

Insight U Presents:

How people learn

In  
simulation

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# Learning

The goal of education is to acquire **knowledge and skills** that are usable in novel problems at a later time; learning is the ability to *transfer* formal knowledge to new situations.

# Factors to consider in learning

To understand how people learn, we must consider how the different elements of learning are defined, researched and measured

# Science of learning

- **Introspection** - self-report; self-assessment; reflection
- **Behaviourism** - only observable is reliable; experiential learning
- **Cognitivism** - subconscious and conscious processes influence learning; direct and indirect measures; long term and working memory
- **Cognitive Neuroscience** - specialized areas of the brain for processing important information; associations and memories can be mapped

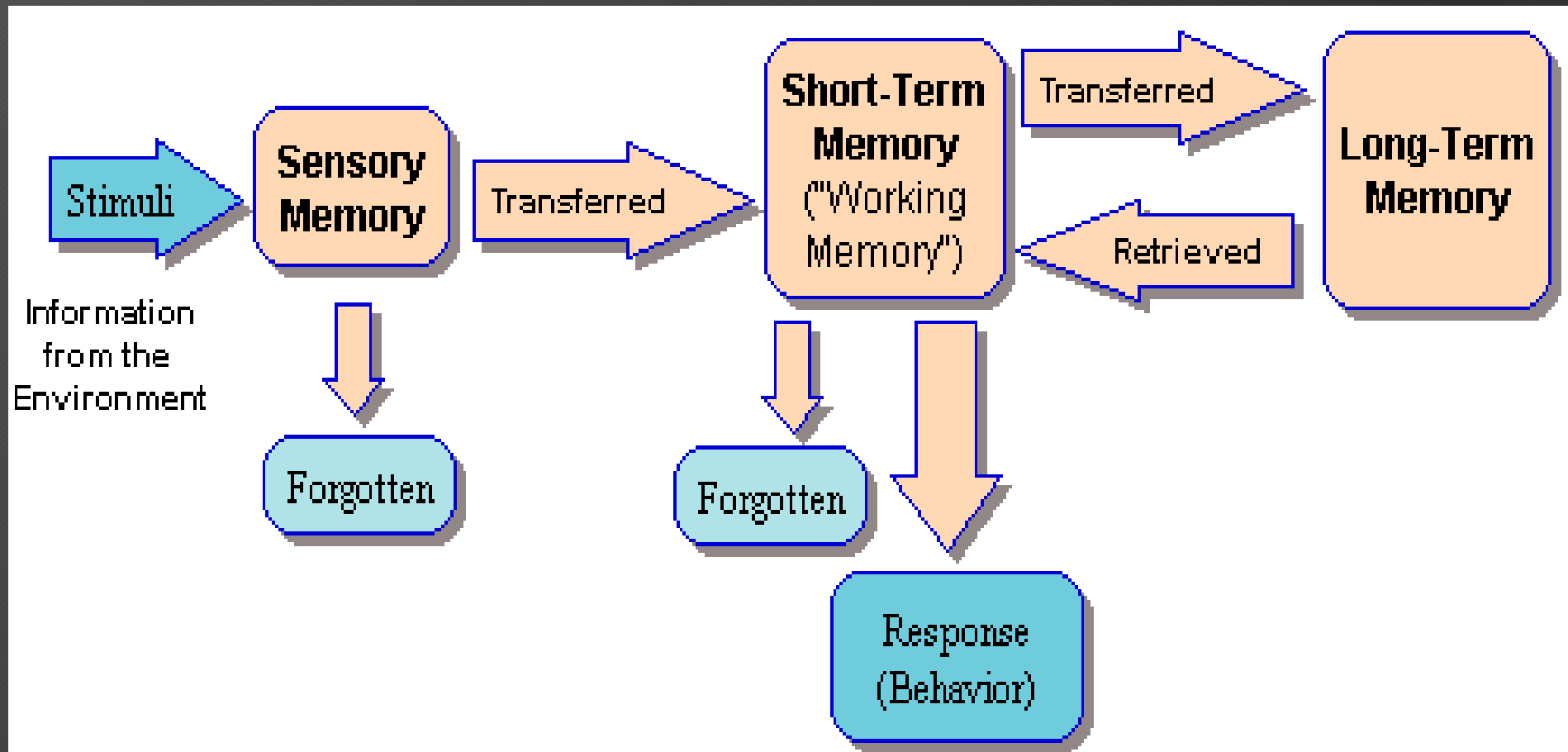
# Misconceptions from the Science of Learning

- Introspection - self-assessment is entirely accurate; self-report is entirely valid
- Behaviourism - behavioral indicators are perfect predictors of later performance
- Cognitivism - direct measures access conscious processes only; indirect access subconscious; there is a value assigned to one process over the other
- Cognitive neuroscience - left and right brained; analytic and non-analytic personalities

