Announcements

- Assignment 2 – Active Learning. Deadline: 19th October
- Assignment 3 – Practice. Deadline:
- 1st Classroom Observation is due within the month of October
- Extra class after mid-semester break

Expertise

Key Concepts

- Transfer: what it is & why it matters
- Two courses of expertise: Routine vs Adaptive
- Metacognition & graduated prompts
- Practical design moves for teaching

Transfer

- Transfer = extend learning to new contexts
- Improves with learning for understanding
- Often shows up as faster learning in a new unit
- Deep idea: the core relationship or principle that makes a method work across different situations. It's what stays the same when the context (tools, numbers, setting, audience) changes.
- Conditions of Applicability: the boundary conditions under which a method or idea does / doesn't work. It's the "works when… / fails when…" checklist. Knowing limits prevents negative transfer (blindly applying an old routine where it doesn't fit).

Transfer

- Everyday examples:
  - Driving: dry roads ➜ rain
  - Cooking: home stove ➜ camp stove
  - Tutoring one-on-one ➜ whole-class teaching

Teaching for Transfer

- Add one second context for the same idea (home ↔ school, paper ↔ digital)
- Use contrasting cases to reveal deep features vs surface
- Ask for conditions of applicability every time (“works when… fails when…”)
  - Students name what is the same and what must change
  - Students justify why a method fits this case

Teaching for Transfer

Case A: 12 cookies shared among 4 kids ➜ each gets 3

Case B: 15 grapes shared among 5 kids ➜ each gets 3

Teaching for Transfer

Case A: 12 cookies shared among 4 kids ➜ each gets 3

Case B: 15 grapes shared among 5 kids ➜ each gets 3

Deep idea: Equal groups / fair share.

Surface: different items; different totals.

Would fail if: groups are not equal (leftovers ignored).

Transfer try: 16 stickers shared among 4 kids (➜ 4 each)

Teaching for Transfer

Case A: Pencil is 12 cm long with a ruler.

Case B: Pencil is about 5 inches long with an inch ruler.

Teaching for Transfer

Case A: Pencil is 12 cm long with a ruler.

Case B: Pencil is about 5 inches long with an inch ruler.

Deep idea: Measure the same attribute (length); units can change.

Surface: unit type; number value.

Would fail if: mixing units in one measure or not aligning zero.

Transfer try: A book is 20 cm. About how many inches?

Two Courses of Expertise

- Routine expertise: fast & accurate in stable settings
- Adaptive expertise: explain why, modify, invent under change
- Example: Spreadsheeting
  - Routine: copy/drag formulas; same column names
  - Adaptive: new dataset; columns changed ➜ re-model, re-validate

Metacognition and the Prompt Ladder

- Metacognition = thinking about your thinking
  - Why it matters: helps you notice what you know, fix what's off, and transfer ideas to new tasks.
- The Prompt Ladder (use in class + for self-help)
  - Unaided try ➜ "Let me try first."
  - Invariant ➜ "What must stay the same for this to work?"
  - Representation ➜ "Can I draw / table / act out the relationships?"
  - Principle ➜ "Which big idea am I protecting here, and why?"

Multiple Representations

- From concrete ➔ abstract
- Add a second representation to reveal structure
  - Fractions: pizza slices and number line
  - Feedback: rubric and annotated exemplar
- Exposes deep structure
- Reduces negative transfer from a single routine
- Builds flexible problem representations