Interaction Design and Children 2015

Opening remarks:
What is curiosity?
(and how to assess it)

Jamie Jirout

Rhodes College

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Outlineof talk

1. How can curiosity be assessed?
   - Why we need to assess it
   - The importance of an operational definition
     - Both for assessing and promoting
2. An example
3. Future directions/ take-home messages

Why study curiosity?

- Bas… …g and inp…
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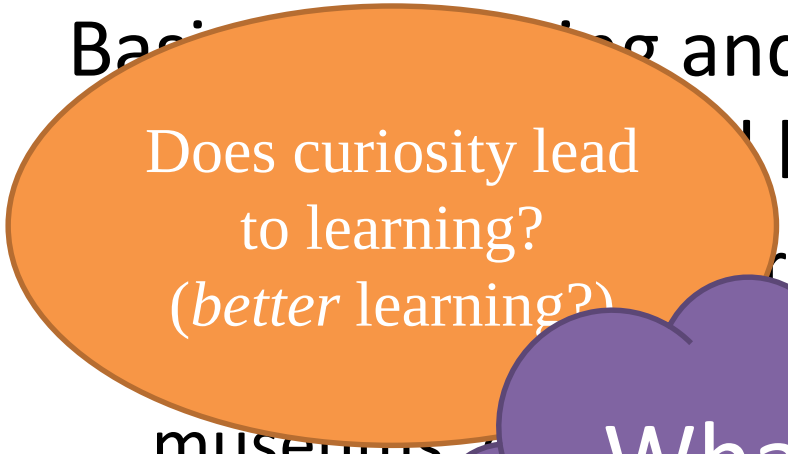
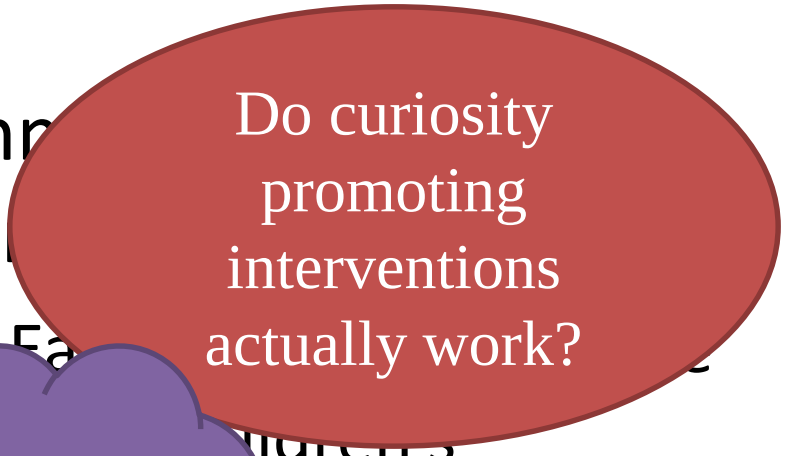
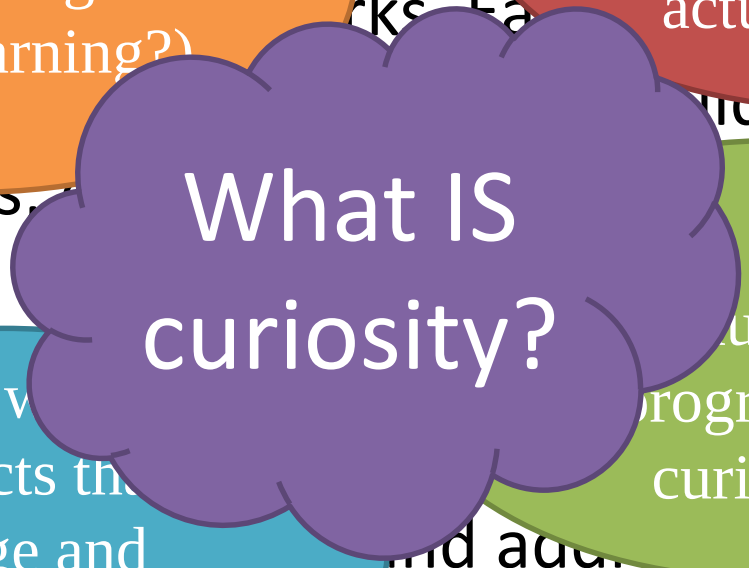
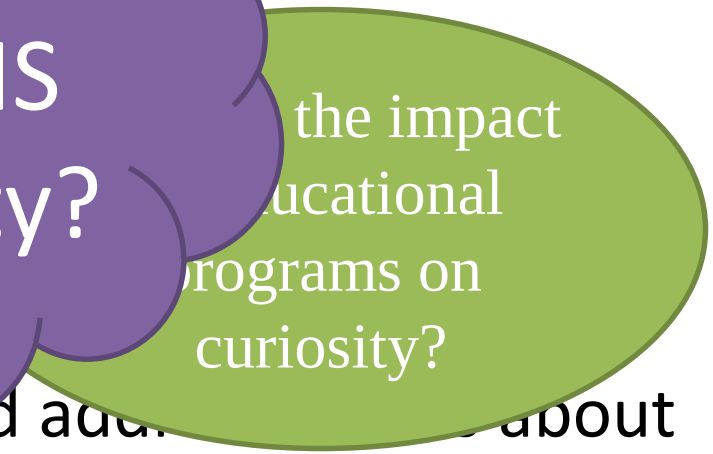
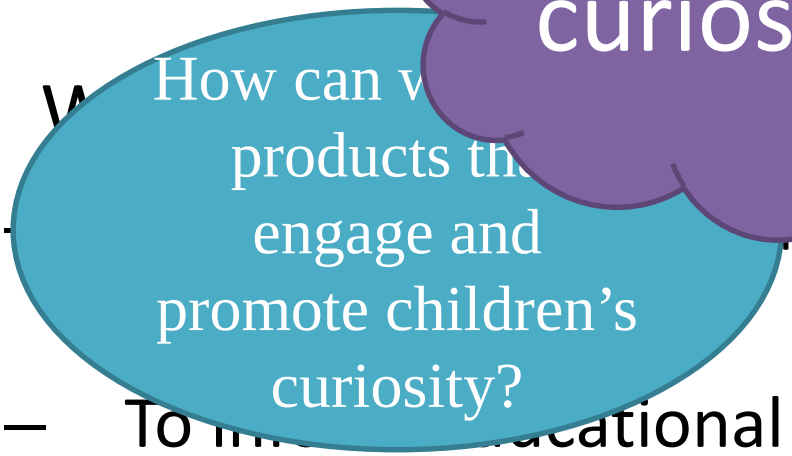
  museums.
- W…
  …nd add… …about
  - To in… …ucational practice and products











