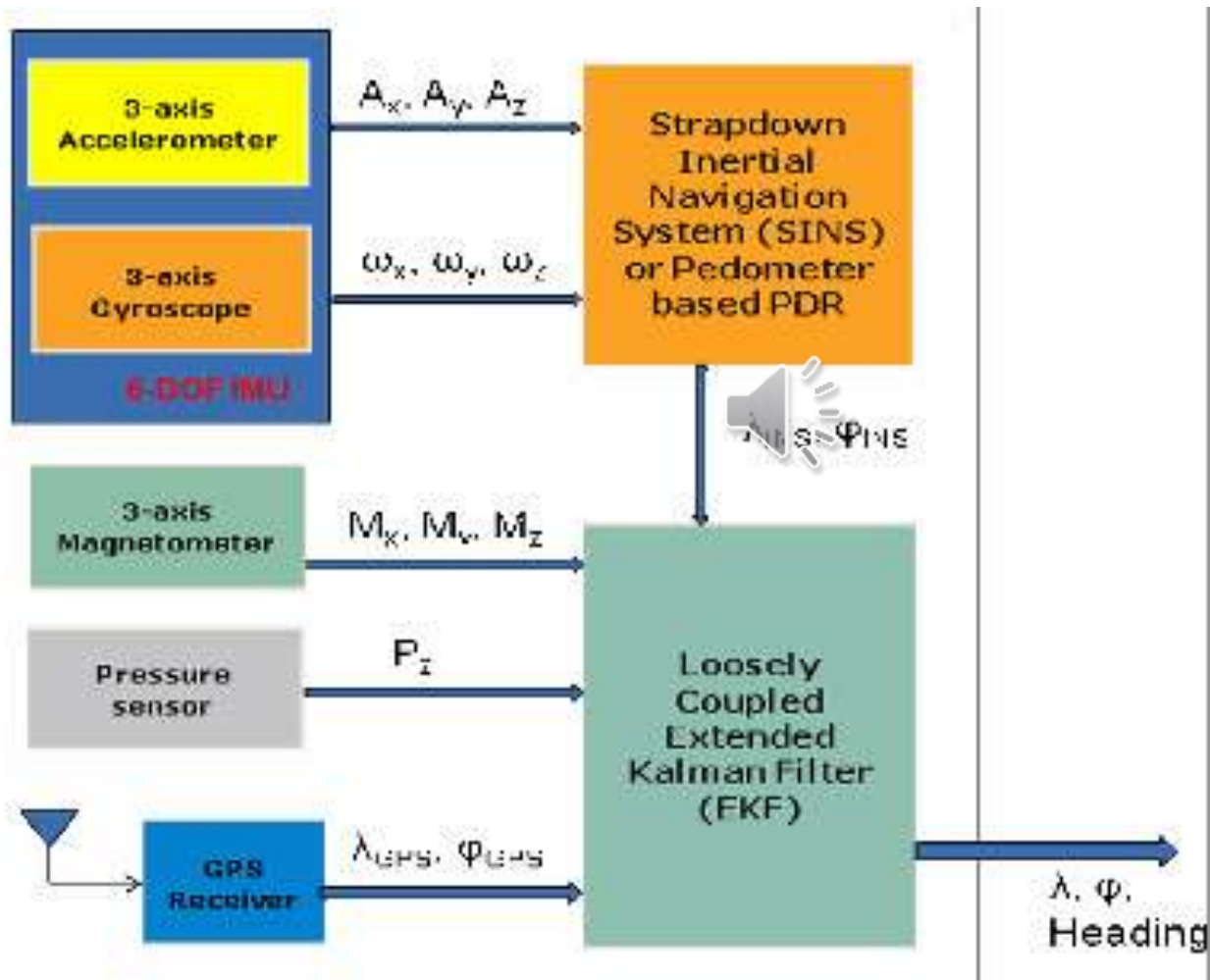
Context and Computation!



Computer Primer




Input devices (sensors) galore!



What sensors do you have?




Android App	iPhone App
AndroSensor	 Sensor Monitor
Android Sensor Box	Hardware Tools

3-axis Accelerometer



- Measures the linear acceleration of the phone.

