# I-SMART Goal 2 Scenario-based Tasks Chapter 5: What We Learned



Innovations in Science Map, Assessment & Report Technologies

## **Overview of Chapters**

- 1. Introduction
- 2. Testlet co-design
- 3. Testlet prototype walkthrough
- 4. Think-aloud study

5. What we learned



## I-SMART Goal 2

Design, develop, and evaluate learning map model-based assessments that incorporate science disciplinary content and science and engineering practices in highly engaging, universally designed, technology-delivered formats.

#### **Focus of This Study**

- Co-design and evaluate testlets for "secondary population" students
- Scenario-based tasks to evaluate range of depth of knowledge (DOK)
- Deeper application of UDL principles
- Greater emphasis on formative use of instructionally embedded testlets



- Design process
- Student interaction and engagement
- Study design
- Supporting formative assessment
- Use in balanced assessment solutions



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## **Key Takeaways**

- Student engagement
  - We learned what task components engage student in demonstrating their KSAs (and guess what, it's not reading!)
- Paper prototyping
  - Allowed for rapid iterations
  - Allowed all students to engage in process around the table





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## **Key Takeaways**

- Do students understand how to interact with new item types? (RQ1)
  - Most students clear on what to do and used interfaces skillfully
  - Co-design helped ensure usability
- Did students make effective **explicit** choices? (RQ2)
  - "I like projects where you can choose what you want to do and not be forced to do something that you wouldn't want to do."
  - "People might know about this one ecosystem but other people might not know or not be interested in the other one as much."
  - Students loved it, but would it make a difference?
  - Novelty effect of explicit choice?
  - Additional cognitive load?



## **Key Takeaways**

- Did students make effective **implicit** choices? (RQ2)
  - Text-to-speech
  - Speech-to-text
  - Hints
  - Glossary
  - Use of Pros & Cons Clipboard

*How do we address students' varying metacognitive and self-regulated learning skills?* 

HOW TO PLAY ATTACK FROM MARS
SUPER SKILL SHOT: Hold left flipper button WHILE launching ball. Make any flashing arrow shot to collect.
ATTACK WAVE: Complete center 3-bank to start an Attack Wave. Save cities by shooting center shot to destroy the saucer. Save all 5 cities to Attack & Conquer Mars!
EXTRA BALL: Complete Attack Waves OR bottom lanes to light Extra Ball. Shoot right eject to collect.
IULTI-BALL™: Center loop lights lock. Lock 3 balls in center loop to start 3-ball multi-ball. Shoot ramps and loops to collect jackpots. Collect all 5 jackpots to light moving Super Jackpot.
<b>IARTIAN ATTACK:</b> Complete M-A-R-T-I-A-N targets to light Martian Attack at right eject. Shoot right eject to start. Hit all 4 Martians in the time allowed to start Martian Attack 2-ball Multi-ball.
<b>TOTAL ANNIHILATION:</b> Complete Capture, Big-O-Beam, Tractor Beam or Atomic Blaster to start HURRY UP. Center shot awards HURRY-UP. Complete all 4 shots to start Total Annihilation 4-ball Multi-ball. Shoot ramps and loops while in Multi-ball to collect big points.
COMBOS: Make consecutive ramp and loop shots while red arrows are lit for Combos.
SUPER JETS: Get the number of jet hits needed (see display) to start Super Jets for big points.
RULE THE UNIVERSE: Collect Super jackpot, Super Jets, Martian Attack Multi-ball, Total Annihilation, Conquer Mars and 5-way combo to light Rule the Universe. Shoot right eject to start. Collect displayed points while in Multi-ball to Rule the Universe.



## **Expert Learners**

- Purposeful & motivated
- Resourceful & knowledgeable
- Strategic & goal-oriented



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## **Recommendations**

- **Training and opportunity to use tools instructionally essential** for effective use
- Serial presentation of options, e.g., Pros and Cons Clipboard
- Finer-grain corrective feedback to minimize perseverative guessing
- **Deeper embedded supports**, e.g., dealing with double and triple negatives
- **Explicate relevance of hints** e.g., construct-relevant supports vs. task clarification



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## **Study Design**

- Students need **more time** to learn the support tools!
- Think-aloud protocol worked well but is limited when students provided with radically new task designs
  - Longer post-think-aloud interviews would have helped uncover more details e.g., students' limited use of hints



#### **Behavior and Interaction Patterns**



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## **Key Takeaways**

- Research Question 3: Does task assess a range of DOKs?
  - Opportunity for students to demonstrate basic **and/or** higher DOKs
- Next question
  - How to support educators and students in using student data effectively to inform subsequent instruction



#### **Basic vs. Higher-Order DOKs**



**Basic DOK Score** 



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## **Concerns for Summative Use**

- Task comparability vs. reduction of construct-irrelevant variance
  - Psychometric implications of immediate feedback
  - Psychometric implications of choice
- Construct relevance of hints and glossary
  - "Training wheels off" mode
- Cost-benefit analysis
  - Items are expensive to develop, administer, score
  - But if they also have instructional value ...



## **Final Thoughts**

- Importance of providing learner agency in the assessment process
- Challenge of reducing "deep" sources of construct-irrelevant variance



## **Research & Design Team**

#### CAST

- Jose Blackorby
- Bob Dolan
- Kim Ducharme
- Allison Posey
- Samantha Gilbert
- Mckenzie Parkins
- Agatha Oehlkers
- Laurel White
- Matthew Brambilla



#### **KU ATLAS**

- Meagan Karvonen
- Gail Tiemann
- Russell Swinburne-Romine