

# **Learning, Knowing, and Remembering in a Digital World**

**Naomi S. Baron**

**Professor of Linguistics  
American University Washington, DC**

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The year was 1964 ...



# Elements of Learning, Knowing, and Remembering

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- Mental effort
  - Work involved in learning and knowing
    - Not “In my heart I know ...” or “Intuition tells me ...”
- Memory
  - Recalling what you learned and know
- Integration
  - Assimilating new learning, knowledge with prior learning, knowledge

# Issues Relevant for Learning and Knowing

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- Differences between
  - Data (facts and figures)
  - Information (data processed)
  - Knowledge (understanding)
- What standards/goals do we have for each (with respect to education – and citizenship)?
- What data/information/knowledge should be
  - Internal (in our heads)
  - External (e.g., retrievable through internet)

# “Knowing” in a Digital World

- Michael Lynch, *The Internet of Us: Knowing More and Understanding Less in the Age of Big Data*
  - “Today, the fastest and easiest way of knowing is Google-knowing ... but it can also weaken and undermine other ways of knowing ... that require more creative, holistic grasps of how information connects together.” (pp. xvi-xvii)
  - [NOTE: For Lynch, “knowledge” seems to mean “information”]
  - “greater knowledge doesn’t always bring with it greater understanding” (p. 6)
    - “Understanding is what we have when we know not only the ‘what’ but the ‘why’.” (p. 16)

# Digital Challenges

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## ■ Affordances of digital media

### ■ Storage

- Paul Marsden: “Digital devices are the new flash drives of the mind” (in Kaspersky, 2016, p. 5)

### ■ Search

- Can search in depth, but most searches are for specific datum/piece of information – not knowledge
- Susan Greenfield: “Now we are in danger of entering ... an arguably question-poor world where our brains are saturation-bombed with answers” (*Mind Change*, p. 207)

# Digital Challenges (2)

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- Consequences of these affordances of digital media for
  - Mental effort
    - Do we try as hard to learn as with print sources?
  - Memory
    - Do we remember what we read digitally?
  - Integration
    - Do we make the effort to integrate new data/information/knowledge with what already exists?

# Remembering: Pre-Internet Issues

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- Individual responsibility (internal memory) vs. outsourcing to writing (external memory)
  - Plato's *Phaedrus*
    - “Their trust in writing ... will discourage the use of their own memory within them”
- Tools for internal memory
  - Method of loci/memory palace
    - Mentally associate information with (imagined) physical spaces (e.g., rooms in a building)
    - Used by Cicero, Quintilian; in Middle Ages (see Carruthers)

# Overview of Today's Discussion

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- Effects of the internet on mental effort and memory
- Effects of reading digitally on mental effort and memory/learning
- Memory, thinking, and education
- Case study: GPS
- Digital challenges revisited

# Effects of Internet on Memory

## Making the Internet Our Transactive Memory Partner

- Daniel Wegner: transactive memory
  - Normal human experience: divide up memory responsibilities (you remember family birthdays, I'll remember how to change a tire)
- Betsy Sparrow: internet as memory partner
  - Better memory for search path than for result (Sparrow, Liu, & Wegner)
- Limitations of internet as memory partner
  - After internet search, inflated beliefs about knowledge of topic haven't researched (Fischer et al.)
  - Stop making effort to remember things ourselves (Sparrow & Chapman; Ward)

# Kaspersky Lab Reports

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- “Digital amnesia”
  - “the experience of forgetting information that you trust a digital device to store and remember for you”
- Studies (Winter-Spring, 2015)
  - Europe: 6,000 consumers, age 16 – 55+ (UK, France, Germany, Italy, Spain, Benelux)
  - US: 1,000 consumers, age 16 – 55+

# Kaspersky Lab Reports (2)

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- Dividing up memory responsibilities: *use the internet as an extension of your brain*
  - Europe: 80%
  - US: 91%
- Memory for search path, not results: *not necessary to remember facts found online, only where you found them* (cf. Sparrow, Liu, & Wegner)
  - Europe: 61%
  - US: 61%