Does curiosity lead to learning? (*better* learning?)

Do curiosity promoting interventions actually work?

What IS curiosity?

How can w… products th… engage and promote children's curiosity?

…the impact …ucational …rograms on curiosity?

Children's curiosity: What is known?

- Literature review:
  - More than 350+ papers on curiosity in past 50 years!
    - A lot has been learned about curiosity, but…
      - Not much of it is generalizable or able to contribute to a single framework
      - No existing measure I could use!

“Types” of curiosity definitions

Curiosity as spontaneous exploration	Any fact fami (McRe Martin	sity. Ignore important characteristics, children’s hey are exploring. nuchin, 1971; Endsley, Hutcherson, Garner &
Curiosity as exploratory preference	Wha char and/ Mar (Smoc	rtant. Takes into account but not familiarity with or objects. ocus on *novelty preference*. r, 1964; Greene, 1964; Mendel, 1965)
Curiosity as preference for uncertainty	k unde (Alberti an 1994; Vlietst Schulz & Bonaw	t as important as muli and the subject’s perience *and* . n and Moore, 1980; Arnone, Grabowski and Rynd, Terrell, 1964; Charlesworth, 1964; Loewenstein, 1989; ut & Klahr, 2008)

Organized from very general to very specific

So what to do?

- Curiosity can be defined many ways, for different purposes.

- Research or design
  - Identify *purpose*, specify a definition of what you are interested, and *operationalize* it
  - Learning? Exploration? Question asking? Information seeking? Uncertainty reduction?
- Example: studying uncertainty preference

Example of curiosity assessment

- Purpose: To create an assessment of curiosity
  - Look at individual differences
  - Assess change over time
  - Look at more general curiosity, rather than state-specific

- Operationalization:
  This was the tricky part!