Android	iPhone
Accelerometer Values 	Accelerometer Values
Accelerometer Monitor	SPARKvue (PASCO)
Accelerometer Record (Resultant)	AccelMeter (Resultant)
Vibrations (FFT)	iSeismo
Accupedo Pedometer	Pedometer

3-axis Gyroscope


- Measures the rotational velocity of the phone.



Android	iPhone
Gyroscope Log	
Orientation Log 4	


Magnetic Field Sensor



Android	iPhone
Max Magnetic Field Detector 	Magnetic Data
Metal Detector	Compass Data
Smart Protractor	Multi Protractor
Max Protractor	

Sound Meter



Android	iPhone
Sound Meter	
FrequenSee (Spectrum Analyzer) 	
Sound Form (Sig Generator)	

Barometer


- Measures atmospheric pressure



Android	iPhone
SyPressure 	
Barometer.WSK	
Atmosphere Logger	

GPS



Android	iPhone
GPS Status and Toolbox 	GPS Path
GPS Essentials	

Integrated Sensor Apps



Android	iPhone
PhysicsGizmo	TouchOSC
MINDdroid	Lego Mindstorms
SensorTrack	Signal Scope
Movement Tracker	Motion Data
DomoticHome	Sensor Log
Tool Box	Sensor Data

Proximity and Light Sensors



- Most proximity sensors max out at 2 inches
- Light sensor apps seem to be unreliable
 - Photography light sensor apps get high ratings
 - Check against known good sensors before using them

Needed App Doesn't Exist?



- Develop apps in a drag and drop application
- Deploys to phone through USB or QR code
- Free Web Application (small local install)

App Inventor



App Inventor for Android Blocks Editor: Accelerometer_test

Accelerometer_test Saved Undo Redo Restart Phone App Zoom 100%

Built-In My Blocks

- Definition
- Text
- Lists
- Math
- Logic
- Control
- Colors

```
def gRunning to false
```

```
when btStart.Click  
do  
  set global gRunning to not global gRunning  
  ifelse test global gRunning = true  
  then-do  
    set btStart.Text to text Stop  
    set cClock.TimerEnabled to true  
  else-do  
    set btStart.Text to text Start  
    set cClock.TimerEnabled to false
```

```
when cClock.Timer  
do  
  if test global gRunning = true  
  then-do  
    set cAccel.Enabled to true
```

```
when cAccel.AccelerationChanged xAccel name xAccel  
  yAccel name yAccel  
  zAccel name zAccel  
do  
  set Label1.Text to text X: join cAccel.XAccel  
  set Label2.Text to text Y: join cAccel.YAccel  
  set Label3.Text to text Z: join cAccel.ZAccel  
  set cAccel.Enabled to false
```

