Rational Cognitive Task Analysis 3

Goals for today

- Quick review/example
  - CTA => instructional redesign
    - OLI Statistics online course (CTA1 slides)
  - CTA => automated instruction
    - algebra cognitive tutor example
- Discussion of Aleven, Klahr, & Siegler
  - What are the tasks?
  - What CTA methods used?
  - What is the output of the CTA?
  - How is (or could) CTA used to improve ed?
- Applying CTA to your own research

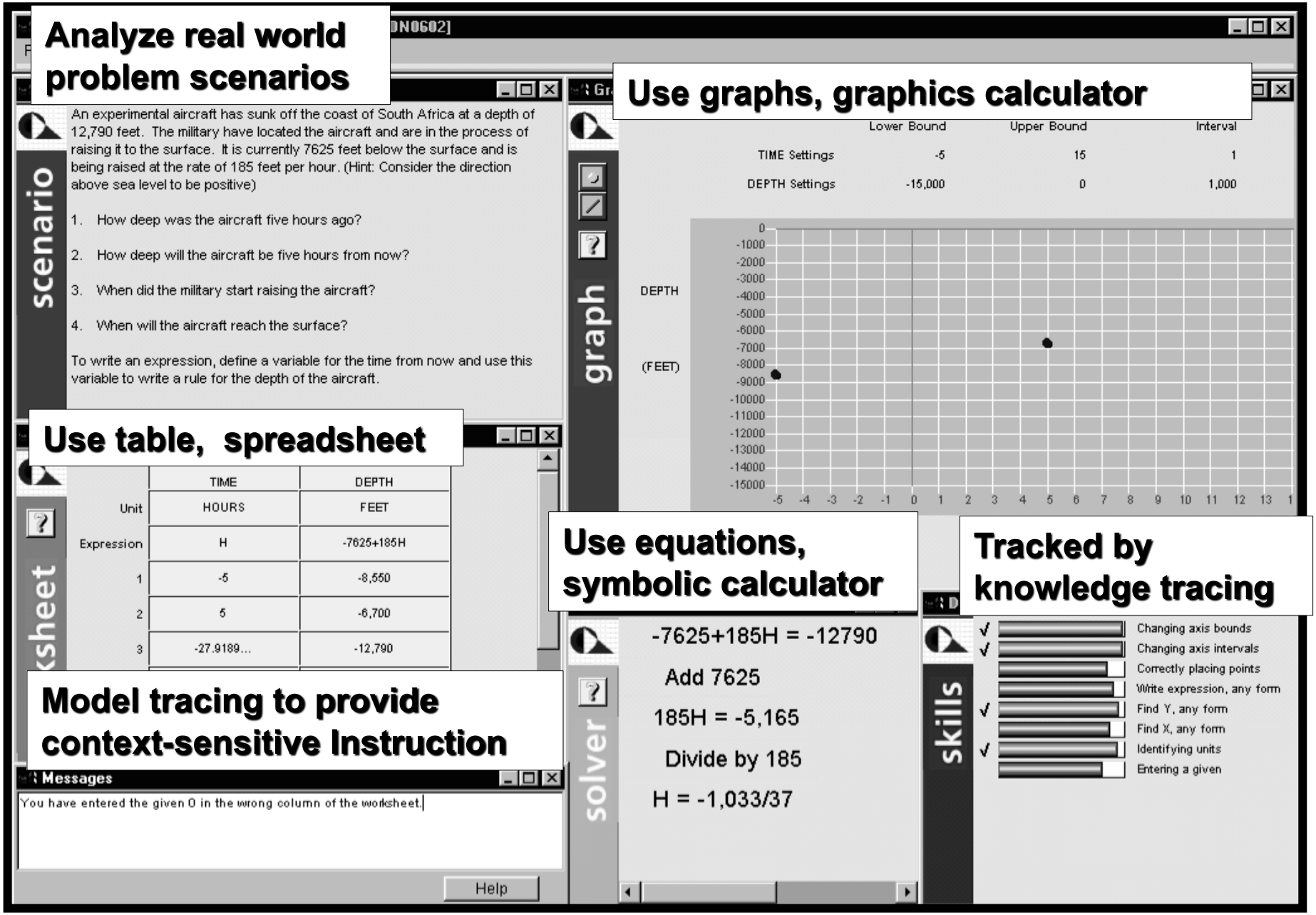
CTA and instructional design

- CTA yields a representation of knowledge or a "cognitive model" of student thinking
  - Model has elements: production rules, concepts, skills, schemas … "knowledge components" (KCs)
- Cognitive model guides instructional design
  - Direct verbal instruction corresponding with KCs
  - Select activities: Examples & tasks
  - Order activities: Aid learning of then- and if-parts
  - Assess & remediate based on KCs
  - Make intermediate steps visible (reify)

