Practical approach to Skill Acquisition and Motor Learning

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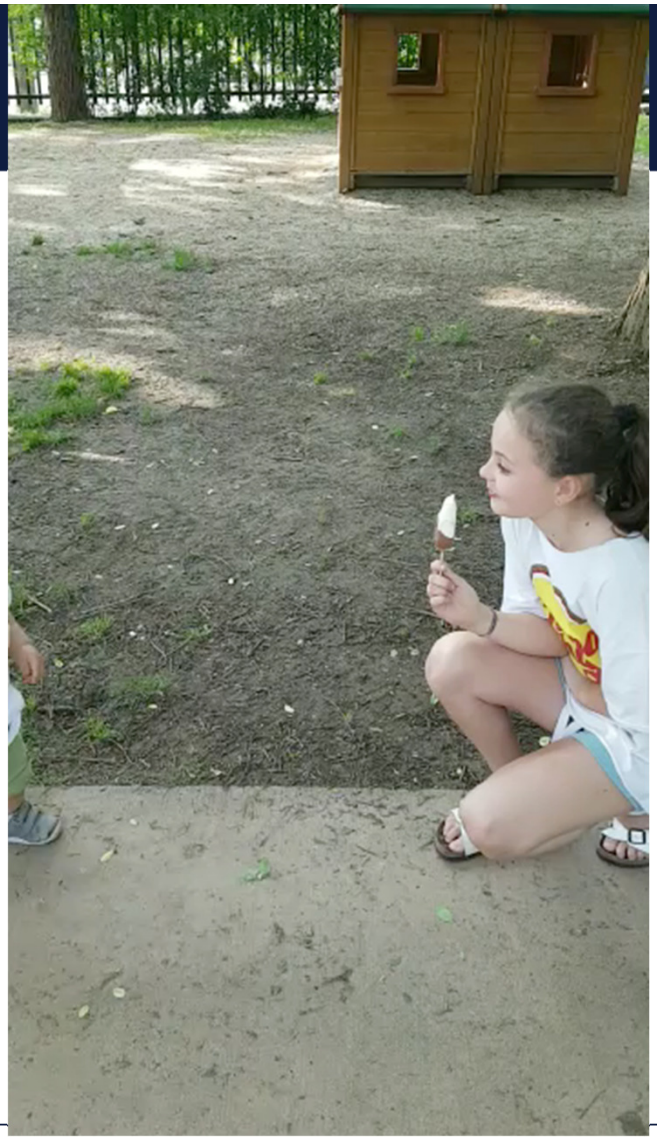
US SKI AND SNOWBOARD

How we learn

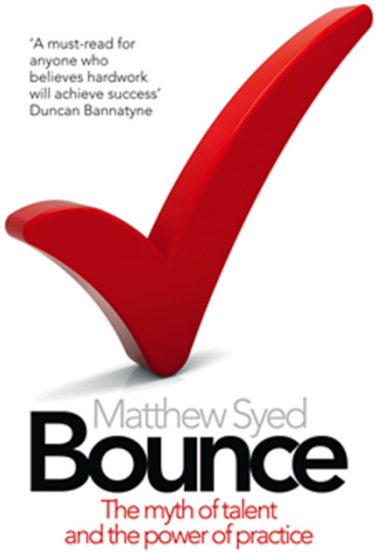


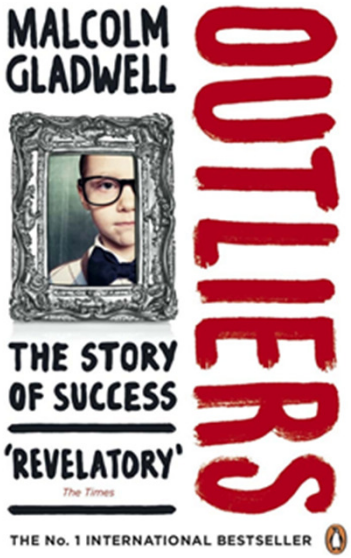
Definitions

- **Skill Acquisition** is the science that underpins movement learning and execution and is more commonly termed motor learning and control (Williams & Ford, 2009). Each stage embodies unique characteristics relative to an athlete's level of performance of a **skill** or activity.

- **Motor learning** has been defined as a “set of internal processes associated with practice or experience leading to relatively permanent changes in the capability for skilled behavior.”

