

## **Psychology 134: Technology Assisted Reading Acquisition**

### **Dom Massaro**

Interdisciplinary Course: Linguistics, Psychology, Engineering Sciences, Cognitive Sciences, Infant Development, Language and its Acquisition, Speech, Reading, Literacy, Economics & Business, Technology

### **Learning Objectives:**

The primary learning objective is to achieve an understanding of language and its acquisition.

### **Grading and Evaluation**

Class Participation (20%): Class participation consists of commenting in class, correspondence with the instructor, TA, or other students about the course content.

Quizzes and Exercises (40%): Short Learning Modules will be presented in class and students will complete 8 periodic quizzes or short exercises. For example, after relevant readings and lecture material on the differences between a nativist and empiricist account of language acquisition, students will be asked to list two findings and describe why they are consistent with one alternative but not the other.

Paper and Project (40%): One papers (20%) and one projects (20%) will be required. A student might write a paper on three differences between spoken and written language and the implications of these differences for language acquisition in their respective modalities. A small project might involve the design of an automated system that would augment a child's experience with language.

This is a 5 credit course. Lectures and discussion including quizzes and exercises will be 3.5 hours, readings will require about 8 hours, and peer reviewing, project and paper will require an average of 3.5 hours per week, totally 15 hours per week.

### **Note that topics roughly correspond to weeks.**

**Topic 1:** We begin with an overview of the scientific process because the research and theory discussed in the class will consist of alternative perspectives and the students will learn how different perspectives are developed and evaluated. This process will enhance their critical thinking skills.

#### **1) Genesis of and Exploration of an Idea**

- i) Where and When Ideas
  - (1) Experience
    - (a) Becoming an Expert
  - (2) Creativity
    - (a) Lateral Thinking
- ii) Testing Ideas
  - (1) Hypothesis Testing
    - (a) Potential Pitfalls
    - (b) Strong Inference
  - (2) External Validity
    - (a) Facing Complexity

- (b) Challenge of Applications
- iii) Distinguishing Science From Pseudoscience
  - (1) Ten Criteria
  - (2) A Real Example
    - (a) Initial Promising Results
    - (b) Meta-Analysis
    - (c) Continued Practice
      - (i) Time on Task

**Topics 2, 3, and 4:** There have been two primary theoretical frameworks to describe language and its acquisition. The nativist position holds that language and its acquisition are unique depend on a considerable amount of innate abilities, and unlike other perceptual and cognitive functions. The empiricist position holds that very little, if any, of language depends on innate abilities and its acquisition can be accounted for by typical perceptual and cognitive processes. To evaluate these two theoretical frameworks, we will learn about language structure, how it is used, and how it is acquired.

## **2) Language Structure**

- i) Duality of Patterning
  - (1) Phonology
  - (2) Morphology
  - (3) Syntax
- ii) Supplemental aspects of language
  - (1) Prosody
  - (2) Iconicity
  - (3) Multimodal communication
    - (a) Gesture
    - (b) Facial expression and visual speech

## **3) Language Comprehension And Production**

- i) Theories
  - (a) Interdependencies
  - (b) Comparison between modalities
- ii) Empirical Results
  - (a) Interdependencies
  - (b) Comparison between modalities
  - (c) language acquisition
    - (i) Innate vs. Learned
    - (ii) Critical periods
- iii) Spoken vs. Written Language
  - (1) Learning
    - (a) Live vs. 2D Media
  - (2) Traditionally different purposes
    - (a) Casual vs. formal
    - (b) Recent uses
      - (i) Email and text messaging
  - (3) Pitch of language
    - (a) Talk vs. books

## **4) Acquiring Language**

- i) Current Views
  - (1) Nativist
    - (a) Chomskyan

- (b) Specialized processes
- (2) Empiricist
  - (a) Perception
  - (b) Association
  - (c) Statistical
- ii) Modality in language evolution
  - (1) Speech vs gesture
  - (2) Live vs. Virtual Media
- iii) Distal vs. Proximal Influences
- iv) Early exposure to written language
  - (1) Picture book reading
  - (2) Labeling experiences

**Topic 5:** To set the stage for assessing the possibility of naturally acquired reading, we will explore speech perception and how it is acquired. Speech has also had two alternative theoretical frameworks, and we will consider the relevant research that addresses their differences. The goal of this assessment is to better understand what is required for speech perception and its acquisition and how these requirements compare to the natural acquisition of reading.

