Charting the Cs Conference 2025:

To Literacy and Beyond

Cooperation
Communication
Collaboration

To Inferencing and Beyond! Supporting Children's Language Comprehension in the Inference Galaxy

April 2025

Dr. Kristen McMaster

Dr. Reagan Mergen

Presenters

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University of Minnesota, Twin Cities: College of Education and Human Development

Mission Statement: The College of Education and Human Development at the University of Minnesota will advance research, teaching, and community engagement to increase opportunities for all individuals to have a successful start in life and to foster healthy human development and will provide programs that meet the demands of the 21st century.

Acknowledgements

The research reported here is supported by the Institute of Education Sciences (IES), U.S. Department of Education, through Grants **R324A160064**, **R305A170242**, and **R305A220107** to the Regents of the University of Minnesota. The opinions are those of the authors and do not represent the policies of the U.S. Department of Education.

Session Agenda

We will:

- Describe the **Inference Galaxy**, a technology-based suite of assessment and instructional tools designed to promote inference-making in children in K-2, including children who experience difficulties with language comprehension.
- Explain **how it was developed**, **key components**, and **how it can be used** within multi-tiered systems of support
- **Share findings from research** supporting its feasibility to be implemented in practice and its promise to improve student learning outcomes
- Provide information about how you can **participate in Inference Galaxy research** and use as well as **strategies to support children's language comprehension skills** in the classroom using the questioning, scaffolding, and feedback techniques

Whip Around: Who Are You? Why This Session?

I am….

- Name
- Role (e.g., teacher, administrator, related service provider)
- Age/Grade of Students
- Setting (e.g., resource, self-contained)

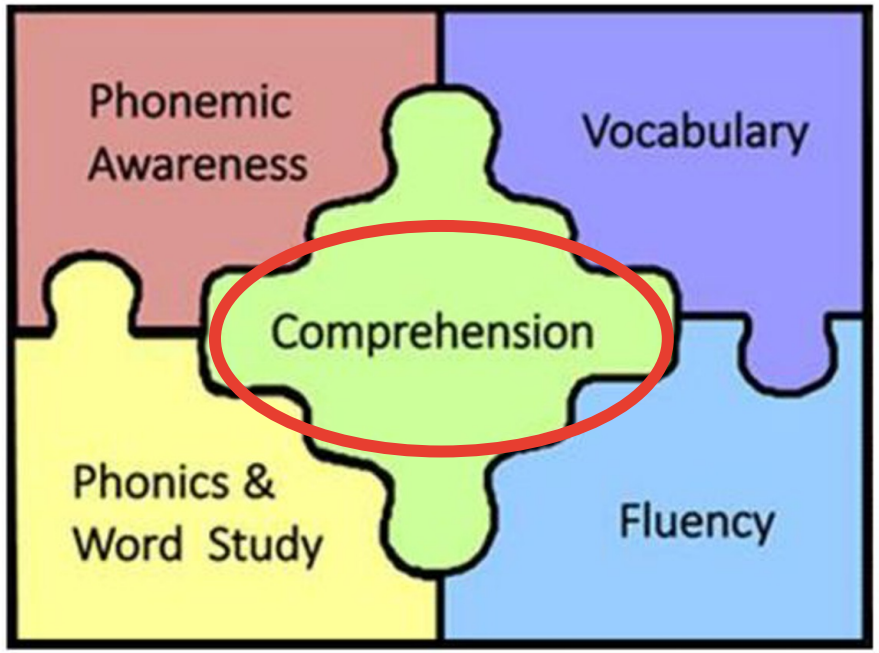
I joined this session today because…

- I hope to learn _____ about inference-making

The State of Reading

- One of the main goals of elementary education is **teaching young students to read**
- **Teaching children 'how to read' is a multifaceted, complex process** that requires decoding and comprehension skills
- In our work, we developed innovative instructional solutions to supplement core reading instruction. **ELCII** and **TeLCI** are **web-based tools designed specifically to bolster inference-making skills, the cornerstone skill of comprehension**
- Research suggests **that inference making is a foundational component**, or sub-skill, **of reading comprehension**
- However, as you might have also experienced as a teacher, it is **not widely included as one of the building blocks of reading instruction**

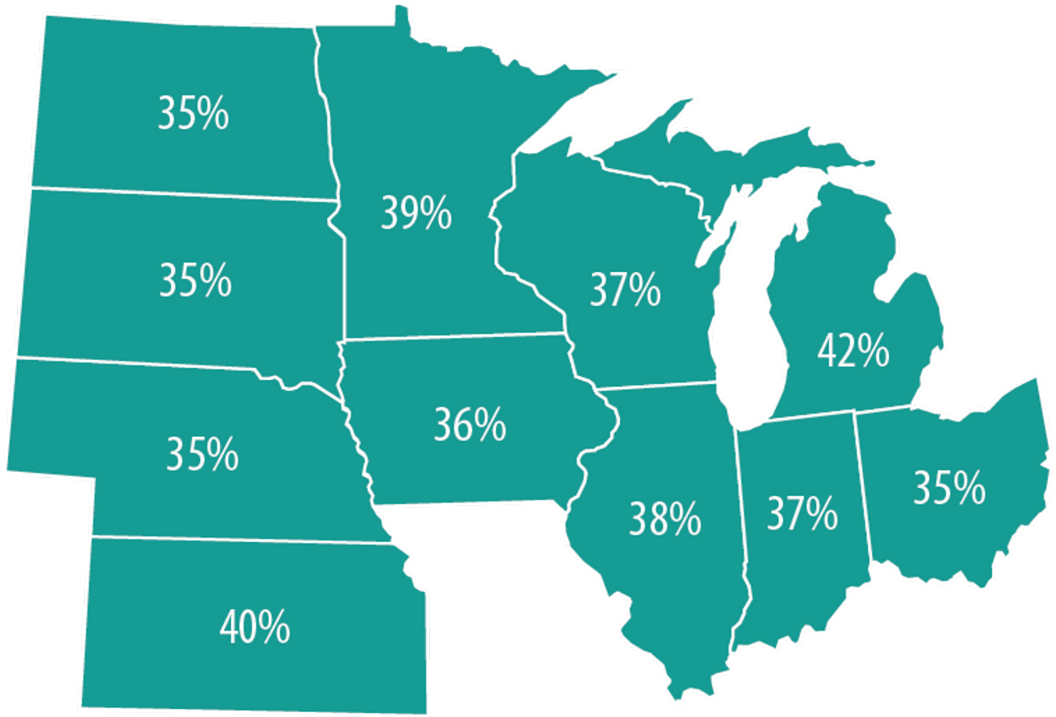
Addressing *All* the Pieces of the Reading Puzzle



Importance of Inference-Making

- Inference: information or idea that is not explicitly stated, but can be generated based on information that we have seen, heard, or read (Kendeou et al., 2019)
- Critical for reading comprehension and learning from text
  - Texts do not always provide all of the information needed for successful comprehension.
  - Connecting what readers know and information from text is only possible through inference-making (i.e., critical for coherent mental representation of the text) (Hwang et al., 2024)