# Useful findings from the Science of Learning

- Introspection - conscious reflection and intentionally making associations helps learning (limitations)
- Behaviourism - encourages rigorous science; correlation is not causation
- Cognitivism - learning occurs through explicit and implicit means, helps learning to reduce exposure to unnecessary information
- Cognitive Neuroscience - serotonin and dopamine play a role in learning, areas of activation for expertise

# Information Processing Model



# Memory

- Sensory - momentary capture of input (visual sketchpad or phonologic loop)
- Long term - massive storage capacity; due to building of associations; events can be recreated from elements
- Working - consciously accessible; limited in capacity



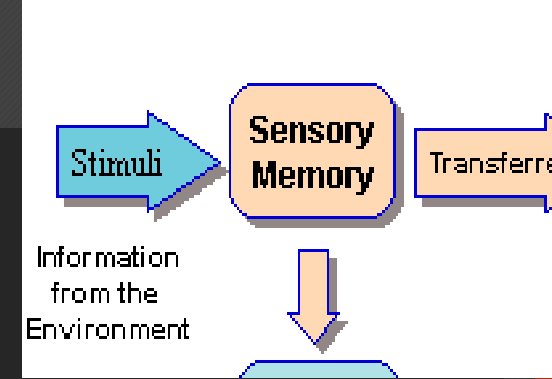
# Remembering

- Intentional recall
- Familiarity
- Recognition

# Memory mistakes (or different ways to fail to remember)

- Forgetting
  - Transience - associations are lost
  - Absent mindedness - often due to lack of attention
  - Blocking (tip of the tongue)
- Distortion
  - Misattribution - association gone wrong
  - Suggestibility - memory illusions (Loftus)
  - Bias - perception or beliefs influences memory (also what we know influences what we perceive)
- Intrusion
  - Persistency

# Perception



- Bottom-up
  - Data driven
  - I.e. What your retina actually captures
- Top-down
  - Conceptually driven
  - I.e. Application of previous knowledge aids you in recognition

# Bottom-up and Top-Down



# Science of Learning - Direct and indirect measures

- Declarative knowledge - recall and recognition (personal experiences and facts)
- Procedural knowledge - procedural *skills; showing how* - may not translate into *knowing how*
- *Transfer - near or far*

# Factors to consider in learning

Not all skills are *procedures* - clinical reasoning skills for example reflect the quality and quantity of clinical content and an integration of multiple experiences - *clinical reasoning skills* cannot be taught directly or in discrete elements as if it were a series of steps to follow

# Factors to consider in learning

When faced with novice learners, educators should consider how to manage cognitive load, to create associations and to facilitate deliberate practice

# Factors to consider in learning

When faced with expert learners, educators should be conscious of the advantages and disadvantages of pattern recognition as well as the role for reflection in learning and reasoning.



# Things we know or think we know

It is essential that students learn self-assessment skills so they can become successful lifelong learners

WRONG - more accurate terminology addresses self-monitoring skills and incorporates feedback from coaches, peers and mentors

# Things we know or think we know

Learning in context assures transfer to the work situation.  
Successful simulations must closely resemble the real world  
(authenticity, high fidelity)

WRONG - attempts to increase 'fidelity' can negatively impact learning, especially for novice learners

# Things we know or think we know

E-learning has clear and consistent advantages over alternative approaches. Today's students learn better in a virtual environment

WRONG - there is no evidence that technology alone improves learning. Place learning content online may make it more accessible, but may also make it less effective

# Things we know or think we know

Multiple choice tests are overused. Too much testing interferes with learning.

WRONG - MCQs are an excellent way to supplement self-monitoring and to develop some personal insights about knowledge acquisition and skill development

# Test enhanced learning

- The theoretical explanation behind the benefits of testing refer includes retrieval practice - the act of remembering some piece of information, makes it more accessible, and possibly more memorable for the future

# Implications for Teaching

- Testing is similar to practice and is critical for learning and transfer
  - to impose meaning on concepts
  - to overcome “context specificity”
  - to enhance transfer

# Practice formats that create associations

- Testing - novelty of content matters
- Mixed practice - readiness of learners matters
- Distributed practice - consistent benefits
- Integrate different sciences - small but consistent effects
- Deliberate practice - feedback specifically for improvement
- Master learning - practice until perfect

# Managing Cognitive Load

- Reduce strain on working memory for irrelevant information
  - Don't use Augmented reality
  - Limit use of high fidelity contexts
  - Worked examples benefit novices



# Thank you for joining in the discussion

Please direct questions about content in this presentation to Sandra Monteiro

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