Resources in Popular Writing





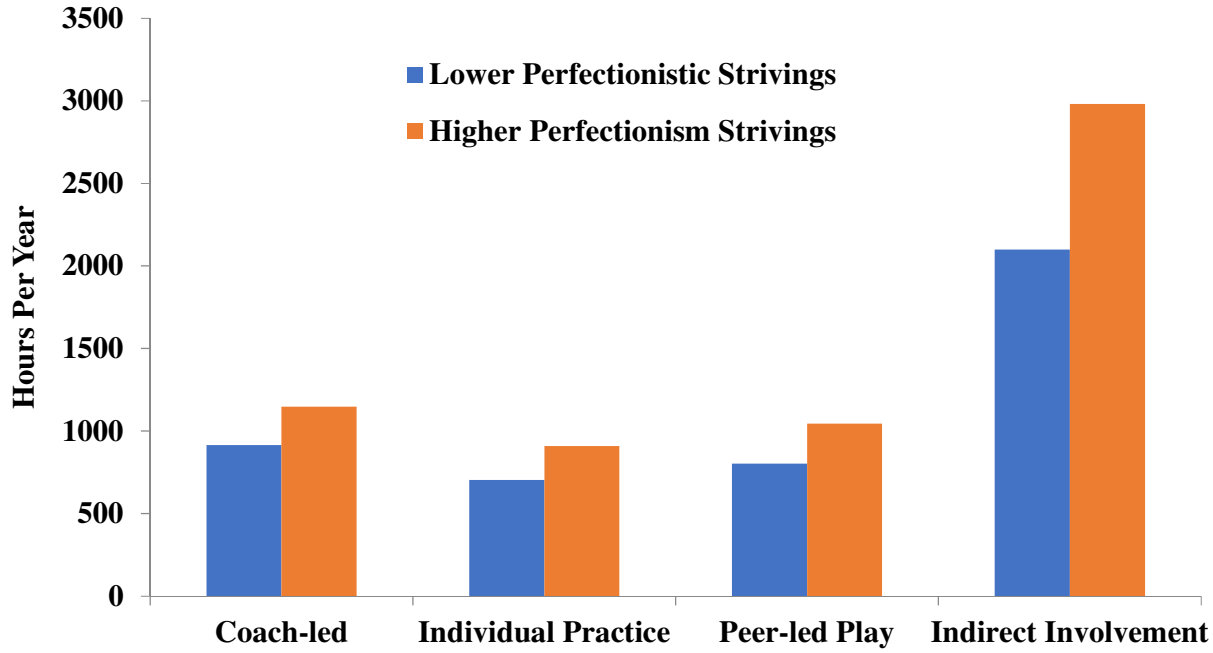
How the Experts Actually Train

- How experts practice differently?
  - More time devoted to weaker skills
  - More mental and physical effort invested
  - More self-reflection/cognitive engagement
  - Less enjoyable