Example of curiosity assessment

Information-Gap Theory: Loewenstein, 1994

- Curiosity is aroused when attention becomes focused on a gap in one's knowledge

- Adult studies show reliable pattern of an 'optimal level' of knowledge gap that leads to exploration
  - Too small or too great of a gap reduces likelihood of exploration

Example of curiosity assessment

- The challenge: what to measure?
  - Curiosity as a stable, cognitive variable
    - BUT still sensitive enough to detect changes over time, for example from the beginning to the end of a school year.
- Operational definition
  - *The level of desired uncertainty in the environment that leads to exploratory behavior*

Example of curiosity assessment

- Assess children's level of preferred uncertainty – when is a child *most likely* to explore?
  - In a situation with two choices to explore, differing only in amount of uncertainty, which will a child choose?

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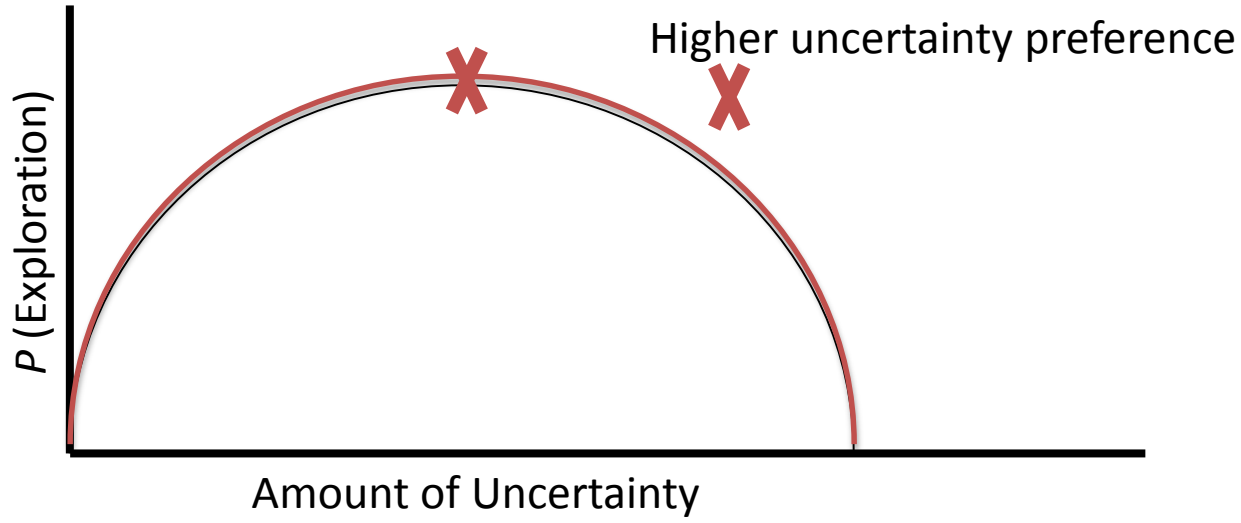
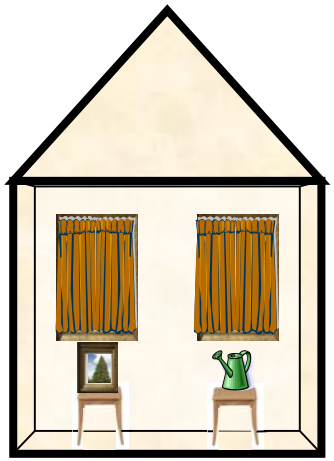
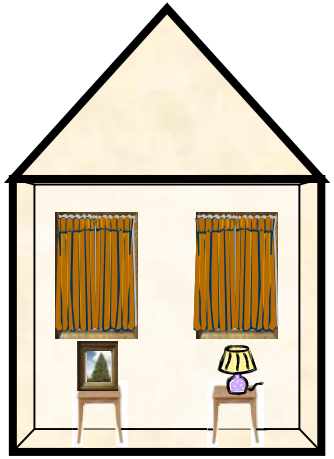


Measuring uncertainty preference

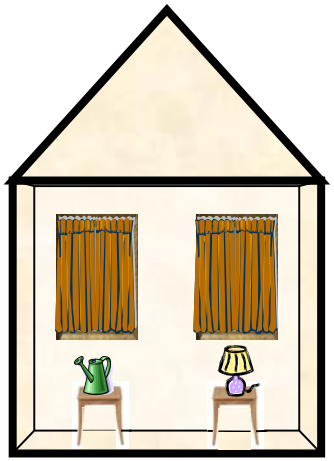
- Assess children's level of preferred uncertainty – when is a child *most likely* to explore?



