The Science of How we Learn

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Repetition
Reinforcement
Conditioning
Imprinting
Mimicking
Working memory
Creativity and innovation

Learning and innovation skills
- Critical thinking and problem solving
- Communication and Collaboration

Information media & technology skills
- Information literacy
- Media Literacy
- ICT literacy

Life & career skills
- Flexibility and adaptability
- Initiative and self-direction
- Social and cross-cultural skills
- Productive and accountability skills
- Leadership and responsibility

C21st framework
The search for strategies = 400+

<table>
<thead>
<tr>
<th>Brain Gym</th>
<th>Mindfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative problem solving</td>
<td>Mnemonics</td>
</tr>
<tr>
<td>Comprehension Monitoring</td>
<td>Monitoring</td>
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<tr>
<td>Concept Mapping</td>
<td>Note taking</td>
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<td>Critical thinking techniques</td>
<td>Planning</td>
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<tr>
<td>Discussion groups</td>
<td>Practice / Rehearsal</td>
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<tr>
<td>Distributed Practice</td>
<td>Practice Testing</td>
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<tr>
<td>Elaborative Interrogation</td>
<td>Re-reading</td>
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<tr>
<td>Environmental structuring</td>
<td>Retrieval cueing</td>
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<tr>
<td>Error monitoring</td>
<td>Selecting Main Idea</td>
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<tr>
<td>Examination skills</td>
<td>Self-monitoring</td>
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<tr>
<td>Help-seeking</td>
<td>Self-questioning</td>
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<tr>
<td>Highlighting/Underlining</td>
<td>Self-regulation</td>
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<td>Interleaved Practice</td>
<td>Sleep</td>
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<tr>
<td>Keeping records &amp; monitoring</td>
<td>Summarization</td>
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<tr>
<td>Learning Styles</td>
<td>Think Aloud</td>
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<tr>
<td>Listening &amp; Notetaking</td>
<td>Time Management</td>
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<tr>
<td>Memorisation</td>
<td>Underlining/Highlighting</td>
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</tbody>
</table>
A Model of Learning

Inputs

Skill → Prior Achievement
A Model of Learning

The Will: Dispositions

RESILIENCE – emotional strength

RESOURCEFULNESS – cognitive capability

REFLECTION – strategic awareness

RELATING – social sophistication

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The Thrill

Motivational strategies

Deep, Surface, Achieving: Motives and Strategies

Challenge

Success Criteria

Seeking to understand what success looks like

Having a sense of the standards desired

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A Model of Learning

Inputs

Skill

Exposing

Will

Embedding

Thrill
A Model of Learning

Inputs → Surface → Deep

**Skill**
- Exposing

**Will**
- Embedding

**SURFACE** (increase in quantity)
- One idea
- Many ideas

**DEEP** (change of quality)
- Relate ideas
- Extend ideas

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A Model of Learning

Skill
- Exposing

Will
- Embedding

Thrill

Outlining
- Rehearsal & practice
A Model of Learning

Inputs → Surface → Deep

Skill → Exposing → Outlining → Self regulation → Self talk
Will → Embedding → Rehearsal & practice → Self talk
Thrill
A Model of Learning

Inputs → Surface → Deep → Transfer → Outputs

Skill

Exposing

Embedding

Will

Rehearsal & practice

Self talk

Self regulation

Transfer

Outlining

Skill

Will

Thrill

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A Model of Learning

Inputs → Surface → Deep → Transfer → Outputs

Skill

Exposing

Embedding

Will

Outlining

Self regulation

Transfer

Rehearsal & practice

Self talk

Thrill

Environmental Structuring

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What is learning?

The process of developing sufficient surface knowledge to then move to deeper understanding such that one can appropriately transfer this learning to new tasks & situations.
The Evidence

1. Visible Learning
2. Lavery, 2009
3. Dutch team
   - Dignath, Buettner & Langfeldt (2008)
   - Donker, de Boer, Dignath, Kostons & Werf (2013)
6. Our SLRC meta-analysis
   10,000+ studies, 43,157 effects from about 12-16m students
No. of effects

Learning strategies  \( d = .60 \)
A Model of Learning

Inputs

Skill

Prior Achievement  9  8014  .77

No. metas  No. effects  ES

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# A Model of Learning

## The WILL

<table>
<thead>
<tr>
<th></th>
<th>No. metas</th>
<th>No. effects</th>
<th>ES</th>
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<tr>
<td><strong>Self-efficacy</strong></td>
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<td>Task Value</td>
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<td>Reducing anxiety</td>
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The Thrill: a. Motivation

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<td>TOTAL</td>
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<td>Similarities and differences</td>
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## Environmental structuring

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<td><strong>TOTAL</strong></td>
<td><strong>23</strong></td>
<td><strong>2865</strong></td>
<td><strong>0.28</strong></td>
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A Model of Learning

Inputs → Surface → Deep → Transfer → Outputs

Skill
- Prior achievement
  - Exposing

Will
- Self-efficacy
  - Embedding

Thrill
- Challenge Knowing success

Summarisation Organising
- Outlining

Planning Evaluation
- Self regulation

Transfer
- Detecting differences & similarities

Practice
- Rehearsal & practice

Self talk
- Self talk
- Self questions

Receiving feedback
### A. The right time for interventions

<table>
<thead>
<tr>
<th>Rank</th>
<th>Influence</th>
<th>Effect-size</th>
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<td></td>
<td>Whole language</td>
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### The Major Messages from this Meta-Synthesis of Learning Strategies

#### A. The right time for interventions

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<td>168</td>
<td>Problem based learning</td>
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<tr>
<td>184</td>
<td>Whole language</td>
<td>0.06</td>
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</table>
A Model of Learning

Inputs → Surface → Deep → Transfer → Outputs

Skill
- Exposing
- Embedding

Problem based learning
- Outlining
- Self regulation
- Transfer
- Self talk
- Rehearsal & practice

Will
- Thrill

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The Major Messages from this Meta-Synthesis of Learning Strategies

A. The right time for interventions

B. An over emphasis on surface knowing

Learning strategies
Teacher questions
Lesson observations
Test analyses
Visible Learning

90+% are surface
90+% are surface
90+% are surface
90+% are surface
90+% are surface

We privilege a grammar of surface learning
The Major Messages

A. The right time for interventions
B. An over *emphasis* on surface knowing
C. The mantra should be “surface to deep to transfer”
D. The importance of the skill, the will & the thrill (as both input and outputs)
"I've missed more than 9,000 shots in my career. I've lost almost 300 games. 26 times I've been trusted to take the game winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed."

~ Michael Jordan
Thank you

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