National Need for Evidence-Based Reading Instruction



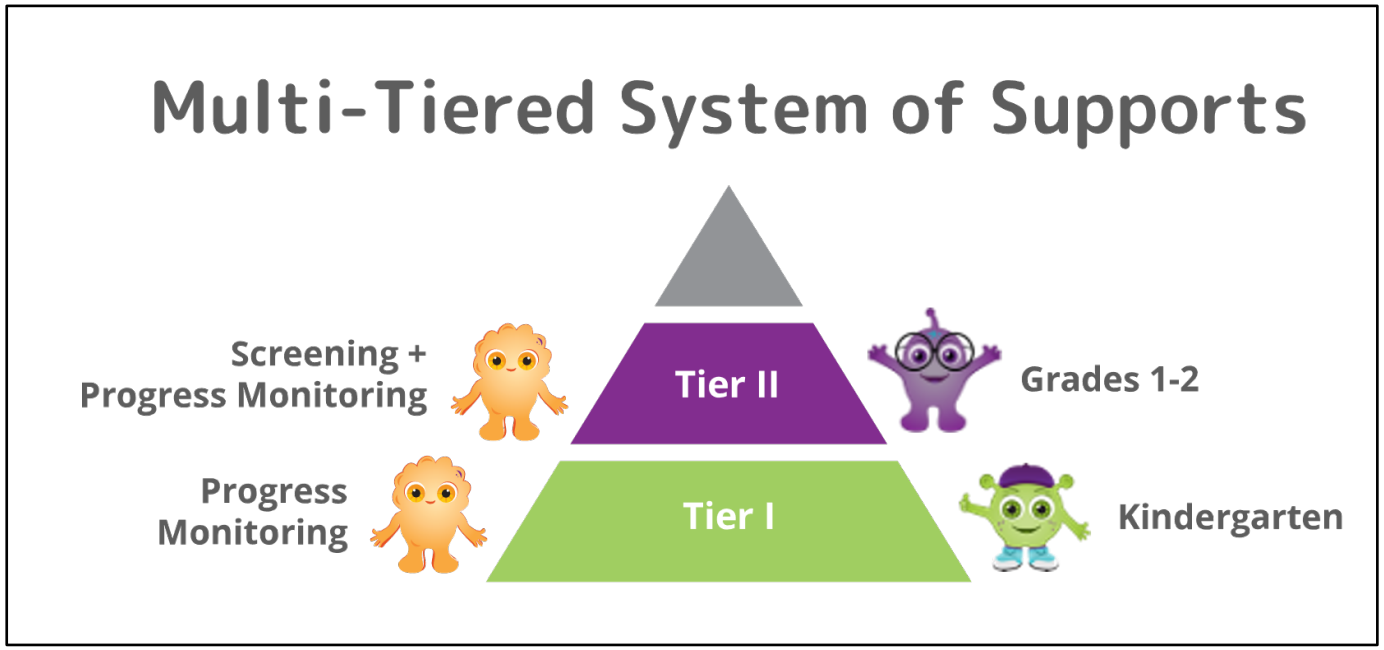
* For the nation as a whole, 39% of fourth-grade students had "below basic" level reading scores in 2022.

Source: National Assessment of Educational Progress

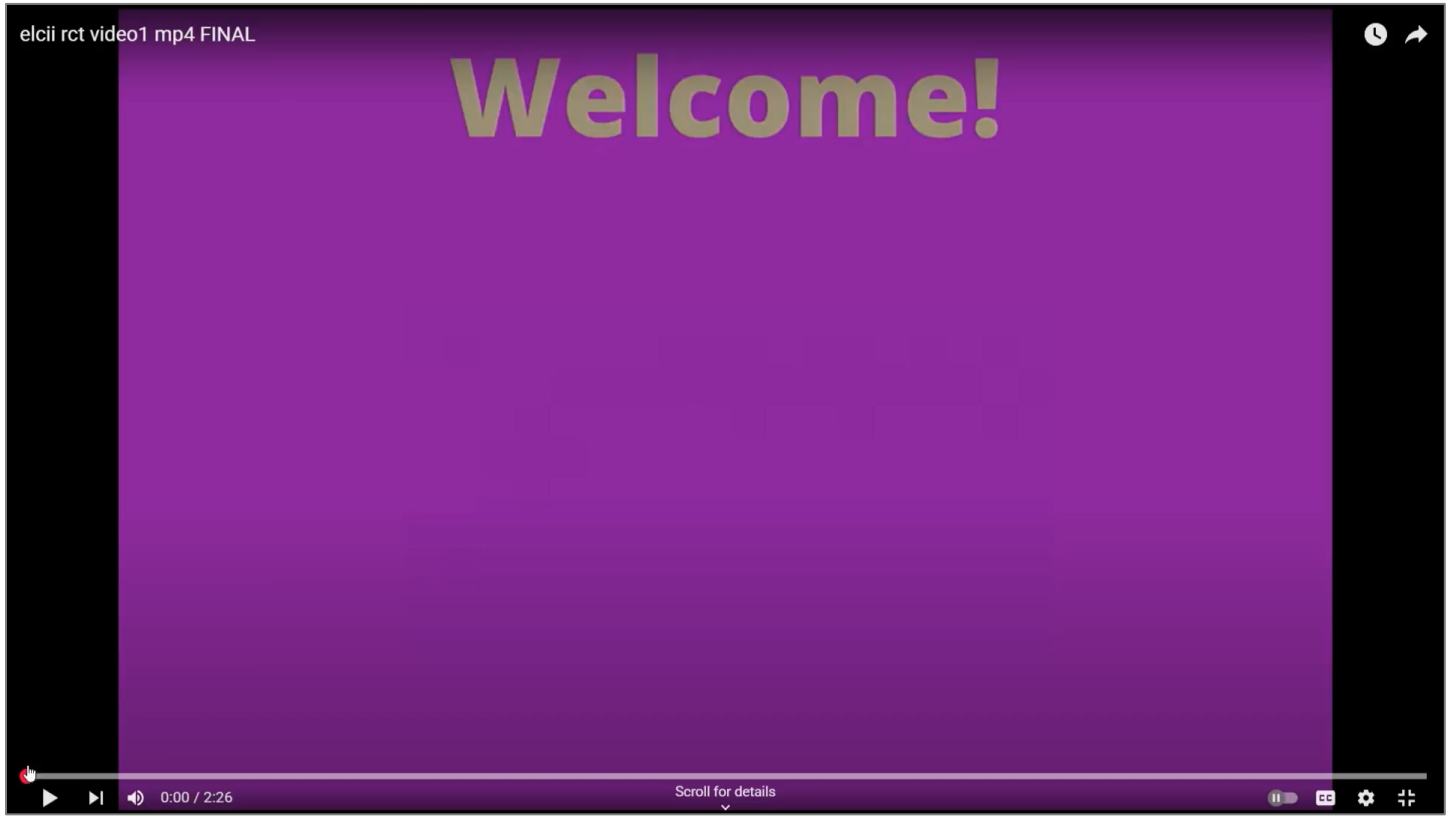
Minnesota Reading to Ensure Academic Development (READ) ACT

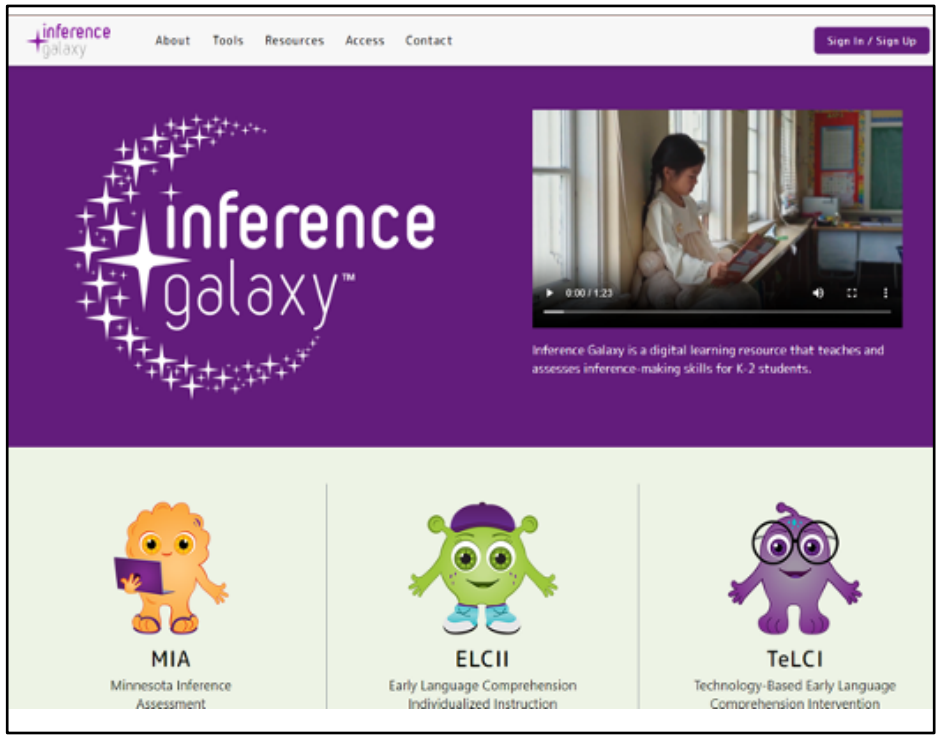
Minnesota Reading to Ensure Academic Development Act, known as the READ Act, was passed and signed into law by Governor Tim Walz on May 24, 2023. The goal of this legislation is to have every Minnesota child reading at or above grade level every year, beginning in kindergarten, and to support multilingual learner and students receiving special education services in achieving their individualized reading goals in order to meet grade level proficiency. The READ Act replaces Read Well by Third Grade (RWBTG) and is in effect as of July 1, 2023.

