Computational Thinking in Middle School: Design Thinking Outline

1. Conversation about the typical delivery of CT across grades 6-8
2. Open discussion of pain points in teaching and learning CS in middle school
3. Learning progressions: palette and block restrictions
   a. Specific computational thinking concepts and sequences
   b. Instructors can check and uncheck palettes in design mode
   c. Instructors can still use these
      i. Instructors can put blocks in the game interface, but the students can't add any new ones.
      ii. Students can't do anything to the blocks already there
   d. Left click exclude/include is available to restrict individual blocks
   e. Quest: several games, increasing amount of freedom allowed as you're learning concepts in a progression
      i. Different difficulty levels for different games
4. Focusing on CT concepts via points
   a. Emphasizing looping: the loop has a higher point value than doing it individually
      i. Explain the point system, preset configurations, save/load configurations
   b. Explain scoring system options for Parson's Puzzles and Constructionist Video Games
   c. Parson's operates on a specific gaming rubric
      i. Incorrect block placement decrements score
   d. Constructionist: set your own goals for learning objectives, based on instructor preferences.
   e. Record the number of points that students get in their games, translate into leaderboards.
   f. Teacher gets to weight various ways that students can be incentivized.
   g. Several ways of assessing mastery: actual mastery plugin with the Hairball analysis, and PECT analysis.
      i. Login as a student: spider graph is the mastery of results across concepts
      ii. Automated assessment results from CT concepts
5. Gameful Direct Instruction: create a Parson's Puzzle
   a. Create sprites and put them in the stage
   b. Game templates under construction
      i. Might be a calculation, maze, etc.
   c. Enter question, enter hint
      i. Find a number: have you tried a loop? Canned vs. dynamic hints.
   d. Saving/loading Parson's Puzzles in Design and Play modes
   e. Load from a student view:
      i. Automatic constriction of which palettes are available
      ii. Experiment from a selective Parson's palette.
   f. When you load as a student, the student doesn't see any scripts in the scripts pane. The goal is to match what the teacher has created.
   g. Discuss which CT concepts and other subjects (e.g. math) teachers might want to deliver via Parson's Puzzles
6. Gameful Constructionism: game-objective editor and feedback system
   a. Deep dive on principles of Constructionist Video Games
   b. Beginning quest: once upon a programmer
   c. Capability to create game objectives using block-based software testing grammar: teacher task

      d. Expect to have games pre-built and have templates and games customizable with content relevant for your school/environment.
      e. Make copies of your own games. Borrow games and objectives from the affinity space.
      f. Objective blocks will have a drop own: don't have to know underlying names of Scratch blocks
      g. Explore options for student view of feedback in real-time
      h. Explore teacher capability, time, and willingness to engage in this activity

7. Gameful Intelligent Tutoring: recommender and auto-hinting
      a. Outer loop next-task guidance via Mission/Quest/Game recommendations
      b. Ordered vs. unordered access to games in the quest
      c. Guidance toward additional practice games when automated evaluation of mastery low, challenge games when mastery high
      d. Describe inner loop and opportunities for problem-solving support through individualized just-in-time and on-demand hinting
      e. Explore teacher interest in throttling hinting at the class and individual levels

8. Infusing CT across the curriculum
      a. Demonstrate Mission/Quest/Game creation, and elicit requirements that would enable teachers from CS and other subjects to fuse learning goals
      b. Discuss game-based learning that facilitates game-based assessment
      c. Review CS/CT standards and means of incorporation, tracking, and reporting
      d. Identify teacher wish-list for Scratch and CT in middle school