Direct Instruction Design Worksheet (Eric Main, FCTL)

The development of complex cognitive skills places high cognitive load on novice learners; alternating practice with worked examples reduces cognitive load and is more effective than practice or presentation alone.

1. Lesson Objective(s): Name or describe the complex cognitive skill that students need to develop and master.

2. Context: Describe the problem statement and state the rationale for spending time and effort on this development.

3. How will you model or present and sequence the material? (This is the "I do" step)
    a. In-class demonstration by you or another expert
    b. Video of you demonstrating
    c. Video of another expert demonstrating

4. Describe the opportunities that students will have to interact with the demonstration and the general feedback you will provide at this stage.
    a. What level of instruction is targeted (from Bloom's Taxonomy)?
    b. What is the likely level of student readiness vs. the level of task difficulty?
    c. The answers to these questions will inform how many times you'll need to alternate worked examples with opportunities for practice and feedback.
    d. As students become more adept with the process, you'll be able to skip steps in repeated worked examples (fading effect). Which steps will continue to challenge students and need to be demonstrated?

5. Describe the synchronous opportunities for individuals or groups to practice the skill (the "We do" step).

6. What individual practice will you assign (the "You do" step)?
    a. How many iterations of individual practice will be assigned?
    b. How will students receive feedback on those iterations?

Design Principles

Chen and Tsai (2016). Design principles of worked examples: A review of the empirical studies. *Journal of Instructional Psychology*. 36.3.

1. Imagination Principle: if students possess sufficient prior knowledge or schemas, encouraging students to imagine procedures and concepts can substantially facilitate their learning (they are retrieving prior knowledge); whereas, for students with low prior knowledge, sequential worked examples are superior.

2. Completion Principle: when only surface level characteristics of the task are changed (but similar in structure), studying incomplete examples fosters self-explanation and can lead to superior transfer.

3. Fading Principle: leave out steps in the repetitions as students develop. It's more effective to leave out later steps than initial steps. As students develop, they need to assume more responsibility and should require less demonstration. Prior knowledge impacts how quickly to fade.

4. Process Principle: focusing on subgoals in the problem-solving process rather than formulaic steps facilitates transfer, especially with multiple solution paths.

5. Presentation Principle: when students need to integrate information from separate diagrams and text sources, the split-attention increases cognitive load. Integrating multiple diagrams and textual explanations facilitates learning.

6. Media Principle: Integrating verbal and visual inputs into a single focal framework leads to superior learning of simple and medium-level tasks. In highly complex problems, it can be more efficient to avoid dual coding of visual and auditory inputs. (For auditory inputs, students learn more from human voices than machine synthesized voices.)

7. Timing Principle: presenting students with problems first followed by worked examples is significantly more effective than exposing learners to just problems or just worked examples.

8. Self-explanation Principle: combining worked examples with self-explanation prompts for students improves performance.