# Kaspersky Lab Reports (3)

- Stop trying to remember things ourselves:
  - *Search online first vs. try to remember first*
    - Europe: Online - 36%; Try to remember - 57%
      - BUT: Wide country variation
        - France: Online – 25%; Try to remember – 71%
        - UK: Online – 52%; Try to remember – 36%
    - US: Online – 50%; Try to remember – 39%
  - *Forget an online fact as soon as have used it*
    - Europe: 24%
    - US: 29%

# Kaspersky Lab Reports (4)

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- Effects of digital amnesia on memory
  - Maria Wimber: “the trend to look up information before even trying to recall it prevents the build-up of long-term memories, and thus makes us process information merely on a shallow, moment-to-moment basis” (in Kaspersky 2015 [US], p. 11)

# Kaspersky Lab Reports (5)

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- "Digital Synergy"
  - "humans and their devices work in partnership" (Kaspersky 2016)
  - Study
    - 6,000 consumers, age 16-65 (Europe, 2016)
  - 64% agree that "having my smartphone or tablet remember things for me means I can concentrate on something else"
  - **HOWEVER:** younger users (18-22 year-olds) are more concerned than older users that "technology is going to take over our lives"

# Effects of Reading Digitally:

## Baron; Baron, Calixte, and Havewala

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### ■ Study parameters

- 429 university students in US, Japan, Germany, Slovakia, and India
- Data collected Spring 2013-Spring 2015

### ■ Key quantitative findings

- Print is medium on which **concentrate** best (92%)
- If **cost** were the same for print and digital, would choose print (school work: 87%; pleasure: 81% )
- If text is **long**, would choose print (school work: 86%; pleasure: 78%)

# Effects of Reading Digitally:

Baron, Calixte, and Havewala (2)

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- Open-ended (qualitative) responses related to reading, learning, memory
  - “reading in hardcopy makes me focus more on what I am reading”
  - “compared to reading in hardcopy, prone to skimming (unlike reading thoroughly) on a digital screen”
  - “[when reading print] it takes me longer because I read more carefully”
  - “[when reading print] feel like the content sticks in the head more easily”
  - “[when reading print] I feel like I understand it more”

# Effects of Reading Digitally:

## COST Research

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- COST Action FB1104: Combining Print with Digital
  - Essays, surveys, interviews with university students on reading and writing, using paper and digital
  - Reading: Print is easier medium on which to concentrate
  - Farinosi et al.: “Students ... feel that ... paper seems to allow readers to immerse themselves in the content better [,] which improves learning” (p. 418)

# Effects of Reading Digitally:

## Other Research

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- Memory for abstract vs. concrete
  - Kaufman and Flanagar: Participants did better when reading print on abstract questions that required inferential reasoning, but better when reading digitally in answering concrete questions
- Reconstruction of story line chronologically
  - Mangen et al., Flood: Participants did better when read story in print
- Reader perceptions
  - Ríos Amaya and Secker: 71% of participants felt they remembered more course information when read in print

# Effects of Reading Digitally:

## Lost in a Book?

### ■ Transportability

- Mangen and Kuiken: Readers noted higher levels of narrative coherence and feeling they could “lose” themselves in the story (“transportation”) in the print condition
- Baron, Calixte, and Havewala
  - “With hardcopy many emotions get attached.... Digital is superficial”
- Farinosi et al.: With paper, “immerse themselves in the content better”

# Education:

## What Do We Want People to Learn and Know?

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### ■ Recap

- Growing use of digital technologies for transactive memory (“ Digital devices are the new flash drives of the mind” )

### ■ Educational issues

- Historical changes in US educational goals, theory, and practice
- How will – and should – US education respond to the potential and challenges of digital memory?