None vs. Medium



None vs. Maximum

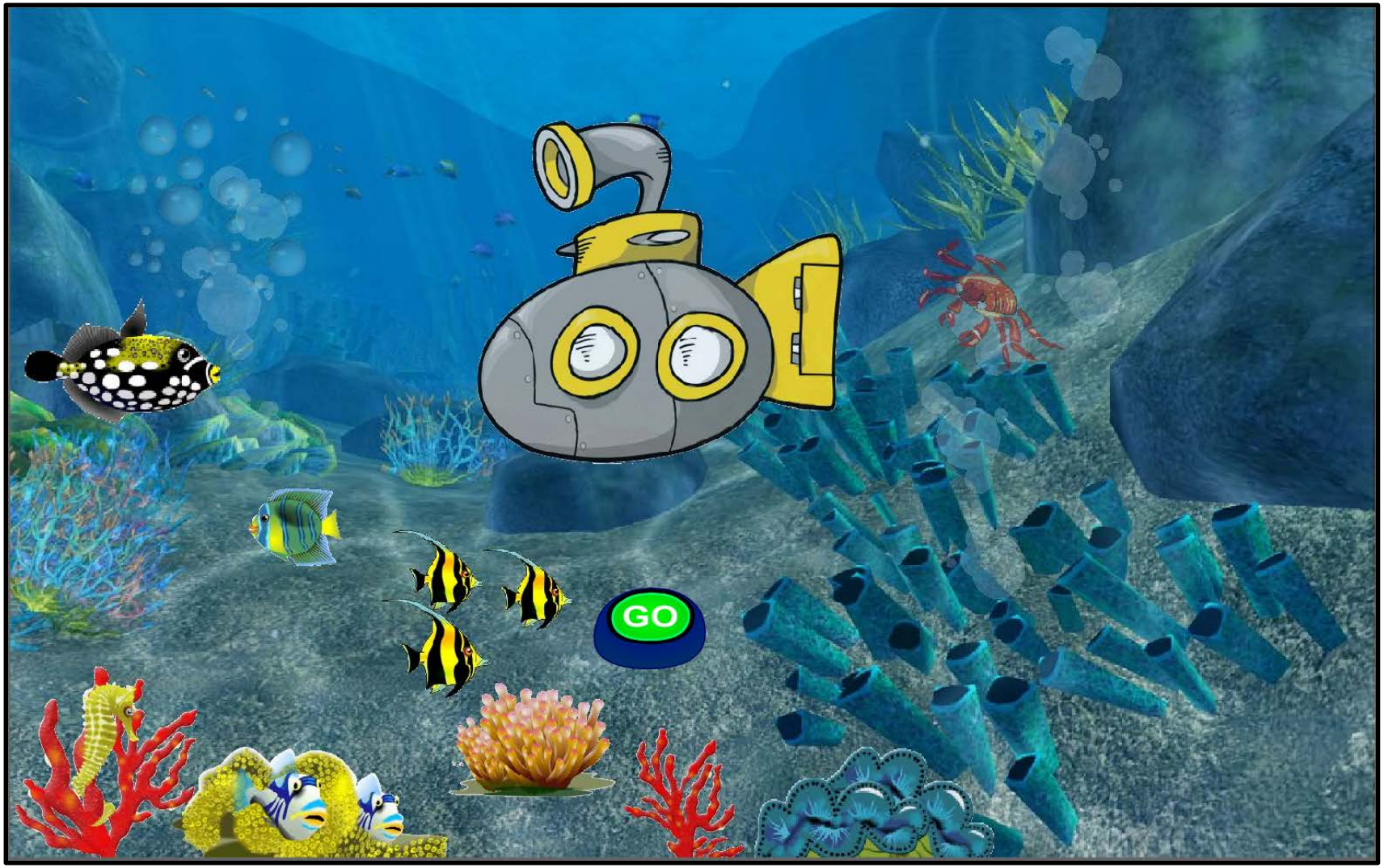