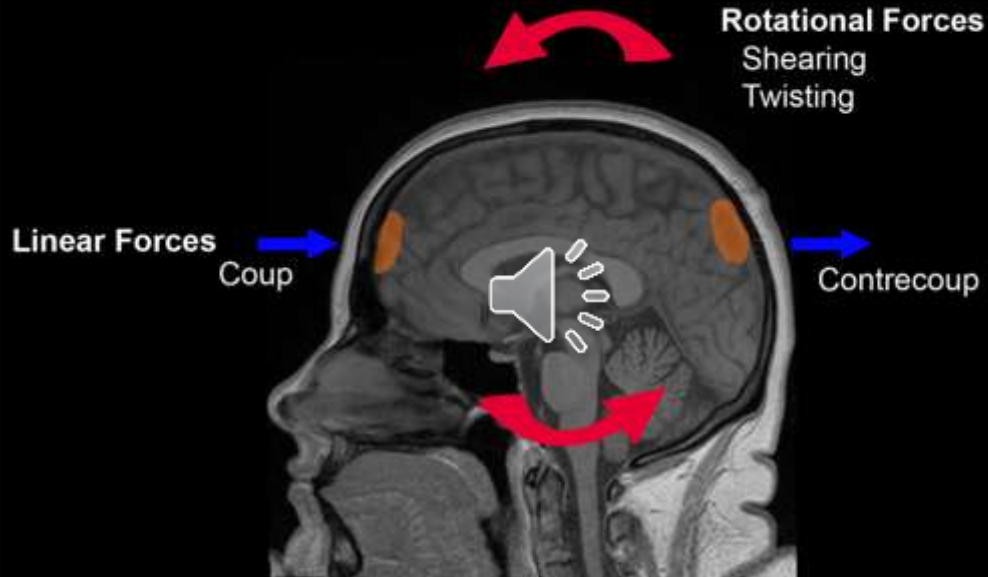
Back to Ashton



Back to Ashton



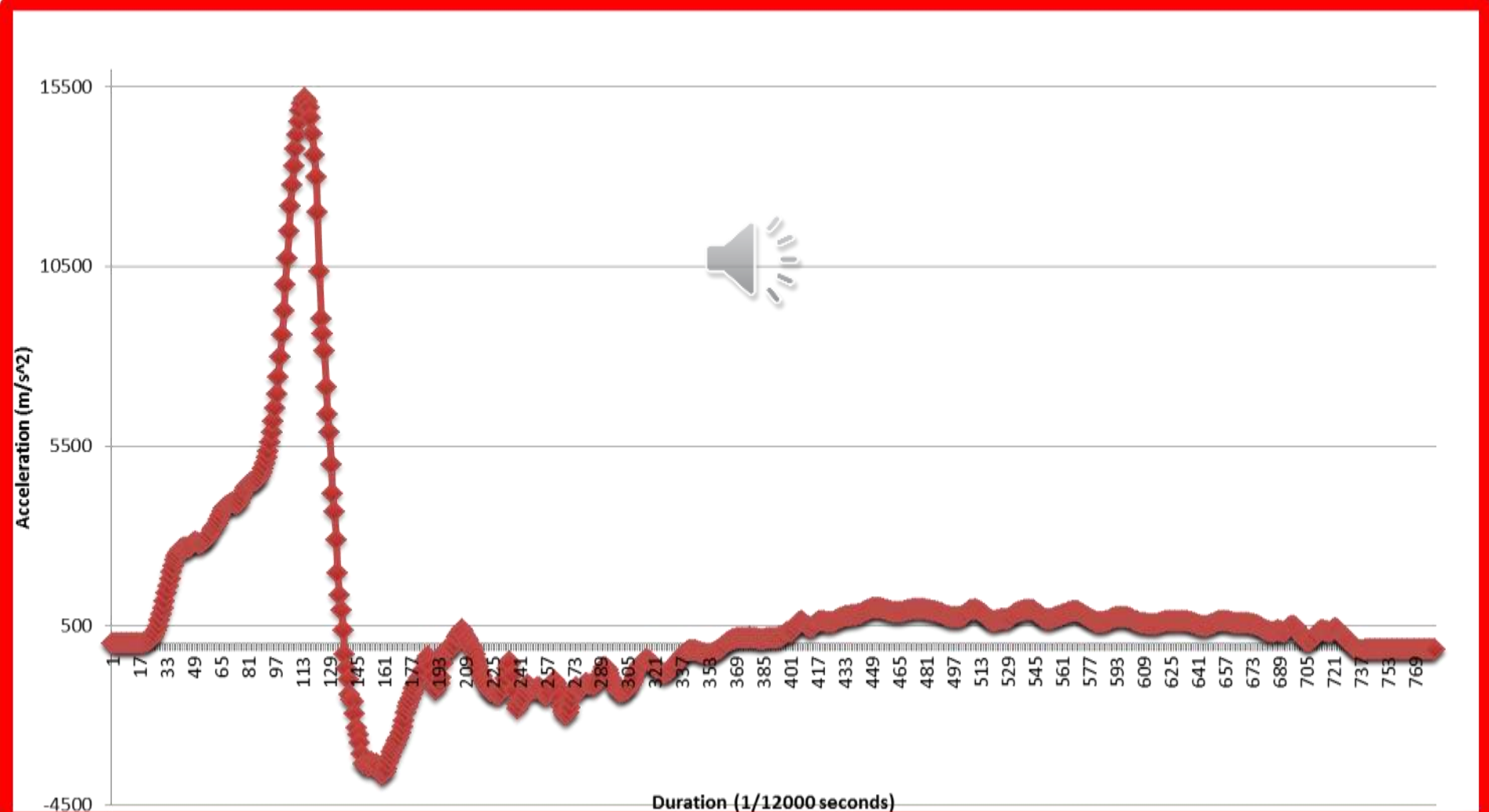
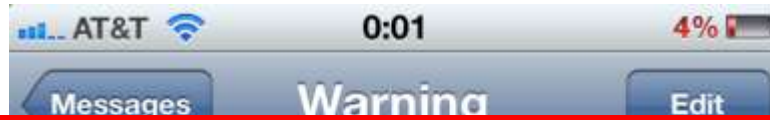
Traumatic Brain Injury



