**COGNITIVE TOOLS & COGNITIVE PROSTHETICS:**
TECHNOLOGY TO SUPPORT LANGUAGE, LEARNING & COGNITION

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## Why Are We Here Today?



*"It keeps me from looking at my phone every two seconds."*

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## Objectives

- Identify Learning, Language & Cognitive strengths and weakness in individuals (personal characteristics).
- Increase awareness, understanding of how specific tools:
  - Interact with and assist an individual's strengths
  - support their weaknesses
  - and interact with their unique language, learning and cognitive skills to create access

## Physical Access

## Cognitive Access

- https://www.youtube.com/watch?v=BIakZtDmMgo

## Cognitive Access

## Cognitive Prosthesis

"**assistive technology** that helps a person with **cognitive deficits** function more independently in certain tasks...a compensatory strategy that directly assists the individual in performing daily activities. It helps a person to **maximize their strengths and abilities to compensate for their deficits** (Institute for Cognitive Prosthetics, 2004 p. x)."

## Cognitive Prosthesis

- The need for a cognitive prosthesis should be considered **when an individual fails to independently perform tasks involving significant cognitive functioning** (e.g., memory, speed of recall, computation, problem solving, automaticity) at a level that approximates the performance routinely demonstrated by his/her peers.
- **A tool** (e.g., device, hardware, software, web site) **serves as a cognitive prosthesis for any individual when s/he is able to demonstrate greater success** (e.g., accuracy, reduced time to complete the task, increased quality of performance) in completing a task involving significant cognitive functioning than is possible when they complete the same task in unaided situations (i.e., naked independence).
- The claim that a tool serves the function of a cognitive prosthesis must be **evaluated by assessing performance on a cognitive functioning task under two conditions, with and without the use of the tool, over time.**

Edyburn, D., (2005). Cognitive Prostheses for Students with Mild Disabilities: Is This What Assistive Technology Looks Like? *Journal of Special Education Technology* p.62-65

## Cognitive Load (Sweller)

Driving in normal road conditions…



20% to talk with a friend

5% to listen to music

50% of attention to driving

15% to monitor the back seat

What happens when you hit a patch of ice?

## How Much Failure Data Do We Need?

- If a person is struggling with handwriting such that tasks such as forming letters correctly or spelling correctly are interfering with the expression of ideas on paper, could the following be considered a cognitive prosthesis?

A. Dragon Dictation
B. Access to a keyboard
C. Predictive Text (E.g., Write:Outloud)
D. Hand Held Talking Speller
E. Word Bank/Cloud (Wordle, Classroom Suite)

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- If a person is struggling with organization, completing assignments and/or turning them in on time due to difficulties with executive functioning or memory, could the following be considered a cognitive prosthesis?
- Google Calendar
- Daily Planner
- Word or Picture Schedule
- Audio Memos
- myHomework Student Planner (App)

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- If a person is struggling with decoding print materials (books, text books, directions on worksheets, story problems, etc.), could the following be considered a cognitive prosthesis?
- Text-to-speech (E.g., Bookshare, Voice Over, Text Edit)
- Audio Books (E.g., Reading Ally)
- Auto Summary
- Talking Dictionary
- Supported Reading Software (E.g., Hypertext, font size, highlighting)
- Siri

- If a person is struggling with understanding (language comprehension) of spoken information, could the following be considered a cognitive prosthesis?
  A. Recording the lecture, allow person to listen to it multiple times or pause it  (audio memos, <u>live scribe pen</u>)
  B. Note taker/Peer Note taker, decrease cognitive load, do one thing as a time (<u>live scribe pen</u>)
  C. Pair auditory information with visual information (Google images, Power Point Presentation, <u>Boardmaker</u>, <u>news2you</u>)

## Cognitive Tool

- A technology we learn with and from, not just through (Jonassen, 1994)