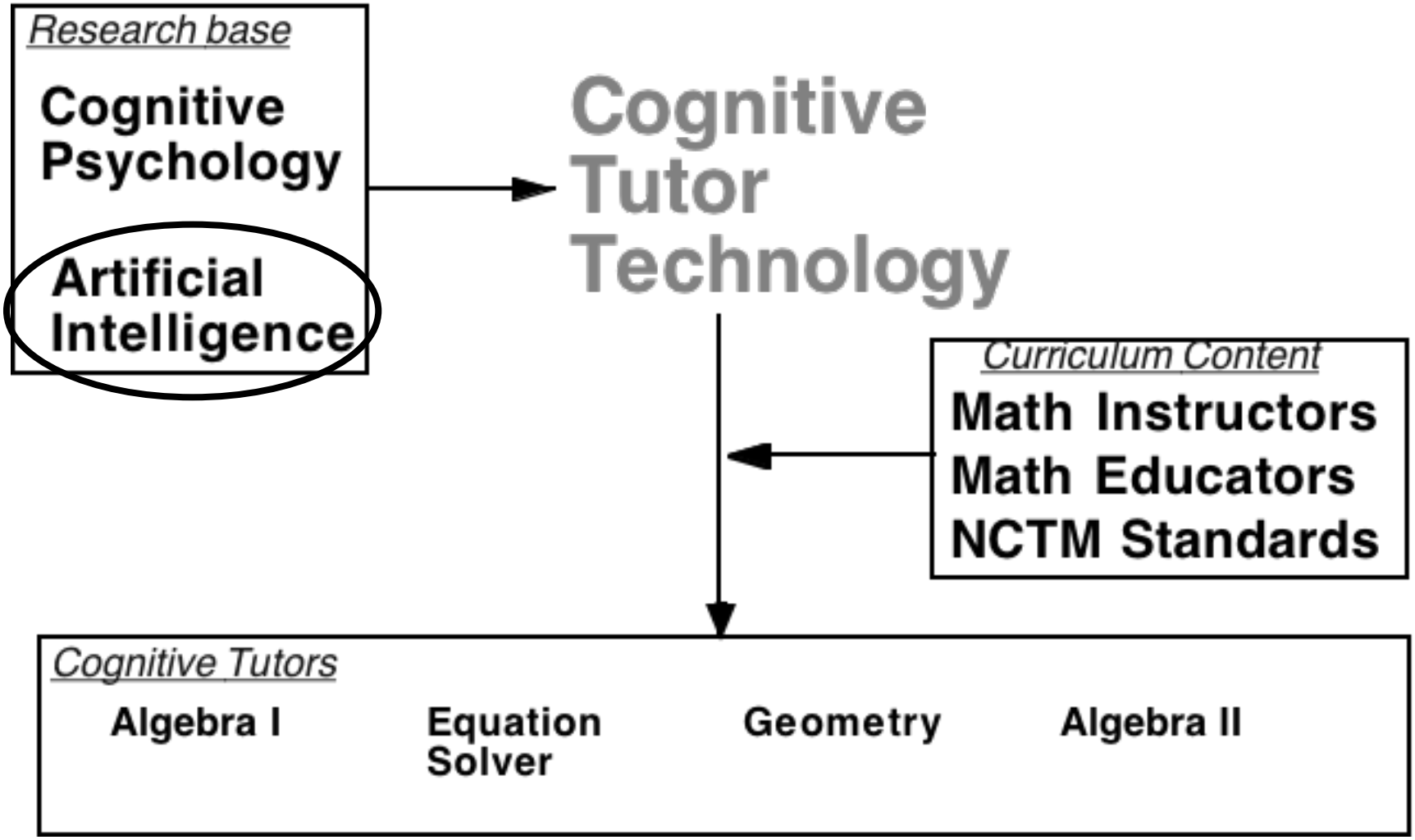
Secondary point

- Another example (besides Zhu & Simon) that production systems can represent multiple solution paths