Medium vs. Maximum

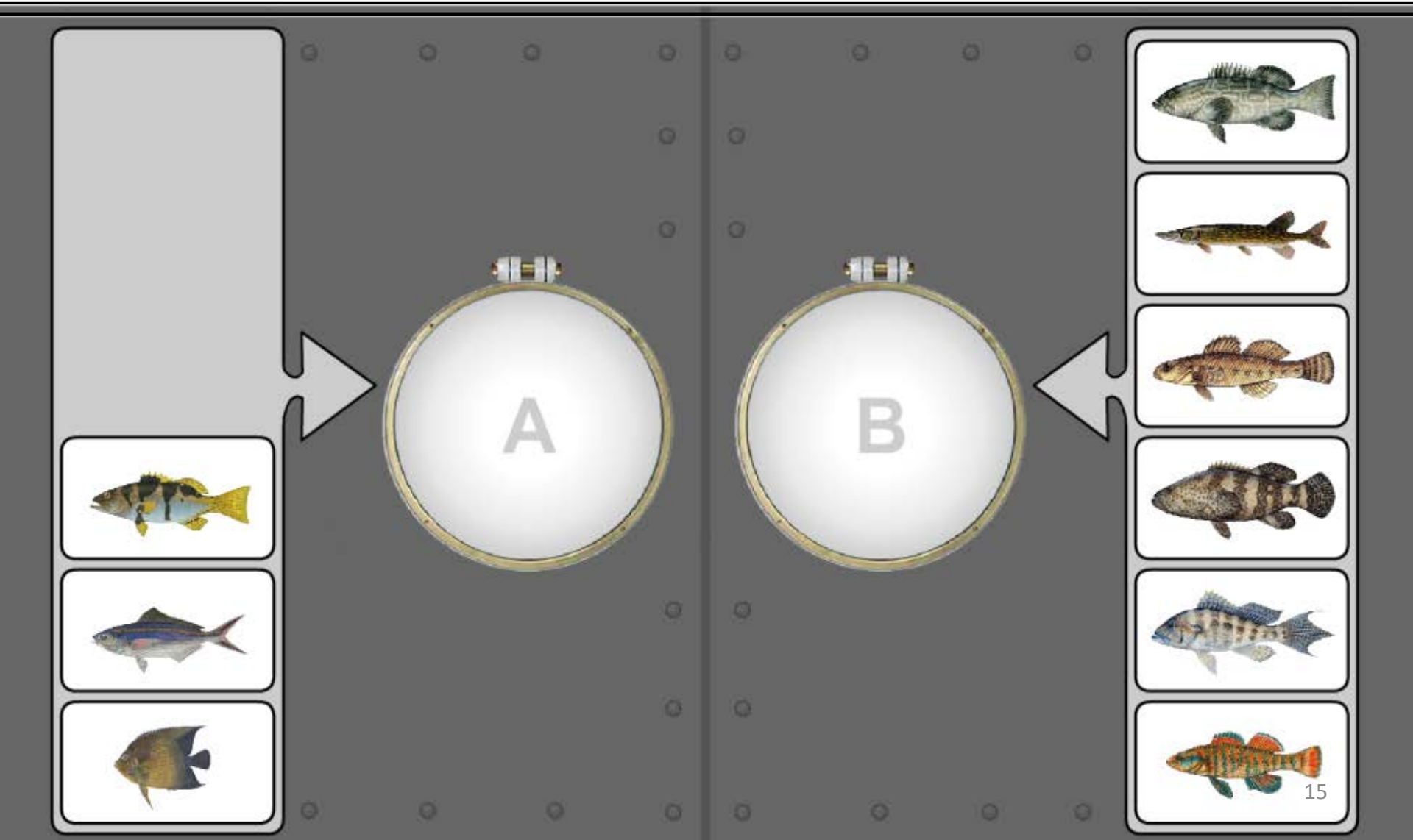
How does technology help?