### **5) Speech Perception and Sign Language Perception**

- i) Current Views of Speech Perception
  - (1) Motor Theories of Speech Perception
  - (2) Pattern Recognition Theories
- ii) Relevant Research
  - (1) Face-to-Face Speech Perception
    - (a) Technology and Research
      - (i) Supplementing visible speech
      - (ii) Automated real-time speech processing
      - (iii) Learning new cues to speech
  - (2) Formal Models of Speech Perception
    - (a) Categorical Perception
    - (b) Fuzzy Logical Model of Perception
    - (c) Tests of Models

**Topic 6:** As covered in Topic 5, it is commonly believed that spoken and signed languages are acquired from birth onward by natural interactions with persons who talk whereas learning to read requires formal instruction and schooling. We consider the hypothesis that once an appropriate form of written text is made available early in a child's life before formal schooling begins, reading will also be learned inductively, emerge naturally, and with no significant negative consequences. We will examine the role of perception and action modalities in language acquisition and use and compare spoken and signed languages to written languages.

### **6) Acquiring Literacy Naturally**

- i) Defining Literacy
  - (1) A World Without Writing
  - (2) A World With Writing
- ii) Current Views of Language
  - (1) Innate and Specialized
  - (2) Learned and General
- iii) Language Modality
  - (1) Speech is Special

- (2) Reading Unnatural
- iv) Alternative View
  - (1) Brain, Body, and Cultural Considerations
  - (2) Pattern Recognition

**Topic 7:** Given the possibility of naturally acquired reading, we will review the nature of reading and how it is currently taught. This discussion will highlight the assumptions in current practice and how they compare to the possibility of naturally acquired reading.

### **7) Implications: Reading and Learning to Read**

- i) Written Language
  - (1) Orthographic Structure
  - (2) Written to Spoken Correspondences
- ii) Two Ways to Read
  - (1) Phonological Mediation
  - (2) Direct Access
- iii) Theories of Reading
  - (1) Via Speech or Not
  - (2) Pattern Recognition

**Topic 8:** We will describe the demographics of literacy and illiteracy and their social and economic implications. The cost of illiteracy as well as the huge cost of formal literacy instruction is one of the major financial burdens on societies.

### **8) Implications: The Global Literacy Problem**

- i) Language Modality
  - (1) Speech is Special
  - (2) Reading Unnatural
- ii) Defining Literacy
  - (1) A World Without Writing
  - (2) A World With Writing
- iii) Economic Burden
  - (1) Cost of Literacy
  - (2) Cost of illiteracy

**Topic 9:** We will study the implications of naturally acquired literacy on individuals who are spoken and/or written language challenged because of deafness or other impairments.

### **9) Implications: Language Challenged Individuals**

- i) Challenges
  - (1) Deafness
    - (a) Demographics
    - (b) Oral and Sign Languages
  - (2) Speech Language Impairment
    - (a) Categories
    - (b) Interventions
  - (3) Dyslexia
    - (a) Categories
    - (b) Interventions
- ii) Late vs. Early interventions
  - (1) Time on Task
  - (2) Neurological Contributions

**Topic 10.** We will review past technological developments to set the stage for peering into the future. We will the various technologies available or soon to be available that will allow the growing children to experience an augmented reality that will be capable of supplementing their real world experience with various forms of language generated automatically.

**10) The Technological Future**

- i) Prior Revolutions
  - (1) Writing
  - (2) Printing Press
- ii) Current Revolution
  - (1) MLDs Mobile Learning Devices
  - (2) On the Horizon
  - (3) Retrospective

**Reading List and Web Sites:**

The topic numbers below correspond to the descriptions given above. All readings will be available electronically and free if possible

**Required Readings**

**Topic 1:**

[http://en.wikipedia.org/wiki/Confirmation\\_bias](http://en.wikipedia.org/wiki/Confirmation_bias)

Massaro, D.W. (1989). *Experimental Psychology: An Information Processing Approach*. New York: Harcourt Brace Jovanovich. Chapter 5. The Scientific Process.

**Topics 2, 3 and 4:**

Golinkoff, R., and K. Hirsh-Pasek. 2008. How toddlers learn verbs. *Trends in Cognitive Science* (12)397–403.

<http://en.wikipedia.org/wiki/Language>

Infant Vision: Birth to 24 Months of Age. <http://www.aoa.org/x9420.xml>. Accessed 17 December 2011.