Inference Galaxy



Inference Galaxy, video





Inference Galaxy, cont.

Designed to ***assess*** **inference making** in **Grades K-2**.
It is an interactive software application with **4 test forms**, which engage students to:

- View age-appropriate, nonfiction ***videos***
- Respond to ***inferential questions***
- Short and fully-automated (15 min)

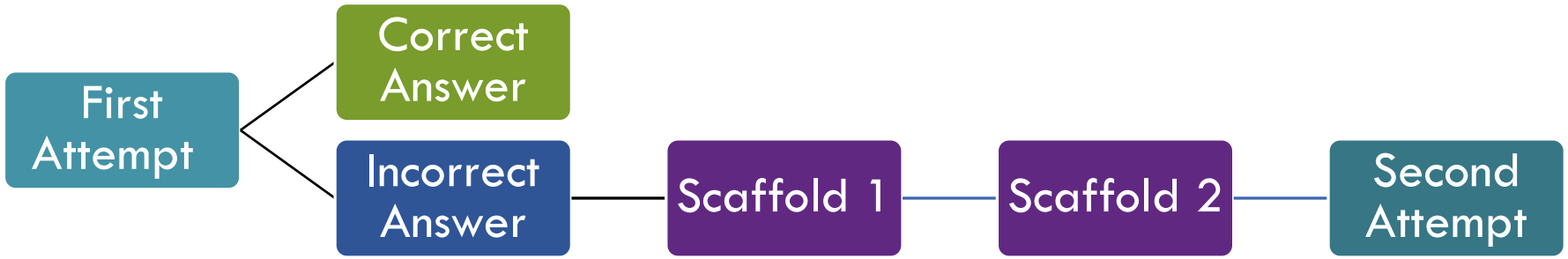
Instructional Module Topics:

ELCII = is an interactive software application comprised of 40 Fiction and Nonfiction instructional modules designed to take 10-15 minutes for a kindergartner to complete one full module.

Sample modules include:

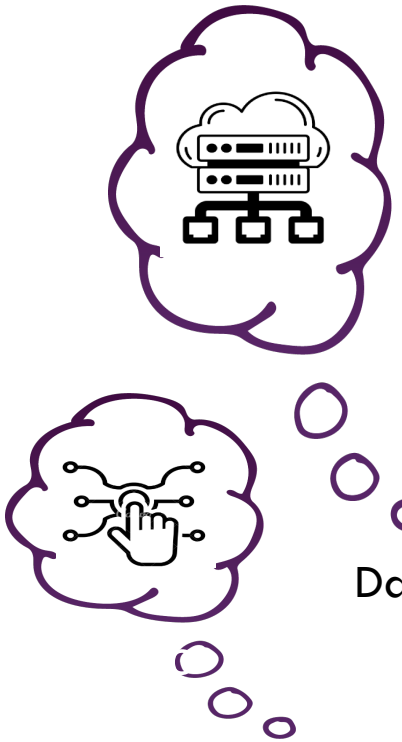



Questioning with scaffolding & feedback

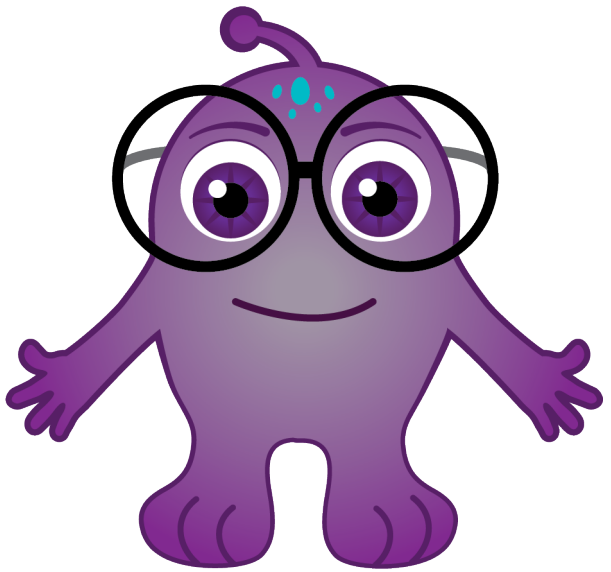


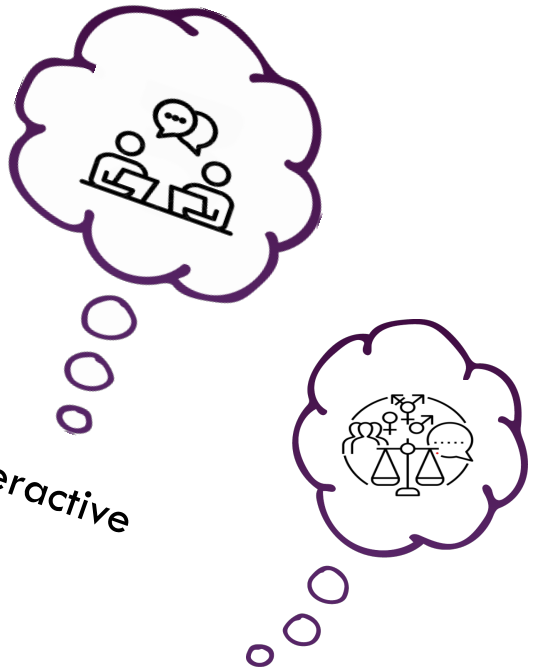
Sample Inference Galaxy Module Clip (3 min)

TeLCI



Data-based





Interactive

Personalized, differentiated

Culturally Responsive

Instructional Module Topics:

TeLCI = is an interactive software application comprised of 24 Nonfiction instructional modules designed to take 10-15 minutes for a kindergartner to complete one full module.

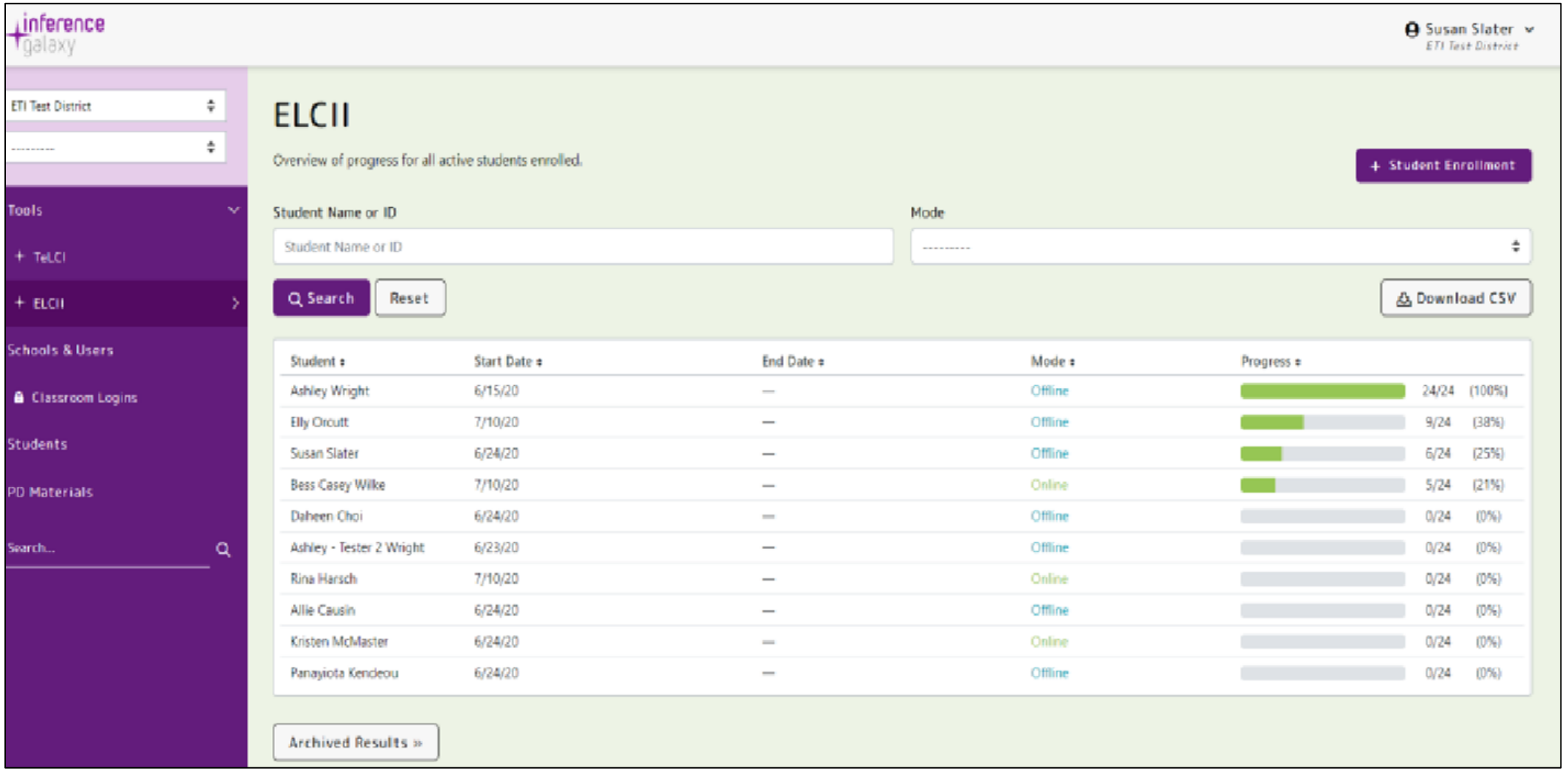
Sample modules include:




