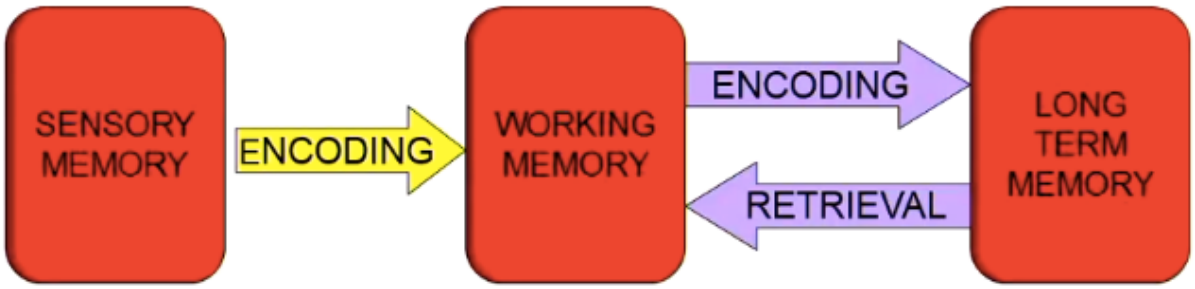
EDUC262: The Learner
Lecture Notes

Lecture 1: Information Processing

What is info processing?

- Remembering, problem solving, thinking, analysing
- Teachers: encourage info processing e.g. analyse facts, make decisions, creativity
- Assumptions
    - Info is actively processed in memory
    - Memory systems are functionally separate
    - Processing capacity is limited
    - Processing may be effortful and automatic
- Modal Model
    - Many info processing models proposed, common elements
    - Sensory memory - where info comes in, some unconscious
    - Working memory - conscious
    - Long term memory - store, knowledge/skills
    - Limitations:
        - Suggests all processing is sequential
        - Over-reliance on the computer metaphor - hardware is predictable/tidy, neural wetware is noisy and unstable
        - Doesn't represent the brains complexity
    - Abstract representation



MEMORY	FUNCTION	LIMITATIONS
SENSORY MEMORY	Registers sensory information	- Duration of ½ sec (visual) - Duration of 3 sec (auditory)
WORKING MEMORY	Organises information Rehearses information Discards information	- Capacity of 7 ± 2 - Duration of 20-30 sec
LONG TERM MEMORY	Stores information	- None known

- What develops over time?
    - Processing speed/efficiency, memory capacity, ability to guide attention, use of memory strategies
    - Metacognitive control, general knowledge, automatic processing, conceptual understanding

Automatic and Effortful processing

- Effortful processing - focus of attention, controlled
    - Practice leads from effortful → automatic
- Automatic processing - no intentional effort, without awareness/choice
    - Advantageous - doesn't interfere with other processing
    - Much processing is already automatic

Sensory memory and perception

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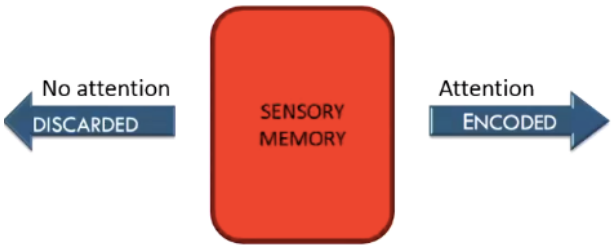
- (Stimulus) → Sensory Memory → (attention) → Working Memory
- Sensation: experience incoming info via senses
- Storage: info is represented in literal form
- Perception: limited interpretation occurs automatically
- Visual register - info available for ½ sec
- Auditory register - info available for 3-4 secs
- Early Development
    - Ability to detect sensations increases in early months of life
    - Ability to perceive some social stimuli - automatic, evolutionarily adaptive
    - Ability to perceive most things - develops with maturation/experience e.g. depth perception
- Background knowledge helps brain to assign meaning to stimuli
- Perception and Context
    - Meaning is relative, not absolute
    - Implication: teachers must define context clearly

Classroom Implications

- Info processing capacity is limited - don't overload students
- Info processing becomes more automatic with practice - time for engagement and re-engagement
- Perception bound by background knowledge - build from what is already known
- Perception bound by contact - explicitly describe context

Lecture 2: Attention



What is Attention?

- Notice or concentrate on something
- Allocation of cognitive resources
- Moves info from WM, keeps into in WM
- We intuitively attend to:
    - Strong stimuli
    - Stimuli that is 'novel in moderation' (need to understand)
- Use selective attention to:
    - Concentration on chosen stimuli
    - Ignore distracters
- Selective Attention - Hagen and Stanovich (1977)
    - Findings: across ages, recall of animals increases - from age 11, household items recall decreases
    - Implications: older children better at selectively attending
- Inattentional Blindness - info not attended to does not reach conscious awareness and is discarded

Attention and Perception

- When does attention occur?
    - Early selection model - select only
    - Attenuated processing model - attend to some things, not others
    - Full processing model - select things, attend everything
- Depends on task difficulty
    - Monitor everything for easy tasks
    - Attenuated processing for resource limited tasks

Development

- What develops?
    - Ability to sustain attention - attention span
    - Ability to ignore distractions - selective attention, choose to attend to and block out
    - Ability to guide attention - attentional control, how you work with your attention
- Sustained attention - Ruff et al. (1998)
    - Measures and Procedure: watched video of puppets with unpredictable delays, watched a screen and hit button if rabbit appeared and participated in construction or make-believe play

    - Findings: attention span increased with age, inattention decreased with age, variation by task
- Attentional Control - Kovshoff et al. (2015)
    - Measures and procedures: selective attention (big shapes then small shapes), divided attention (either shape)
    - Findings: selective attention much slower < 10yrs, divided attention performance 8 < 10 < 12yrs
- Development in Adolescence - Zhan et al. (2011)
    - As age increases - decrease in errors, tasks faster, better attention

Individual differences

- Changes over time and environment
- Different rates of development
- Temperament differences
- ADHD
- Important: these children can learn and can do exceptionally well but teachers must be active partners in process

Maintaining Attention

- Engagement
    - Vary activity, pitch and tone
    - Provide opportunities for student choice
    - Ensure active processing
    - Ensure appropriate task difficulty
    - If needed, take a mini-break and refocus
- Circularity
    - "Explanations punctuated time and time again by returning to key point"
    - Explicit and clear instruction
    - Redirection and refocus
    - Builds on a scaffold of increasing knowledge
- Classroom Implications
    - No attention, no learning
    - Make it engaging!
    - Remove distractors; bells and whistles
    - Guide attention and attentional strategy use
    - Avoid a vicious cycle: repeat instruction if needed

Lecture 3: Working Memory

What is working memory?

- Temporary
- Processing centre - thinking, reasoning
- "Short term memory" - changed in 90's to working memory
- Conscious awareness

Duration and capacity

- 20-30s
- Must use info to keep it active - rehearsal, organisation, other cognitive activity
- To retrieve later, must encode to LTM
- Memory span:
    - 7 items or chunks
    - Variation by individual
    - Little Variation by 'bits per item'
- Element Interactivity - degree of interaction required between chunks
    - Limits capacity further
    - Low interactivity - vocab
    - High interactivity - grammar and sentence structure

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