### ■ What about learning and knowing in our everyday lives?

# Education:

## Memorization versus Memory

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- Shifts in educational theory over time
  - Through late 19<sup>th</sup> c
    - emphasis on memorization
  - Progressive education movement (e.g., Maria Montessori, John Dewey) (see Howlett)
    - Nurture young children's creativity, not focus on memorization
- US primary, secondary education
  - Conflict over how much information (e.g., names, dates) and how much broader concepts
  - Cultural literacy movement of late 1980s (Hirsch)

# Education:

## Critical Thinking

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- 21<sup>st</sup> c emphasis in US education at all levels  
(see e.g., Moore and Parker 2014)
- Related pedagogies: problem-based learning, project-based learning (see Problem-based learning n.d.)
- Challenge
  - Think critically (or solve problems) about what – especially if the internet is down?
  - What/how much do you need to hold in your head to “think critically” or solve problems?
  - Recall Fischer et al.: Doing internet searches leads us to believe we know about topics we haven’t searched

# Learning and Knowing in Our Everyday Lives

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- Case study: GPS

# Case Study: GPS

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- Knowing where we are (place) and how to get to another point (space)
- Past and present of GPS (Greg Milner: *Pinpoint*)
  - GPS began as US military application to improve accuracy of bombs
  - Currently: nearly 3 billion mobile GPS apps
- Milner: “Ignore the GPS: That Ocean is not a Road”
  - Death by GPS

# Case Study: GPS (2)

- London black-car taxi drivers
  - “The Knowledge”: 320 routes; 25,000 streets; 20,000 landmarks/places of public interest
  - Increased size of hippocampus (Maguire et al.)
- Hippocampus: Regulates spatial orientation
  - One of first parts of brain to deteriorate in patients with Alzheimer’s (Kaplan)
  - Is GPS our version of lead pots in ancient Rome?
    - Likely challenge for hippocampus: use it or lose it
- The winds of change in London
  - With Uber and GPS, move to eliminate requirement for “The Knowledge” (BBC)

# Case Study: GPS (3)

- Inuit hunters (in Igloolik region, northern Canada)
  - Research by Aporta and Higgs
- Issue
  - Traditionally, Inuit have “orient[ed] themselves by understanding wind behaviour, snowdrift patterns, animal behaviour, tidal cycles, currents, and astronomical phenomena”
    - Takes many years for young to acquire this knowledge
  - Challenges from coming of GPS
    - Few of the young are investing the time to learn
    - Straight line is not always a safe route (cliffs, ice floes)
    - Process needed for incorporation of GPS into Inuit cultural ecology (cf. rifle, snowmobile)

# Case Study: GPS (4)

- Recall: spatial orientation and Alzheimer's
  - Common problem with Alzheimer's: spatial location
- Cognition studies (see summaries in Edwards; Maxwell)
  - Issues: Does use of GPS
    - Lessen awareness of surroundings (Leshed et al.)
    - Reduce ability to navigate on one's own
  - McGill U research (Veronique Bohbot)
    - Building own cognitive maps (using landmarks) increased hippocampus activity; excessive use of GPS might lead to atrophy in hippocampus as people age
- ASIDE: Museum study
  - If photographed objects in a museum, less likely to remember what had seen than if they just observed the objects (Henkel)

# Digital Challenges to Learning, Knowing, and Remembering

- What do we want people to know?
  - Are search skills more important than memory?
  - Redefining relative importance of data versus information versus knowledge
- What are the cognitive implications of reading onscreen?
  - Research still in the early stages
  - “Using” digital texts rather than reading them
  - Do we pause to think as often when reading digitally as in print?
  - Does emphasis on plucking information from the internet (and not remembering it) diminish opportunities for integration with prior knowledge?

# Digital Challenges to Learning, Knowing, and Remembering (2)

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- Are learning and memory sources becoming ephemeral?
  - Digital, audio: yes
  - Print: also increasingly ephemeral
    - Renting textbooks
    - Giving away, throwing away books
- Will our technology always work?
  - What do we know when the internet is down?
  - GPS: *In techno speramus?*

# The Choice is Up to You!

(“9 of the most epic GPS failures”)



# Thank you

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Naomi S. Baron

Fulbright Specialist

Professor of Linguistics

American University

Washington, DC USA

[nbaron@american.edu](mailto:nbaron@american.edu)

*Words Onscreen:*

*The Fate of Reading in a Digital World*

(Oxford University Press, 2015)