Development & Key Components

Design Principles

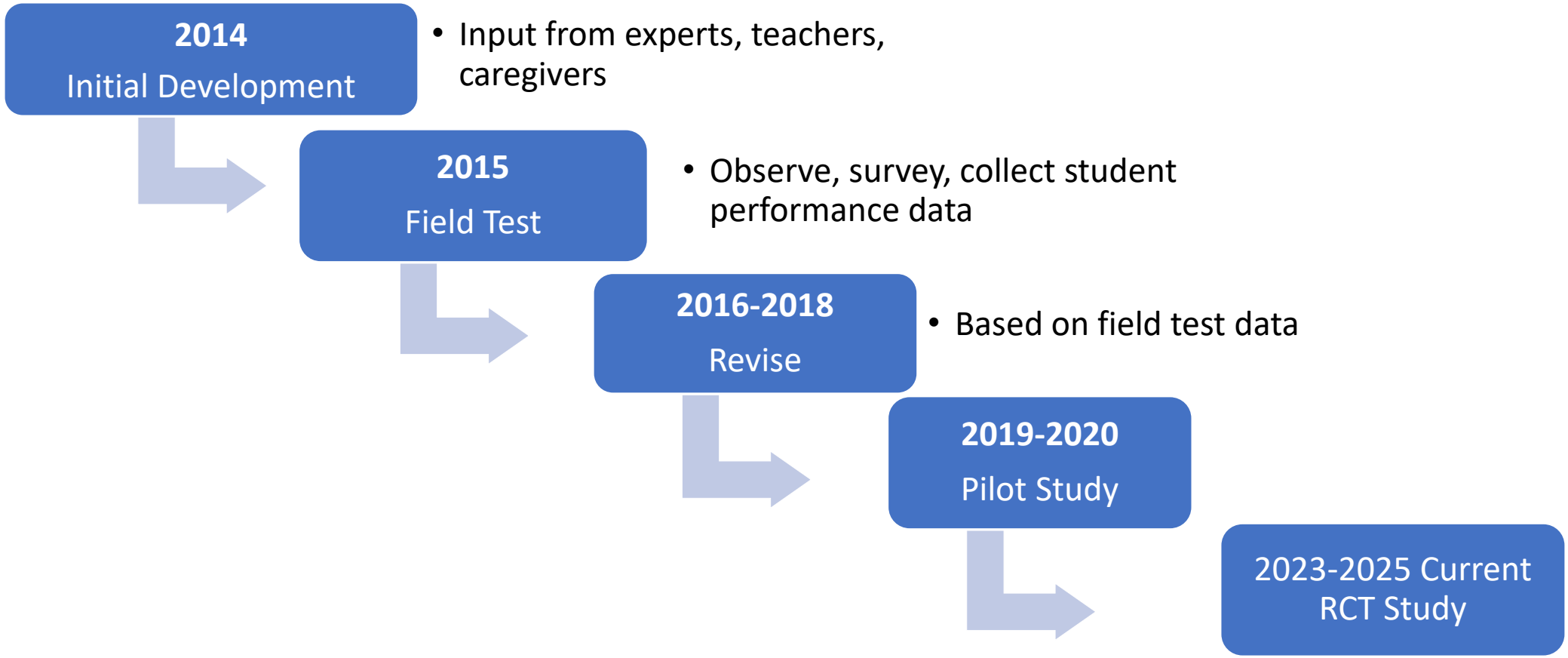
- Content aligns with common core standards (e.g., science, social studies).
- Culturally responsive
- Self-paced and fully automated
- Efficient (each module 15-20 min)
- Flexible implementation (in class, remote, small group, homework)
- Theory-based and evidence-based


inference galaxy
Susan Slater
ETI Test District
ETI Test District

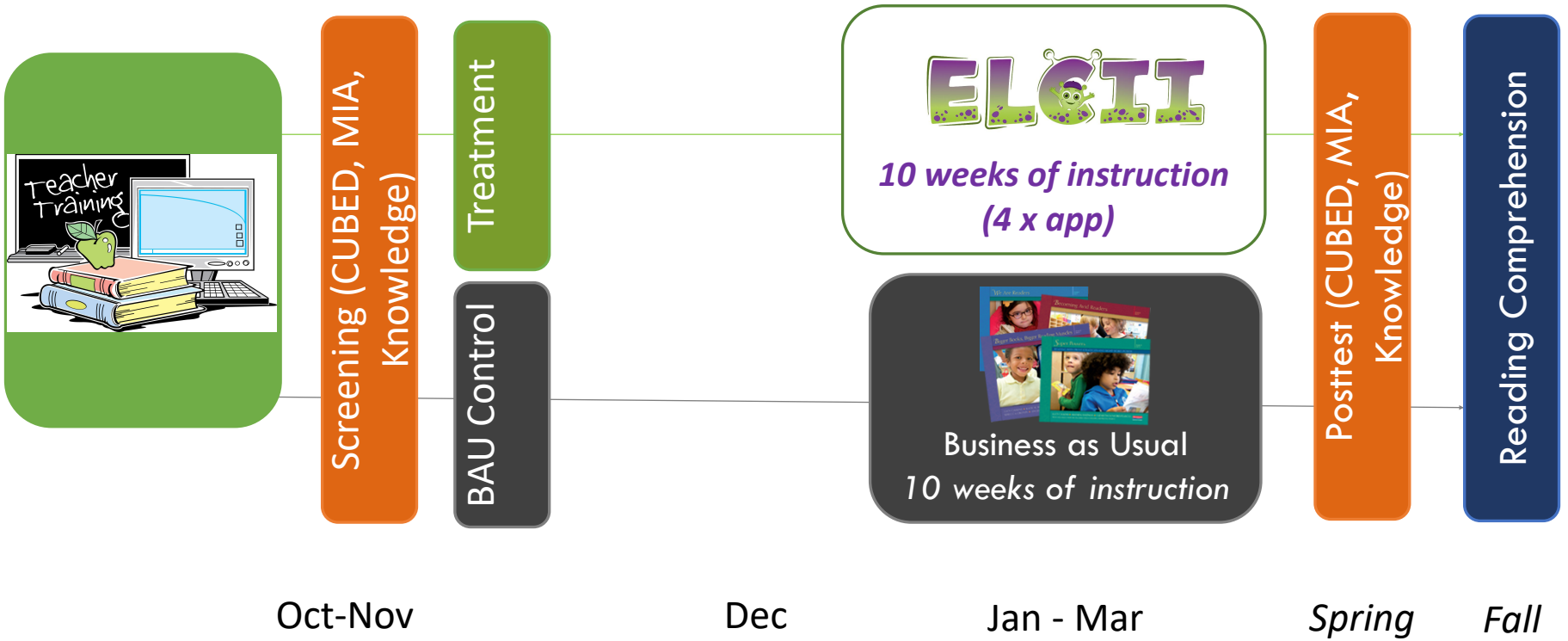
Tools
+ TeLCI
+ ELCII
Schools & Users
Classroom Logins
Students
PD Materials
Search...
ELCII
Overview of progress for all active students enrolled.
+ Student Enrollment
Student Name or ID
Student Name or ID
Mode