Scholz, B. C., and G. K. Pullum. 2006. Irrational nativist exuberance. In *Contemporary Debates in Cognitive Science*, ed. Robert Stainton, pp. 59–80. Oxford: Basil Blackwell.

Werker, J. F., Yeung, H. H., & Yoshida, K. A. (2012). How Do Infants Become Experts at Native-Speech Perception? *Current Directions in Psychological Science*, 21, 221-226. <http://cdp.sagepub.com/content/21/4/221>

**Topic 5:**

Massaro, D. W. (2012b). Speech Perception and Reading: Two Parallel Modes of Understanding Language and Implications for Acquiring Literacy Naturally. *American Journal Psychology*, 125, 307-320.

Massaro, D. W., Cohen, M. M., Tabain, M., Beskow, J., & Clark, R. (2012). Animated Speech: Research Progress and Applications. In G. Bailly, P. Perrier & E. Vatikiotis-Bateson (Eds.) *Audiovisual Speech Processing*. (pp. 309-345). Cambridge: Cambridge University Press.

**Topic 6:**

Beddinghaus, T. 2010. Top 5 Milestones in Vision Development. [http://vision.about.com/od/childrensvision/tp/vision\\_develop.htm](http://vision.about.com/od/childrensvision/tp/vision_develop.htm). Accessed May 29, 2011.

Infant Vision: Birth to 24 Months of Age. <http://www.aoa.org/x9420.xml>. Accessed 17 December 2011.

- Kwon, M-Y., Legge, G.E. & Dubbels, B. (2007). Developmental changes in the visual span for reading. *Vision Research*, 47, 2889-2900.
- Massaro, D. W. (2012). Acquiring Literacy Naturally: Behavioral science and technology could empower preschool children to learn to read naturally without instruction, *American Scientist*, 100, 324-333.
- Sakai, K. L. 2005. Language acquisition and brain development. *Science* 310(4)815–819.

### **Topic 7:**

- Massaro, D.W. (1989). *Experimental Psychology: An Information Processing Approach*. New York: Harcourt Brace Jovanovich. Chapter 20: Reading.
- Massaro, D. W., and A. Jesse. 2005. The magic of reading: Too many influences for quick and easy explanations. In *From Orthography to Pedagogy: Essays in Honor of Richard L. Venezky*, eds. T. Trabasso, J. Sabatini, D. W. Massaro and R. C. Calfee, pp. 37–61. Mahwah, NJ: Lawrence Erlbaum Associates.

### **Topic 8:**

- Drop Out Rates (2011). <http://www.pajamaprogram.org/literacy.html>
- Education-Portal.com. (2010). [http://education-portal.com/articles/Illiteracy:\\_The\\_Downfall\\_of\\_American\\_Society.html](http://education-portal.com/articles/Illiteracy:_The_Downfall_of_American_Society.html). Accessed November 12, 2010.
- Heckman, J. J. 2008. Schools, skills and synapses. *Economic Inquiry*, S46(3):289-324.
- <http://en.wikipedia.org/wiki/Literacy>
- <http://literacy.kent.edu/Oasis/Pubs/econlit.htm>
- Laubach Literacy Statistics (2011). <http://www.policyalmanac.org/education/archive/literacy.shtml>. Accessed June 2, 2011.

### **Topic 9:**

- Goldin-Meadow, S. & Mayberry, R. I. (2001). How do profoundly deaf children learn to read? *Learning Disabilities Research and Practice* (Special issues: Emergent and early literacy: Current status and research directions), 16, 221-228.
- Massaro, D.W. (2006). Embodied Agents in Language Learning for Children with Language Challenges. In K. Miesenberger, J. Klaus, W. Zagler, & A. Karshmer (Eds.), *Proceedings of the 10th International Conference on Computers Helping People with Special Needs, ICCHP 2006* (pp.809-816). University of Linz, Austria. Berlin, Germany: Springer

### **Topic 10:**

- HUD (2011). Head Up Display. [http://en.wikipedia.org/wiki/HUD\\_%28video\\_gaming%29](http://en.wikipedia.org/wiki/HUD_%28video_gaming%29). <http://online.wsj.com/article/SB10001424052702303610504577418181348485336.html>. Accessed November 22, 2011).
- Massaro, D. W. (2011a). Method And System For Acquisition Of Literacy. Patent Application Number 13/253,335, October 5, 2011.
- The Diamond Age: Or, A Young Lady's Illustrated Primer by Neal Stephenson. Bantam Spectra.