How to structure and sequence teaching

Overview

- Explore key concepts of learning to understand how we accelerate learner progress
- Moving from novice to teacher
- Closed versus open psychomotor skills
- Cognitive load
- Scaffolding learning
- Task deconstruction practice

Moving from novice to teacher

- Unconscious incompetence – learner doesn't know what they don't know – lack awareness
- Conscious incompetence – learner now understands what they don't know – learner becomes aware
- Conscious competence – learner can perform the skill reliably and at will – they are aware of each step that they perform
- Unconscious competence – the skill has become like second nature and can be performed intuitively, learner may no longer know how to break the skill down into steps

The process of teaching is taking the unconsciously competence skills performer and making them consciously competent again. They almost relearn the skill in order to teach the skill.

Closed psychomotor skills

- A skill that is methodically executed without variation in the same way each and every time
- Eg handwashing

Open psychomotor skills

- A skill where there is some variation of the skill each time it is executed because the anatomy may vary, the body habitus may vary, the pathological state may vary, the degree of inspiration may vary etc.
- Ultrasound is a complex open psychomotor skill

Learning

- Learning is all about how we process information. There are many things that can influence how we process information.

Memory

- Long term memory
    - when you know something, it is in long term memory and you can recall it when you need it.
    - Unlimited capacity
- Short term memory or working memory - If you don't know something, it is not in your long-term memory
    - Very limited

Cognitive load

- Cognitive load is the amount of information we are asking our students to process in working memory at any one time
- Cognitive overload is a situation where the teacher gives too much information or too many tasks to learners simultaneously, resulting in the learner being unable to process this information.
- Cognitive limit is the maximum number of chunks a person can process at one time
- George Miller conducted research on how much information we can memorise at a time = 7 $\pm$ 2 bits of information at a time
- Schema – are the way our brains organise information – like a filing cabinet – it wants to organise like information with like information
- Learners need to have the pre-requisite knowledge to build on
- If foundational knowledge is missing then at some stage this becomes a rate limiting step in the learning process
- Even with increasing experience, missing foundational knowledge is still missing foundational knowledge

Scaffolding

- Scaffolding refers to a variety of instructional techniques used to move students progressively toward stronger understanding and, ultimately, greater independence in the learning process.
- Vygotsky's Zone of Proximal Development (ZPD), is best understood as the difference between what a learner can do without help and what he or she can do with help.
- If the lesson is too easy the learner becomes disengaged and bored
- If the lesson is too difficult and there is not enough scaffolding to provide connections to the extended material, the learner becomes defeated and gives up
- The trick is to keep them in the Zone of proximal development to accelerate their learning and keep them engaged

- Sequence skills learning logically with easy skills before difficult skills, high frequency skills before low frequency skills and when teaching very similar skills, teach them separately to avoid confusion

Lesson from ZEDU

- Don't assume knowledge
- Make sure the foundations are set well
- Use consistent terminology in the initial teaching phase to describe probe movements to accelerate skills uptake and decrease cognitive load in translating what you are saying
- Be mindful that different learners need to hear information differently
- Break your lessons down into smaller chunks
- Be mindful of different learning styles when designing programs and teaching – appeal to the visual, auditory and kinaesthetic learners, the activist, pragmatist, theorists and reflector learners
- Apply structure to your skills session
- George and Doto skills training model –
    - Conceptualisation – lecture content
    - Silent demonstration – real time exemplar of successful skill performance on this patient
    - Narrated demonstration – repeat and think out loud for the auditory learner
    - Student narrates – ask the student to think out loud as they perform the skill or their colleague performs the skill
    - Student performs the skill
- Practice task deconstruction – write down the step by step instructions for image acquisition
- Stand on the other side of the bed to force yourself to articulate the moves
- GOOSE framework for practical skill development
    - **G**et the Window – concentrate first on image acquisition only
    - **O**ptimise the view – once image acquisition becomes more automated, they can optimise the view
    - Optimise the image – adjust the imaging parameters
    - **Select the image** – once image acquisition and optimisation are automated then they have enough cognitive space to figure how to select and store images
    - **Explain the findings** – write structured reports of ultrasound findings