Search
Reset
Download CSV
Student
Start Date
End Date
Mode
Progress
Ashley Wright 6/15/20 — Offline 24/24 (100%)
Elly Orcutt 7/10/20 — Offline 9/24 (38%)
Susan Slater 6/24/20 — Offline 6/24 (25%)
Bess Casey Wilke 7/10/20 — Online 5/24 (21%)
Daheen Choi 6/24/20 — Offline 0/24 (0%)
Ashley - Tester 2 Wright 6/23/20 — Offline 0/24 (0%)
Rina Harsch 7/10/20 — Online 0/24 (0%)
Allie Causin 6/24/20 — Offline 0/24 (0%)
Kristen McMaster 6/24/20 — Online 0/24 (0%)
Panayiota Kendeou 6/24/20 — Offline 0/24 (0%)
Archived Results »

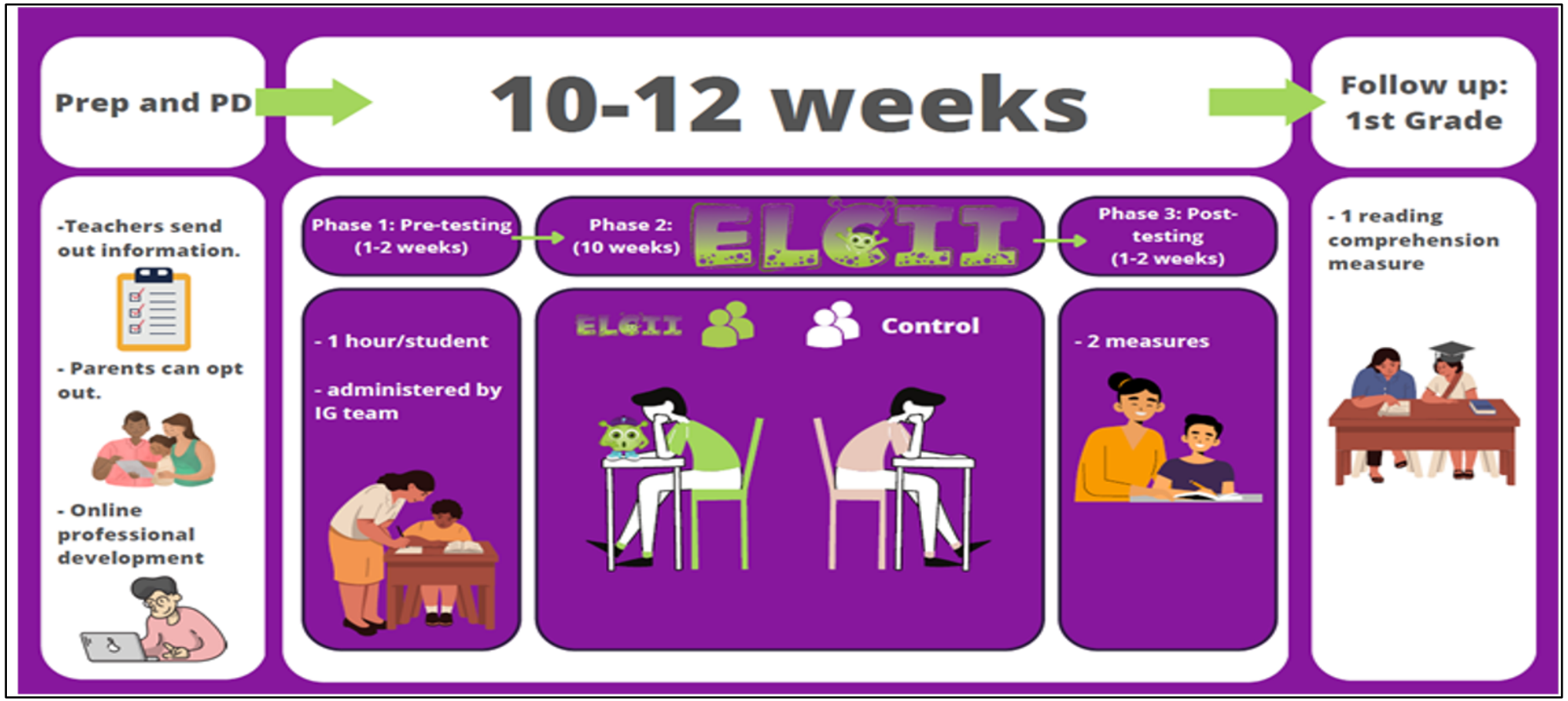
Iterative development process



Large-Scale Randomized Trial (2023-25)