Coughlan, Williams, McRobert, and Ford (2013) JEP: LMC

How the Experts Actually Train

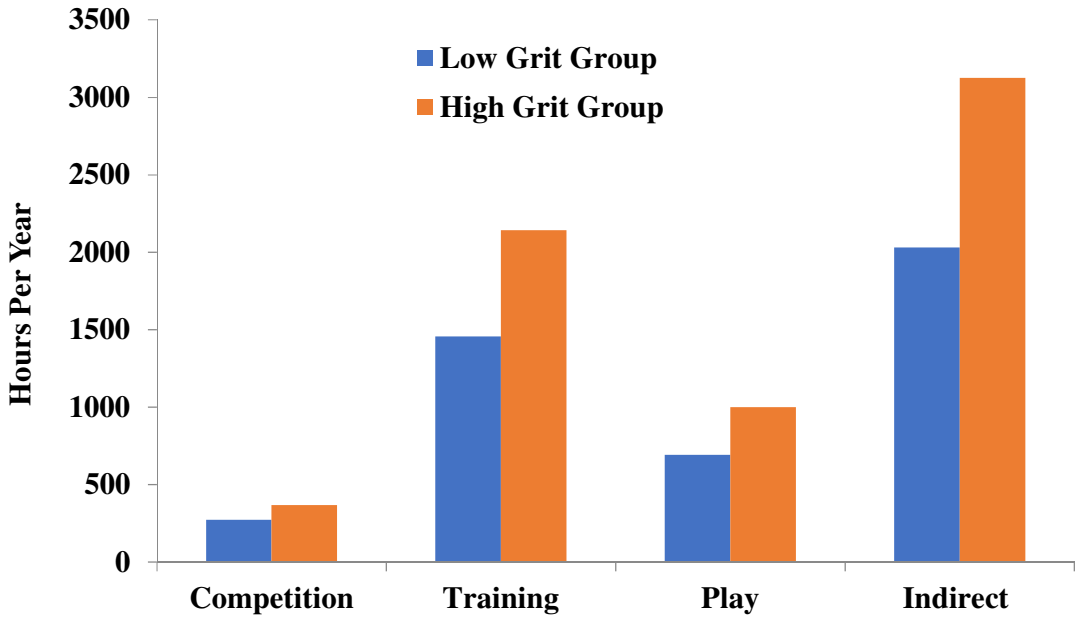
Perfectionism and Practice



Larkin, O'Connor, and Williams (2016) JASP

How the Experts Actually Train

Grit and Practice



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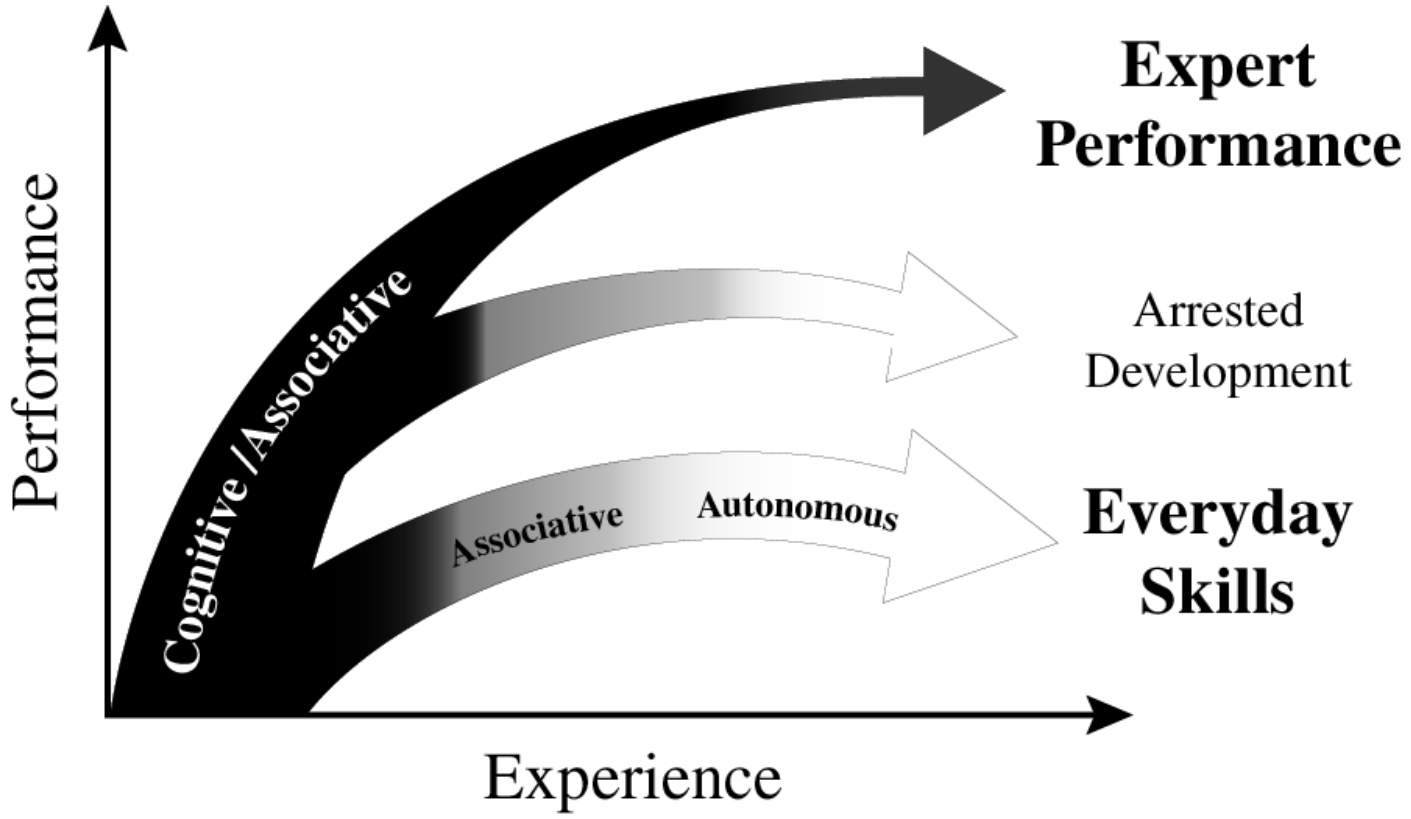
How the Experts Actually Train



Cognitive / Associative

How the Experts Actually Train

Deliberate Practice- Anders Ericsson

break down the skills "fundamentals" that are required to be expert

focuses on improving those skill chunks during practice paired with immediate coaching feedback.

continually practicing a skill at more challenging levels with the intention of mastering it."