## Activity Theory



Tools    Semiotics

Outcome

Subject    Object
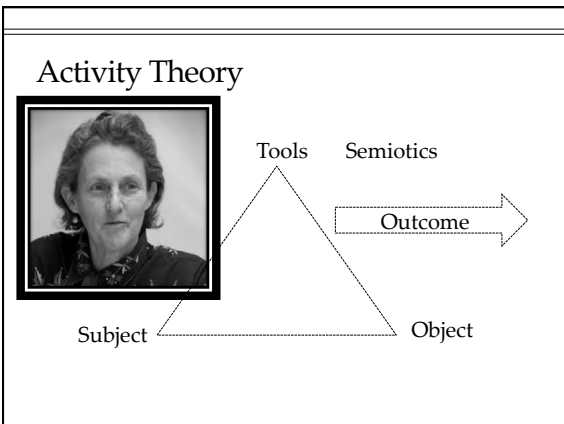
## Language is a Cognitive Tool

- Assumptions
  - Constructivist Learning Principals
    - Children are active in their construction of knowledge through the use of artifacts and symbols
    - Knowledge is gained in a social context by interacting with the environment and people

The Speech Generating Device as a Cognitive Tool:
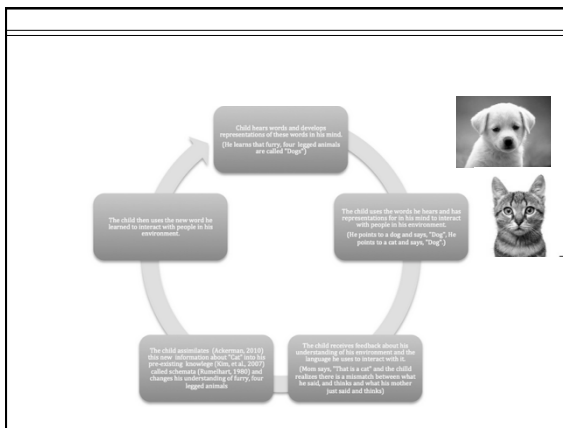http://www.augmentoregon.com/blog/the-speech-generating-device-as-a-cognitive-tool



## Cognitive Tools (Cont)

- engage and facilitate cognitive processing
- They scaffold the all-important processes of articulation and reflection, which are the foundations of knowledge construction.
- " Because of the interactive nature of technology and the power of its information-processing capabilities, Jonassen (1996) proposes that when students learn with technology, it becomes a "mindtool." He defines mindtools as "computer-based tools and learning environments that have been adapted or developed to function as intellectual partners with the learner in order to engage and facilitate critical thinking and higher-order learning"
- " Cognitive tools are technologies that learners interact and think with in knowledge construction, designed to bring their expertise to the performance as part of the joint learning system." (Kim and Reeves (2007:224)

- Shim and Lee (2006), Lajoie (1993, p. 261) summarized that cognitive tools can benefit learners by serving the functions as follows:
  - Support cognitive processes, such as, memory and metacognitive processes
  - Share the cognitive load by providing support for lower level cognitive skills so that resources are left over for higher order thinking skills
  - Allow the learners to engage in cognitive activities that would be out of their reach otherwise
  - Allow learners to generate and test hypotheses in the context of problem solving

- Cognition is distributed between learner(s) and a cognitive tool;
- The way in which cognition is distributed is first determined by the intentions of tool designers, i.e., tool affordances; and
- It can then affected by how the learners decide to use it in specific situations (Kim and Reeves, 2007)

# Embodied Cognition
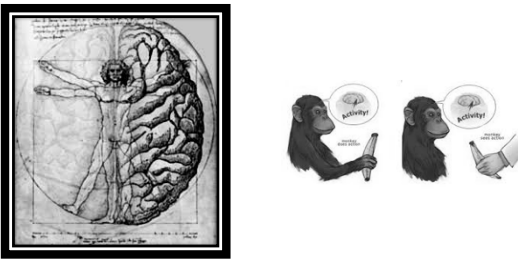
## Examples of Cognitive Tools

• Augmentative & Alternative Communication Systems
• Text-to-speech (scaffolding)
• Supported Reading Software (metacognition!)
• Social Stories
• Other….

## Vygotsky

## Questions?

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