ELCII Timeline and Implementation

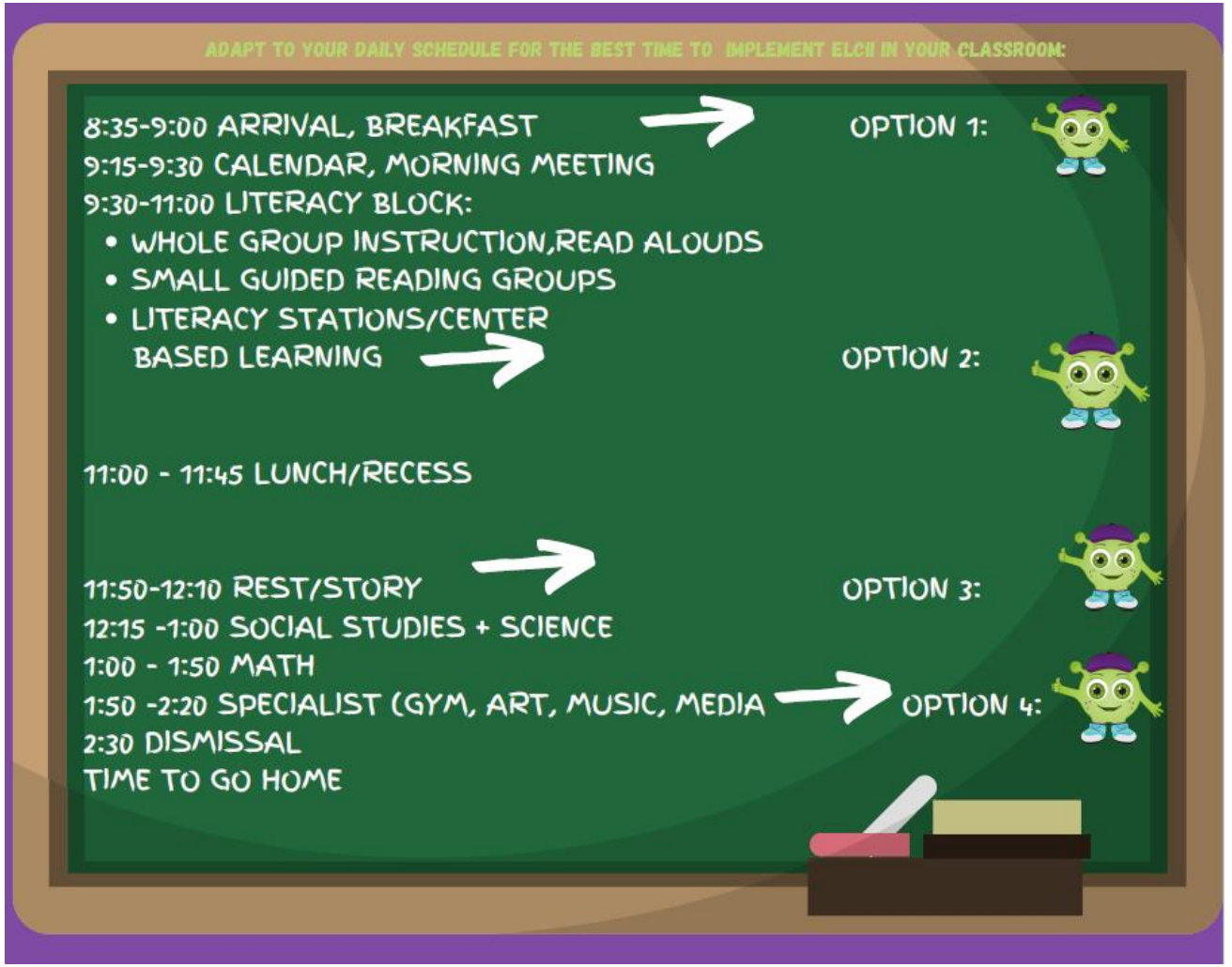


Implementation

4 times per week

15-20 min

10 weeks



Research Findings to Date

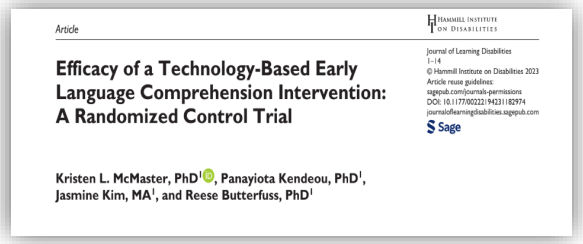
Strong Evidence

Inference Galaxy Instruction → Inference-making Language comprehension → Reading comprehension

Usability

Feasibility

Promise



Article

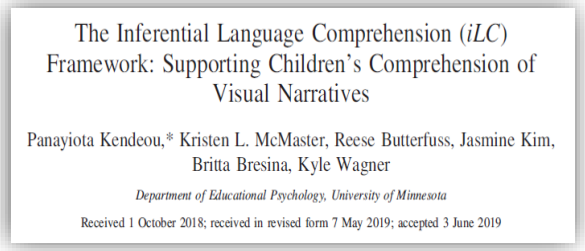
Efficacy of a Technology-Based Early Language Comprehension Intervention: A Randomized Control Trial

Kristen L. McMaster, PhD[1], Panayiota Kendeou, PhD[1], Jasmine Kim, MA[1], and Reese Butterfuss, PhD[1]

Reading and Writing (2023) 36:467–490
https://doi.org/10.1007/s11145-022-10391-2

Supporting inference-making during COVID-19 through individualized scaffolding and feedback: a natural experiment

Jasmine Kim[1] · Joseph Burey[1] · HyeJin Hwang[1] · Kristen McMaster[1] · Panayiota Kendeou[1]

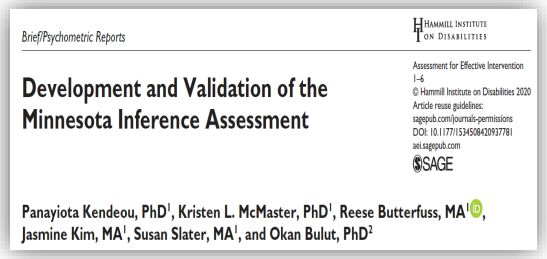


The Inferential Language Comprehension (*iLC*) Framework: Supporting Children's Comprehension of Visual Narratives

Panayiota Kendeou,* Kristen L. McMaster, Reese Butterfuss, Jasmine Kim, Britta Bresina, Kyle Wagner

Department of Educational Psychology, University of Minnesota

Received 1 October 2018; received in revised form 7 May 2019; accepted 3 June 2019



Brief/Psychometric Reports

Development and Validation of the Minnesota Inference Assessment

Panayiota Kendeou, PhD[1], Kristen L. McMaster, PhD[1], Reese Butterfuss, MA[1], Jasmine Kim, MA[1], Susan Slater, MA[1], and Okan Bulut, PhD[2]

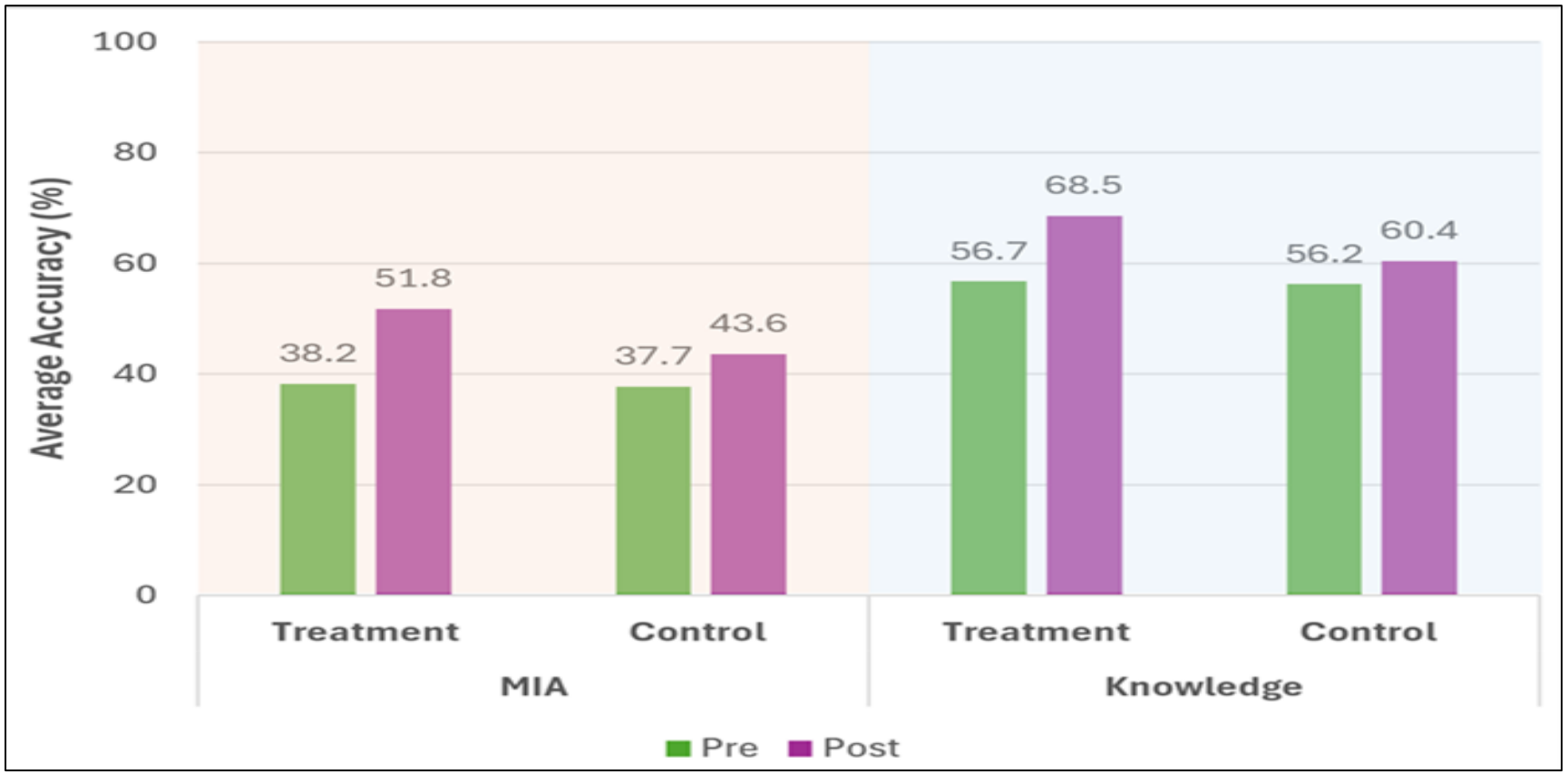
Cohort 1: Preliminary Results

- Effect on inference-making
- Measured with Minnesota Inference Assessment (MIA)
- The treatment group performed higher in MIA
  - *Cohen's d* = .43 (small to moderate effect)
  - 66% of treatment group students are expected to be above the mean of the control group

Cohort 1: Preliminary Results (cont'd)