- Technology = control!
  - Less errors
  - Adaptive measures
  - Fun stimuli
  - unlimited exploration, ability to create and imagine

Underwater Exploration!



"On this turn, look at the sides of the screen to see what fish might be outside of each of the windows. Now tell me, which one of the windows would you like to open?"



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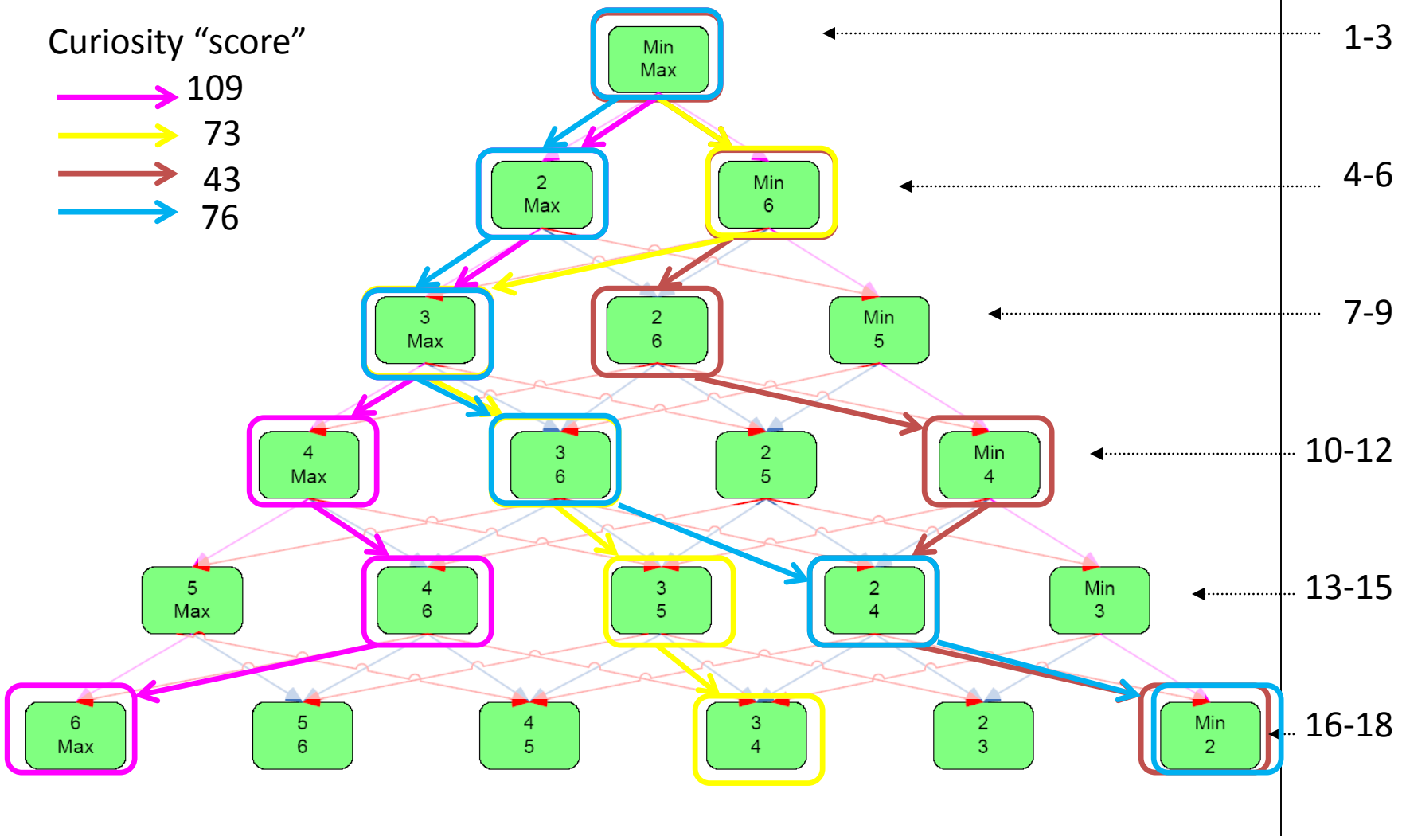


Yay, a measure!

