Cognitive Psychology and Human Factors

Embedded Interface Design

with **Bruce Montgomery**

Learning Objectives

Students will be able to…

- Define cognitive psychology and human factors
- Recognize common human characteristics and behaviors that impact interface designs
- Apply this knowledge to their own UX work

Cognitive Psychology and UX

- Cognitive Psychology [1]
  - Scientific study of the mind as an information processor
  - Building cognitive models of the information processing that goes on inside people's minds
  - Includes perception, attention, language, memory, thinking, and consciousness.
- Understanding the humans that will use your system will improve your designs

Human Factors (Ergonomics) and UX

- Human Factors [2]
  - Ergonomics (or human factors) is the scientific study of interactions among humans and other elements of a system
  - Applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance
  - Contributes to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people

Human Suffering and Technology

- Video
  - Rich Sheridan from Menlo Innovations
  - https://www.youtube.com/watch?v=XdlEGcMtPw4
- Book reference [3]
  - Joy Inc., Rich Sheridan, Penguin, 2013
- Importance of Vision Statements
- Listening vs. Observation

Sheridan: Homo Logicus vs. Homo Consumerus

Take a minute here…

- Ok, clear your head – exercise coming…

Read over this list for 30 seconds (but DO NOT write them down) - we'll come back to it…

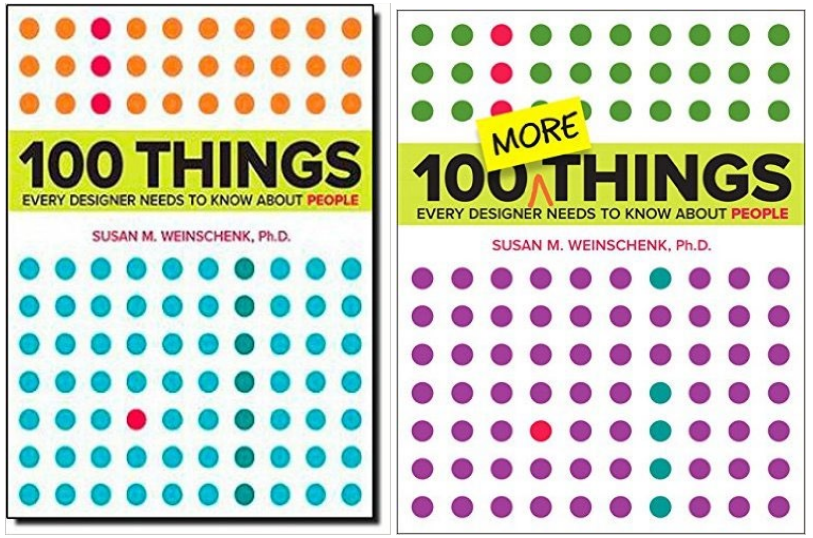
Meeting	Computer	Phone
Work	Papers	Chair
Presentation	Pen	Shelf
Office	Staff	Table
Deadline	Whiteboard	Secretary

~~100~~ 10 Things Every Designer Needs To Know About People - Weinschenk

- Key considerations from her comprehensive books [5] and [6]

1. Most mental processing people do is unconscious
2. People use peripheral vision more than central to get the “gist” of a scene
3. The Fusiform Facial Area (FFA) makes us pay particular attention to human faces
4. People can remember/deal with only 3 to 4 items
    - People like having a lot of choices
    - If you give people too many choices they won’t choose anything

Reference [4]



Take a minute here…

- Ok, clear your head – exercise coming…

~~100~~ 10 Things Every Designer Needs To Know About People – Weinschenk (2)

5. People have mental models for common objects – try to match them
6. Speaker and listener brains syncronise
7. People have weak and strong ties
   - People are strongly tied socially to about 150 people (100 to 230)
8. Beauty is in the eye of the unconscious
   - People prefer objects with curves
9. The brain processes information best when it is presented as a story
10. People expect technology to follow human-to-human Interaction Rules

- Reference [4]

Other characteristics of people to consider for UX

- How People See
  - People automatically look for patterns, so use grouping and white space to create them
  - Avoid red/green text on blue background or blue/green text on red
  - Cultural color chart for meanings [7]
- How People Read
  - Reading a screen is harder than reading paper
- How People Remember
  - Recognition is easier than recall
- How People Think
  - People like to put things in categories
- How People Focus Their Attention
  - Sustained attention lasts only about 10 minutes

Recognition is Easier Than Recall

- Write down as many of the words that you can recall from the initial list…

Read over this list for 30 seconds (but DO NOT write them down) - we'll come back to it…