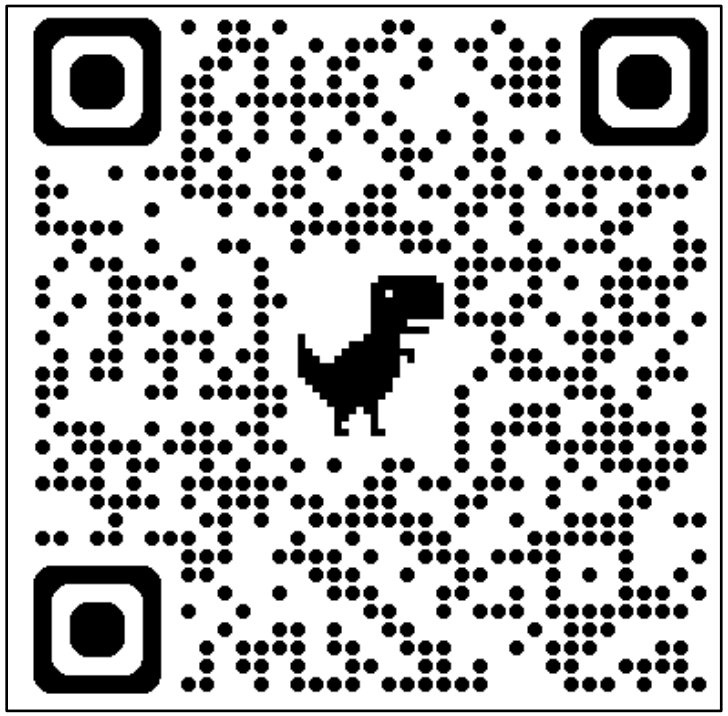
- Effect on content knowledge
- Knowledge measure developed by the research team
  - Multiple-choice and true/false items
- The treatment group performed higher in the knowledge measure
  - *Cohen's d* =.61 (moderate effect)
  - 76% of the treatment group students will be above the mean of the control group

Cohort 1: Preliminary Results (cont'd 2)



Current Status of Inference Galaxy

- Three-year randomized control trial in 40+ kindergarten classrooms in Minnesota
- Scan the QR Code to visit our website for additional research findings: https://inferencegalaxy.com/



Group Discussion

- How to adapt IG to your student population (i.e., students with low-incidence disabilities)?
- How do you currently teach inference-making?
- What strategies are you using to teach inference-making and/or reading?
- What barriers/challenges do you face with your reading instruction?
- How does the READ act impact your reading instruction?

Strategies for Supporting Inference Making

Using the questioning, scaffolding, and feedback techniques

Inference-Making Skills Transfer Across Media

- Inference-making processes are general regardless of types of media (e.g., video, audio, written text)
- Different media can be used to support inference-making
- Offering scaffolding to students while they answer inferential questions can help their inference-making
- Inference-making when listening to read-alouds can be transferred to inference-making when reading independently

How to Design Your Own Inference-Making Videos!

1. Select a topic or theme aligned with student interests and/or curriculum and standards
2. Find videos that relate to the topic or theme
3. Prepare explicit teaching of vocabulary words important to understanding the videos
4. Write inferential questions (see next slide)
5. Consider how you will provide scaffolding and feedback

Source: Hwang, H., Kendeou, P., & McMaster, K. L. (2024). Fostering inference-making through video-based technology in young children with early reading difficulties. Manuscript accepted pending minor revisions in *Journal of Special Education Technology*.

Writing Inferential Questions

- Analyze the content of the video.
  - What information is stated explicitly?
  - What ideas are missing or implied?
- Develop a question that uses explicitly stated information to help fill in the missing information.

Example

- Polar bear video states:
  - “When pack ice breaks in the Arctic, most animals will fall into the water.”
  - “Polar bears have a special walk that keeps them from breaking the ice.”
- Ask a question about what is not explicitly stated, but implied:
  - “Why don’t polar bears fall into the water?”

“Hands On” Inference Making Activity

Design Your Own Read Aloud & Inferencing Video Activities

Inference-Making During Read Alouds

You can replicate in your classroom via read alouds with books.

Use our Lesson Plan template to guide inferencing.

Key Elements

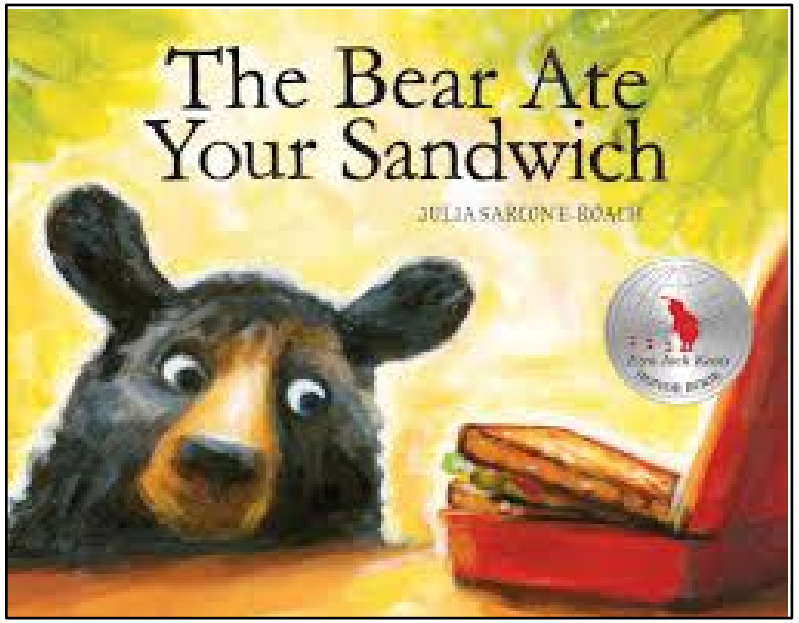
1. Pre-teach vocabulary
2. Model inferencing with explicit clues
3. Engage students in guided practice
4. Provide feedback and extensions

Summary

- Inference-making is generating a new idea based on ideas we have seen, heard, and/or read
- Inference-making is critical for reading and content-area learning
- Read-alouds can be leveraged to support inference-making

Read-Aloud Activity: Modeling and Practicing Inference Making with *The Bear Ate Your Sandwich*

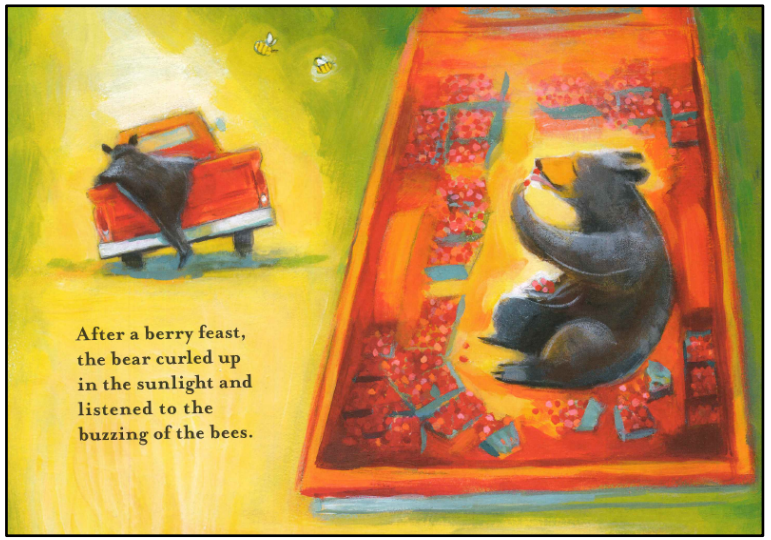
- **Introduction & Vocabulary**
  - **Book Title:** *The Bear Ate Your Sandwich* by Julia Sarcone-Roach
- **Objective:** Teach students to make inferences by analyzing the caterpillar's journey and habits.
- **Pre-teach Vocabulary:**
  - Key Words: *den, ripe, scent*
  - Use vocabulary cards, images, or tactile materials (e.g., real or felt fruit models)



Sarcone-Roach, J. (2015). *The bear ate your sandwich*. Knopf Books for Young Readers.