Skill Acquisition and Motor Learning

Cognitive	**Actions are slow, inconsistent and inefficient**	• **Movements are controlled through conscious thoughts** • **Significant cognitive activity**
Associative	Actions become movements that are more fluid, reliable and efficient.	• Some aspects are still controlled consciously while other are becoming automatic. • Less cognitive thoughts
Autonomous	Actions are becoming skills. They are precise, consistent and efficient.	• Cognitive thought is minimized or eliminated. • Control is automatic

Fitts and Posner- Skill Acquisition Theory (1967)

Skill Acquisition and Motor Learning

Conscious Competence Model- Maslow*

Deliberate and Appropriate Practice

Performance

“….observed behaviour …”

Learning

“….a set of processes associated with practice or experience that leads to a relatively permanent change in the capability for movement…”

Deliberate and Appropriate Practice

Performance vs. Learning

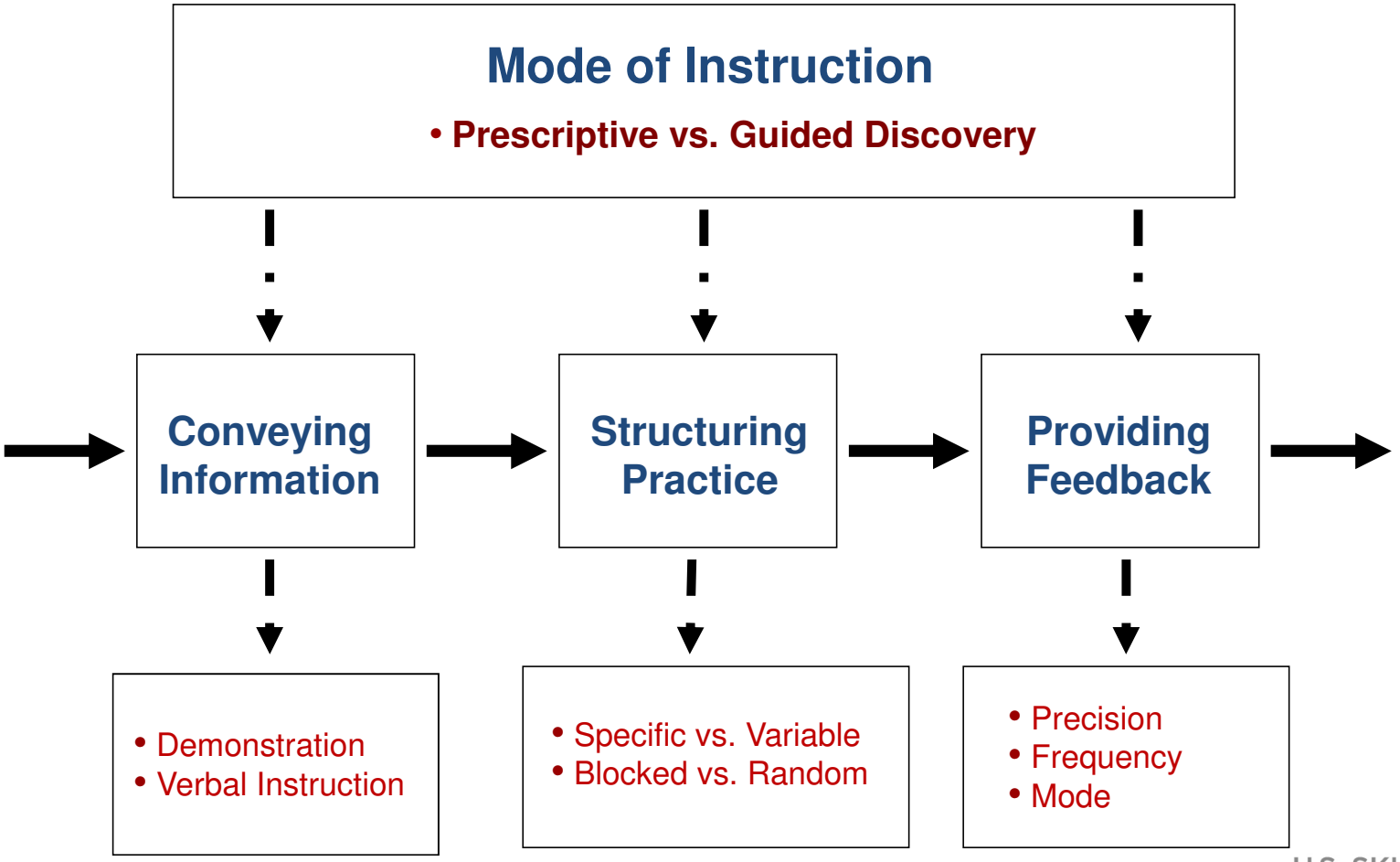
Instructional Phases	Performance	Learning
Convey Information	Always demonstrate Lots of instruction	Infrequently
↓		
Structure Practice	Blocked/constant practice	Random/variable practice
↓		
Provide Feedback	Often and detailed	Infrequent and descriptive