Meeting	Computer	Phone
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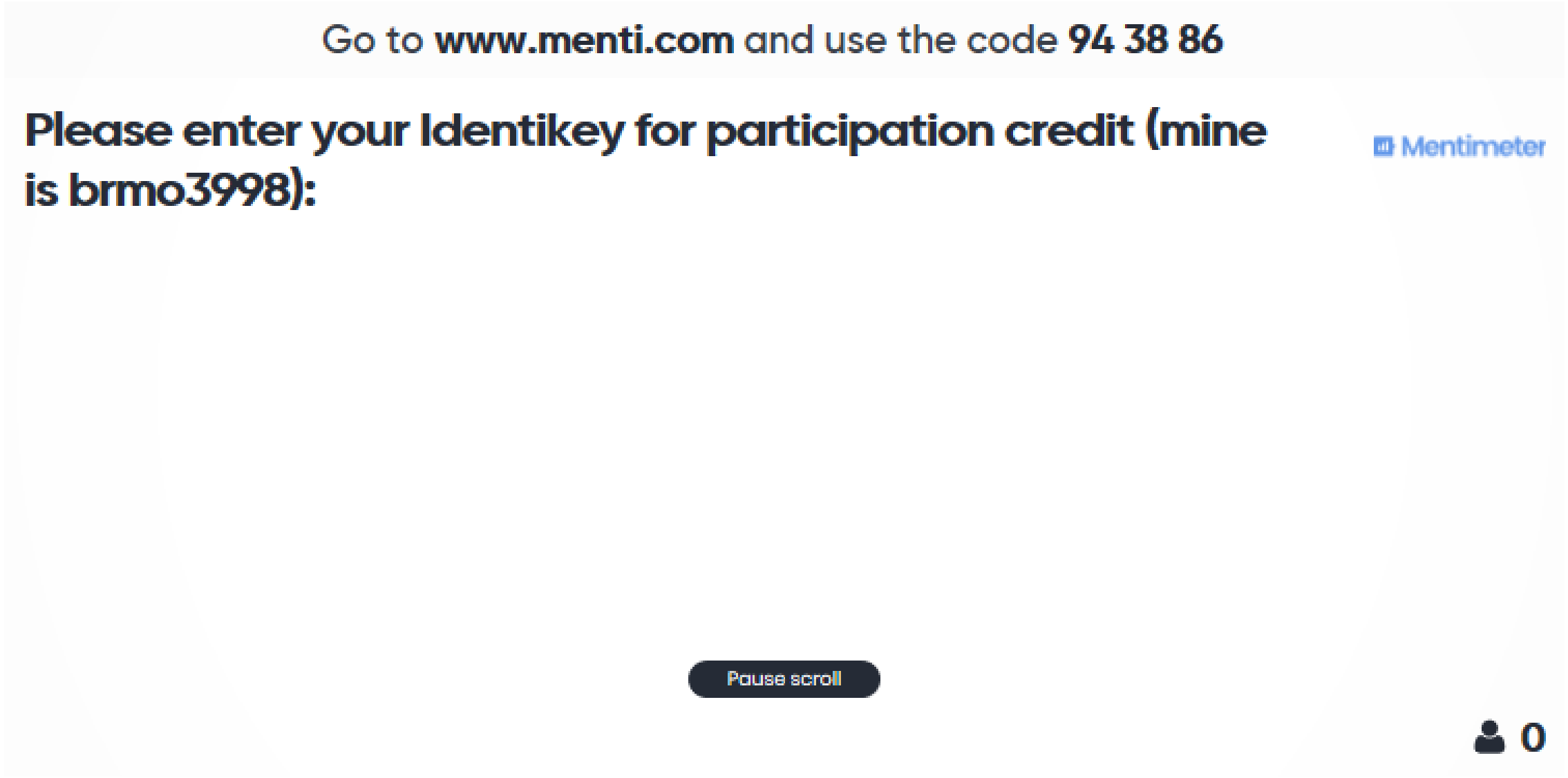
How many did you get right?
Did you remember them in order?
Did you add other office-y words that weren't there – like Pencil or Desk?


Go to www.menti.com and use the code 94 38 86
Please enter your Identikey for participation credit (mine is brmo3998):
Mentimeter
Pause scroll
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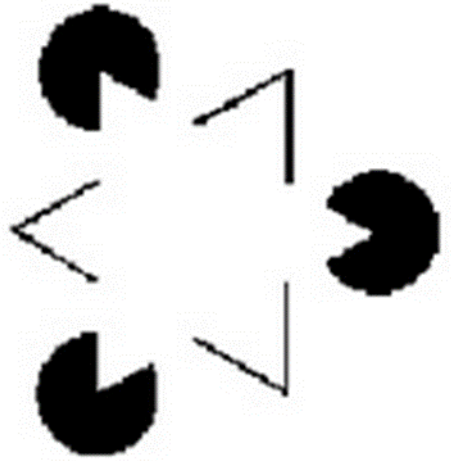
Cultural Color Chart [7]

- Cultural color meanings for various states: anger, fun, danger, gratitude, etc.
- Cultures include Western/American, Japanese, Hindu, Native American, Chinese, Asian, Eastern European, Muslim, African, South American