- What next?
  - Can answer research questions
    - Does uncertainty preference relate to other types of exploratory/curiosity behaviors?
      - Persistence/attention, competence motivation, question asking, recognizing effective methods of reducing uncertainty: yes!
      - Manipulating an object to learn about it, exploring a science museum exhibit: not always.
    - Does it relate to learning?
      - Some evidence suggests yes!

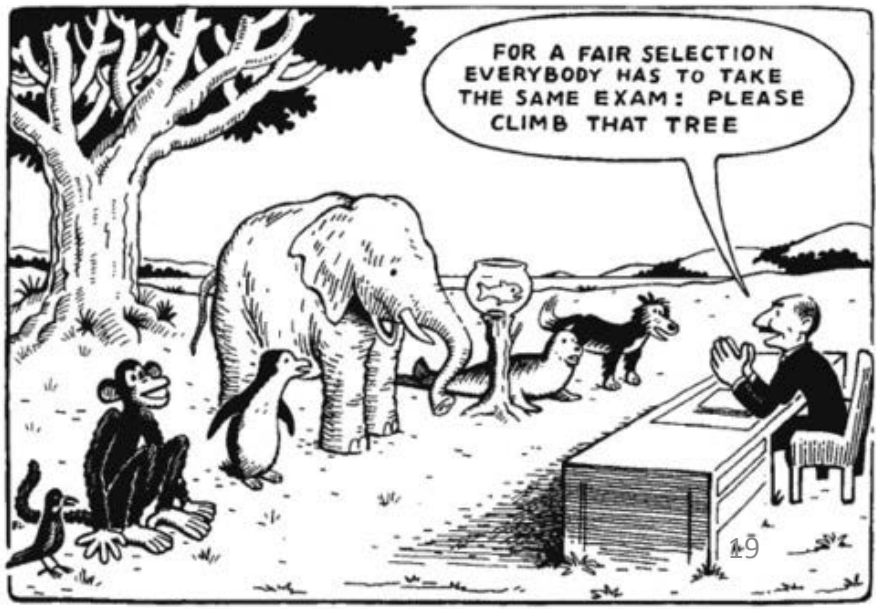
Yay, a measure!

- What next?
  - Can answer research questions
    - How can the research results be used to inform practice and design?
      - Looking at curiosity *this specific way*: provides suggestions for increasing *state* curiosity by providing optimal uncertainty
      - Provides theory of how to increase curiosity
    - Can kids learn to feel comfortable with *more* uncertainty?
      - Stay tuned ☺

However…

- My measure is just an example
  - Very specific “type” of curiosity
  - Was designed for a specific purpose

- Much more work needed!
  - Including more measures measurement methods



Main Message:

- To move the field of curiosity research forward: It's less important *how* you define curiosity, just that you *do*
  - And that you pay attention to others' operationalizations as well
- Technology provides us experimental control and (more importantly) an incredible space to create opportunity for children to explore and learn
  - Can be utilized to both assess and promote curiosity
- By understanding the processes or constructs identified as "curiosity", research findings can be utilized in technological design

PROPEL SCHOOLS

ies

Carnegie Mellon University

PIER @ Carnegie Mellon
PROGRAM IN INTERDISCIPLINARY EDUCATION RESEARCH

Thanks!

Questions?

Rhodes College
—1848—

THE REAL LAB
The Research in Education & Learning Lab at Rhodes College

rhodes.edu/reallab

Measure Validity, Strengths compared to techer ratings

Measure:	Fish Game	T. Ratings
PLBS: competence motivation	**.247***	NS
Attention/persistence	**.193***	NS
Attitudes toward learning	**.280***	NS
Total score	**.267***	NS
DECA: Protective factors	NS	**.269***
LE: vocabulary	NS	**.161***
Mathematics	NS	**.360***
Listening comprehension	NS	**.132***
Alphabet	NS	**.133***
PPVT: vocabulary	NS	**.166***
ASPI: Low energy	NS	**-.319***
Shyness	NS	**-.348***

* $p < .05$, ‘ $p < .10$