Instructional phase

Performance phase

Learning phase

Deliberate and Appropriate Practice



Variable

Conveying Information

Are Demonstrations Always Effective?

Structuring Practice

- Specific Practice – repetitive practice of a skill under constant practice conditions

- Variable Practice – variety within practice conditions

Structuring Practice

Variability of Practice

Drills
Grid Work

Small-sided
Games

Structuring Practice

Variability of Practice

- Specific practice better for performance, variable practice for learning
- Manipulate factors such as distance, speed, height or direction
- Practice should mimic range of variations experienced during competition

Structuring Practice

Contextual Interference

- **Low Contextual Interference** – practice one skill per session in blocked manner

- **High Contextual Interference** – practice several skills in a random manner

Structuring Practice

Contextual Interference

Single Skill
Blocked Practice

Multiple Skills
Blocked Practice

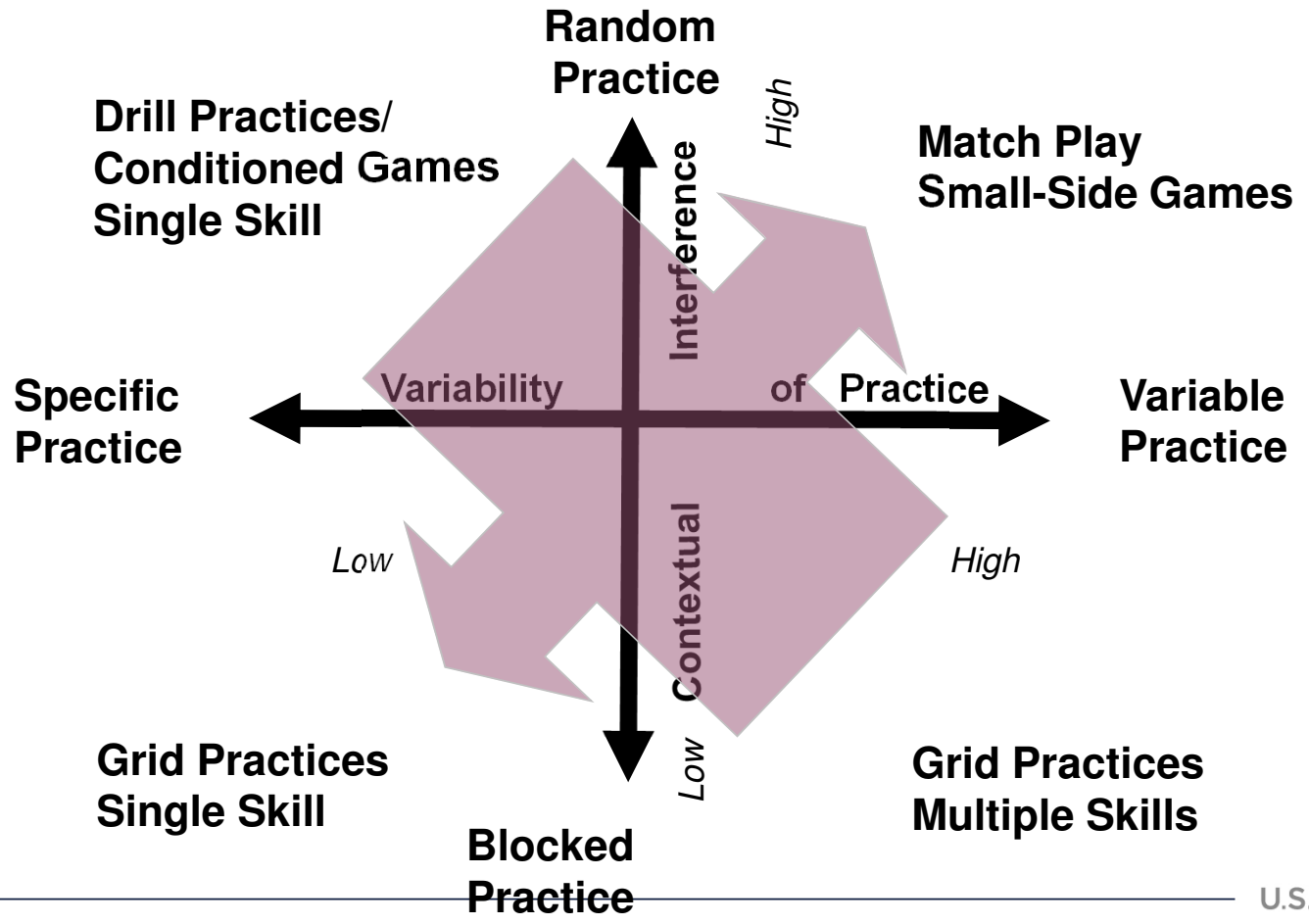
Multiple Skills
Random Practice

Structuring Practice

Contextual Interference

- LCI better for performance, HCI better for learning
- Benefits of HCI greater when skills differ more markedly
- Variability of practice and HCI can be combined for optimal learning

Structuring Practice



Providing Feedback

Is Feedback Always Essential?

- Feedback less important as skill level increases
- Learners develop ability to detect and correct own errors
- So, fade out over time, although precision may be increased

Providing Feedback

Some Key Considerations

- How frequently?
- How precise?
- When to present?
- Mode of presentation?

Providing Feedback

Clear and Concise Language

- Cliché (patience, go deeper, go faster)
- Cue (Initiate turn early, release your edge earlier)
- Skill (Rotary, edging, pressure, stance)

Providing Feedback

Frequency of Feedback

- More is not always better!

- High relative frequency better for performance, low relative frequency best for learning

- If frequency too high:
  - ✓ Attention / memory overload
  - ✓ Overdependence on extrinsic feedback
  - ✓ No opportunity for ‘trail + error’ learning

Prescriptive or Guided Discovery

Prescriptive Coaching