Human perception and cognition for UX

- People perceive what they expect
- Vision is optimized for structure, which we seek and use
  - Example – Kanizsa triangles (1955)
- Color vision is limited, peripheral vision is poor
  - 8% of males, 0.5% of females are colorblind – red/green is most common
  - Put key information where people will naturally look



- Reference [8]

Human perception and cognition for UX

- Reading is unnatural

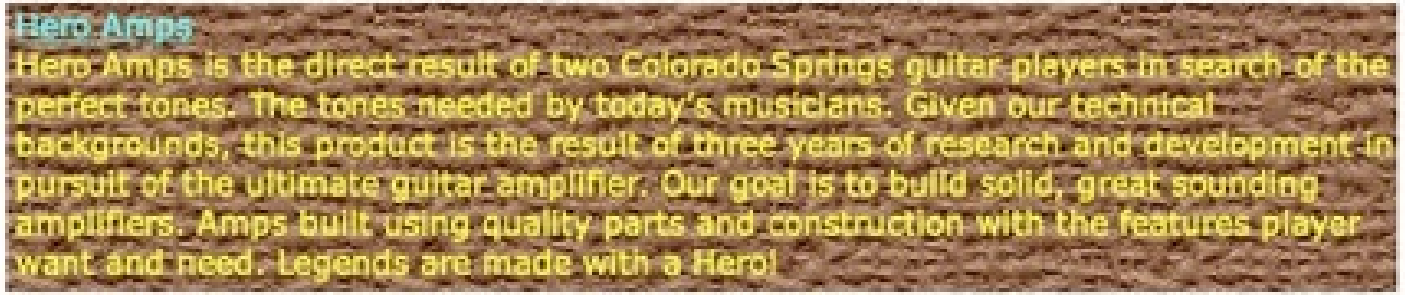
- Poor text presentation can *disrupt* reading
- Unfamiliar words:

  Bailiwick, penultimate, heretofore, defragment

- Difficult typefaces

  TEXT IN ALL CAPS, ESPECIALLY IN A FANCY FONT

- Patterned background or poor contrast



Human perception and cognition for UX

- Attention is limited, memory is imperfect
- Limits on attention shape thoughts and actions
- Recognition is easy, recall is hard
- Learning from experience is easy, problem-solving and calculation is hard
- People have real-time expectations of response

- Reference [8], [9]

Key Real-time Expectations

- Time for a skilled reader to comprehend a word = .15 seconds
- Time to identify a visual object = .25 seconds
- Minimum visual to motor reaction time = .7 seconds
- Average conversational gap = 1 second
- Length of unbroken attention to a task = 6-30 seconds
- Limit of perception of cause/effect = .14 seconds
  - Example: time between a button click and graphic reaction

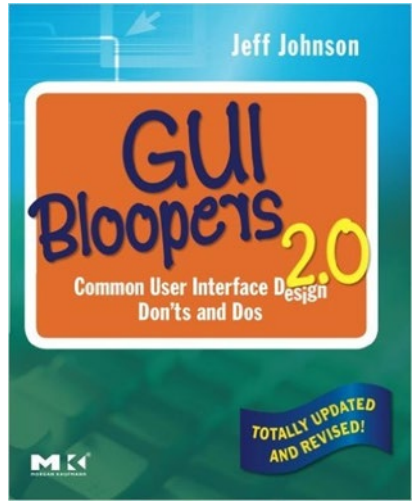
- Reference [8], [9]

UX design principles from understanding people

Johnson's first principles:

- Focus on the users and their tasks, not the technology
- Consider function first, presentation later
- Conform to the users' view of the task
- Don't complicate the users‘ task
- Promote learning
- Deliver information, not just data
- Design for responsiveness
- Try it out on users, then fix it

- Reference [10]



Bloopers are categorized:

- GUI Control
- Navigation
- Textual
- Graphic Design & Layout
- Interaction
- Responsiveness
- Management

Summary

- Thorough UX work is supported by considerations of cognitive psychology and human factors
- Besides general rules, as we've just reviewed, if you're working with a subset of people – children, seniors, etc. – you'll want to consider their particular capabilities and limitations
- Keeping these limits in mind from the beginning supports your work to provide the best UX for your users

References

[1] https://www.simplypsychology.org/cognitive.html
[2] https://www.iea.cc/whats/index.html
[3] http://menloinnovations.com/
[4] https://www.slideshare.net/susanweinschenk/top-10-things-every-designer-needs-to-know-about-people
[5] 100 Things Every Designer Needs to Know About People, Weinschenk, 2011, New Riders
[6] 100 More Things Every Designer Needs to Know About People, Weinschenk, 2016, New Riders
[7] http://www.informationisbeautiful.net/visualizations/colours-in-cultures/
[8] http://www.slideshare.net/baychi/jeff-johnson-at-baychi-designing-with-the-mind-in-mind
[9] Designing with the Mind in Mind, Johnson, 2010, Morgan Kaufmann
[10] GUI Bloopers 2.0, Johnson, 2008, Morgan Kaufmann