Algebra Cognitive Tutor: Example Activity



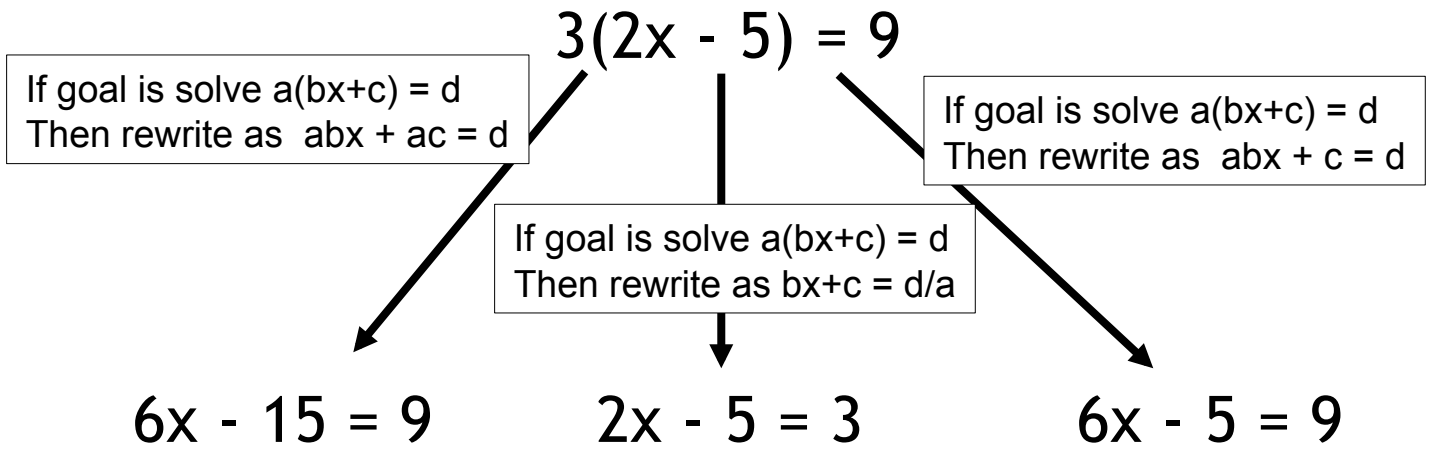
Cognitive Tutors: Combining Cognitive Psychology & Intelligent tutoring systems



Cognitive Tutor Technology

Use cognitive model to individualize instruction

- Cognitive Model: A system that can solve problems in the various ways students can



- Model Tracing: Follows student through their individual approach to a problem -> context-sensitive instruction

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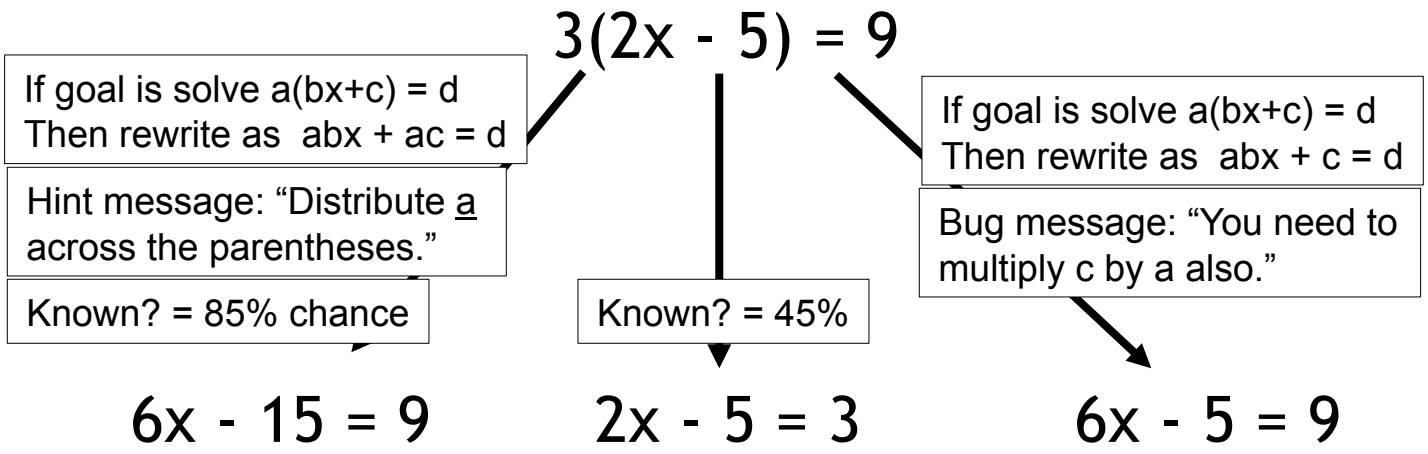

- Model Tracing: Follows student through their individual approach to a problem -> context-sensitive instruction
- Knowledge Tracing: Assesses student's knowledge growth -> individualized activity selection and pacing

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Connecting to your research

- What domain would you do a CTA in?
- How would you do it?
  - Empirical or theoretical/rational?
  - Descriptive, prescriptive?
  - Which technique?
- How might you represent your results?
- How would you use your results to redesign instruction?