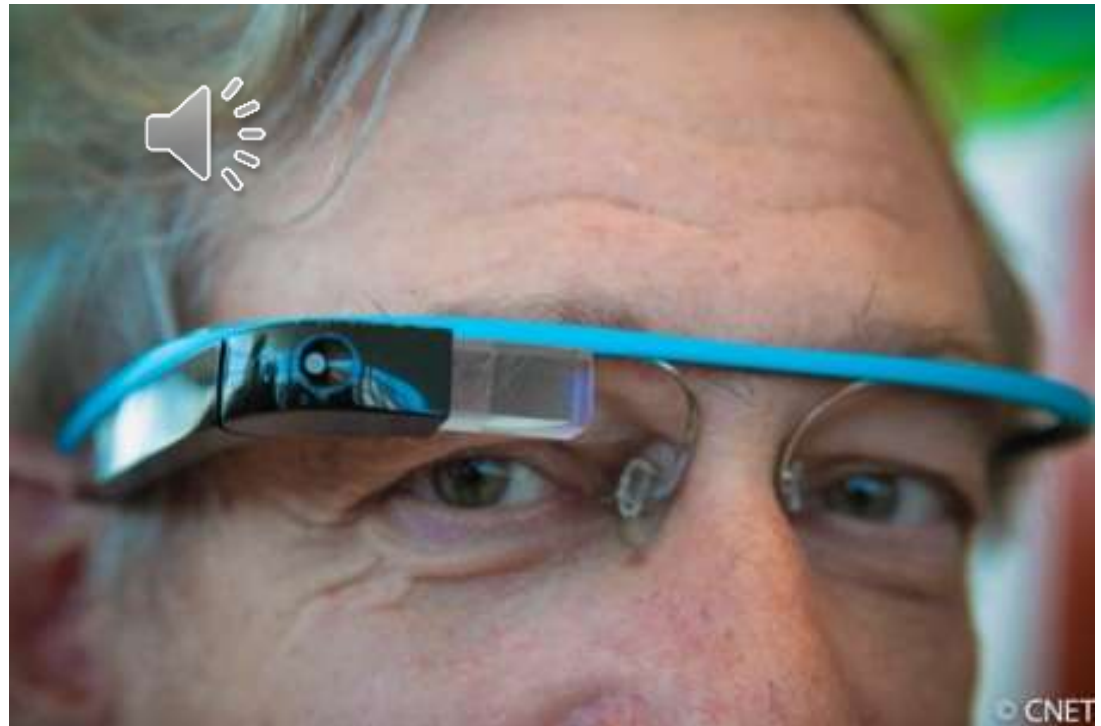
Mechanisms of Injury

- Axonal Injury
- Cellular Damage
- Ischemia
- Contusion
- Cerebral Edema
- Intracranial Hemorrhage
- Late Effects:
 - Gliosis
 - tau Protein Deposition

Back to Ashton



Ubiquitous computer use



Ubiquitous computer use




APRIL 21ST - 27TH 2012

Worldwide cover

What Next????



- Try one change.....
- Allow your student to do your research.
- Join a sharing group.
- Talk to your colleagues. 

Questions???