Read-Aloud Activity: Modeling and Practicing Inference Making with *The Bear Ate Your Sandwich, cont.2*

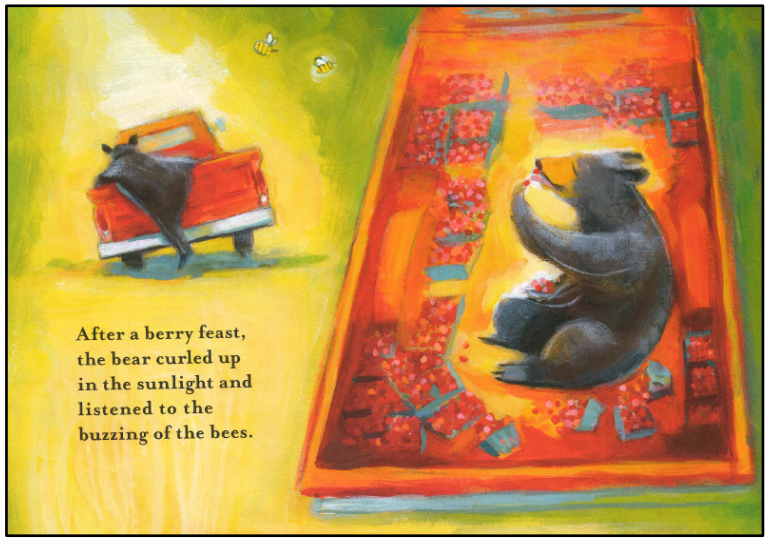
- **Teacher-Led Modeling of Inference Making**
  - Pose a guiding question: How did the Bear find the red pick-up truck?
    - "I know that the bear stepped out of his den." (Teacher gestures to one hand)
    - "I also know that the bear smelled the scent of ripe berries." (Teacher gestures to other hand)



Sarcone-Roach, J. (2015). *The bear ate your sandwich*. Knopf Books for Young Readers.

Read-Aloud Activity: Modeling and Practicing Inference Making with *The Bear Ate Your Sandwich, cont.3*

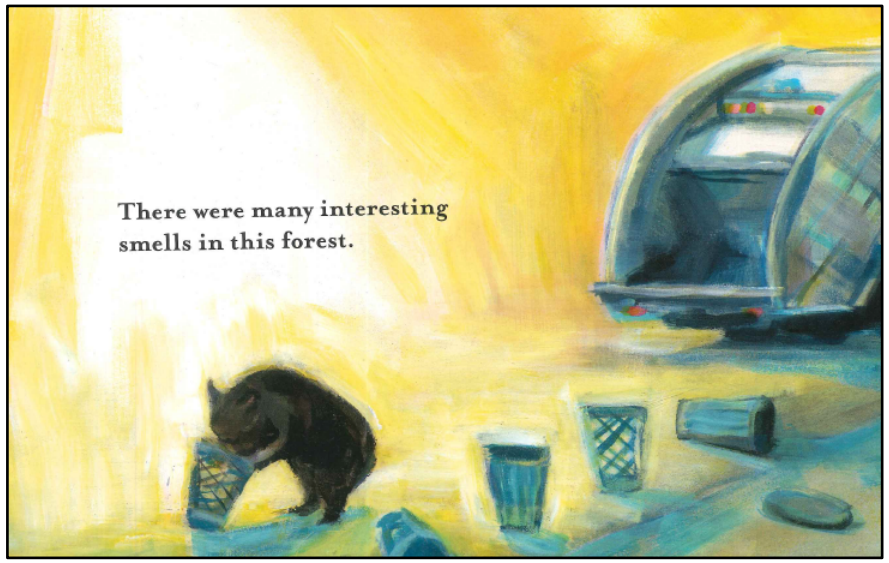
- **Model inference**
  - Inference #1: “I can infer that the bear found the red pick-up truck because he smelled the berries in the back of the truck.” (Teacher demonstrates by bringing both hands together.)



Sarcone-Roach, J. (2015). *The bear ate your sandwich*. Knopf Books for Young Readers.

Read-Aloud Activity: Modeling and Practicing Inference Making with *The Bear Ate Your Sandwich, cont. 4*

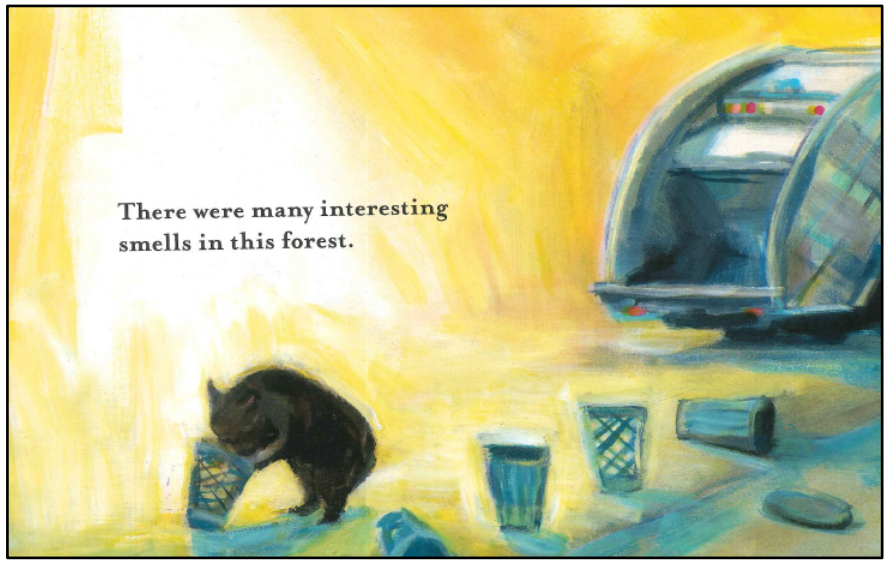
- **Guided Practice with Peer Interaction**:
  - Pose a new question: *Now it's your turn to make an inference! Turn to a neighbor and tell them why you think the bear thought he was in a new forest?*
  - Prompt students to think-pair-share. Ask students for some suggested answers and give them feedback.



Sarcone-Roach, J. (2015). *The bear ate your sandwich*. Knopf Books for Young Readers.

Read-Aloud Activity: Modeling and Practicing Inference Making with *The Bear Ate Your Sandwich, cont.5*

- **After hearing some answers, review the scaffolds and correct answer:**
  - *We know that the bear climbed buildings, parks, and streetlights he had never seen before.* (Teacher gestures to one hand)
  - *And we know the bear discovered many different smells.* (Teacher gestures with the other hand)



Sarcone-Roach, J. (2015). *The bear ate your sandwich*. Knopf Books for Young Readers.

Video Inferencing Activity: Modeling and Practicing Inference Making with *The Bear Ate Your Sandwich*

- You can follow the same read aloud lesson sequence with a video read aloud of *The Bear Ate Your Sandwich*
  - Pause in the same places to ask questions, model and practice inference making, and provide student feedback

It’s Your Turn! Design Your Own Inferencing Video Lesson!

1. Select a topic or theme aligned with curriculum and standards and/or student interests
2. Find relevant videos that relate to the topic or theme
3. Prepare explicit teaching of vocabulary words important to understanding the videos
4. Write inferential questions (see next slide & IG Lesson Plan template)
5. Consider how you will provide scaffolding and feedback

Source: Hwang, H., Kendeou, P., & McMaster, K. L. (2024). Fostering inference-making through video-based technology in young children with early reading difficulties. Manuscript accepted pending minor revisions in *Journal of Special Education Technology*.

Remember: Writing inferential questions

- Analyze the content of the video.
  - What information is stated explicitly?
  - What ideas are missing or implied?
- Develop a question that uses explicitly stated information to help fill in the missing information.

Inference Lesson Planning Resources

- **Video resources**
  - https://tpt.pbslearningmedia.org/
  - https://www.nationalgeographic.org/society/education-resources/
  - https://learninglab.si.edu
- **For video annotation**
  - VideoAnt (freely available at https://ant.umn.edu/)
  - Video Notebook (freely available at https://www.videonotebook.com/).
- **For vocabulary instruction (kid friendly definitions):**
  - https://kids.wordsmyth.net/
  - https://www.powerthesaurus.org/

Want to Learn More About Inference Galaxy?!

1. Visit our website and complete the Contact Form: https://inferencegalaxy.com/contact/

Charting the Cs

Thank you!

Kristen & Reagan

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