- Imposes artificial constraints on learning
- Produce temporary and inefficient movement solutions (routine expertise)
- Skills more likely to break down under pressure
- Changes in performance quicker initially

Prescriptive or Guided Discovery

Guided-Discovery

- Skills more adaptable and unique (adaptive expertise)
- Skills more resistant to forgetting
- Less likely to break down under pressure
- Slower changes in performance

Constraints Based Coaching

A constraints-led approach is based around the idea that movement is influenced by a dynamical system of interacting constraints on either the task, performer or environment. By definition, a *constraint is a boundary which encourages the learner to emerge with certain behaviours.*

- a **task** constraint relates to the activity in terms of the goal, the equipment or rules.
- a **performer (athlete)** constraint involves unique structural characteristics including physiological, psychological and emotional aspects.
- an **environmental** constraint is often very difficult to change and involves gravity, ambience or temperature and socio cultural factors.

*****WITHIN A CONSTRAINTS-LED APPROACH, A KEY FACTOR IS HOW COACHES MANIPULATE THE ABOVE CONSTRAINTS IN ORDER TO ENCOURAGE THE EMERGENCE OF DESIRED SKILLS*****

- Devine, Thomas (2017). http://www.tdgolfcoach.com/learning/constraints-led-coaching-why/

Constraints Based Coaching

Task Constraints

- Conditions or rules
- Course markings (Gate sets, Brushes, paint, etc.)
- Athlete Sequence
- Time and Space

Constraints Based Coaching

Equipment Constraints

Constraints Based Coaching

Conclusions

- Provide minimal instruction and ‘empower’ athletes to learn independently
- Provide variable and random practice
- Reduce feedback provision
- Hands off vs. hands on? Consider ways to manipulate constraints

Conclusion

- Skills are learned through a lengthy, systematic process of deliberate practice.
- Length of process varies by context.
- Performance is different than learning; they both have their place in the process
- The coach conveys information in a structured plan and provides feedback.
- Planned Micro and Macro cycles of prescriptive, guided discovery and constraints based coaching will yield both effective performance and impactful learning.