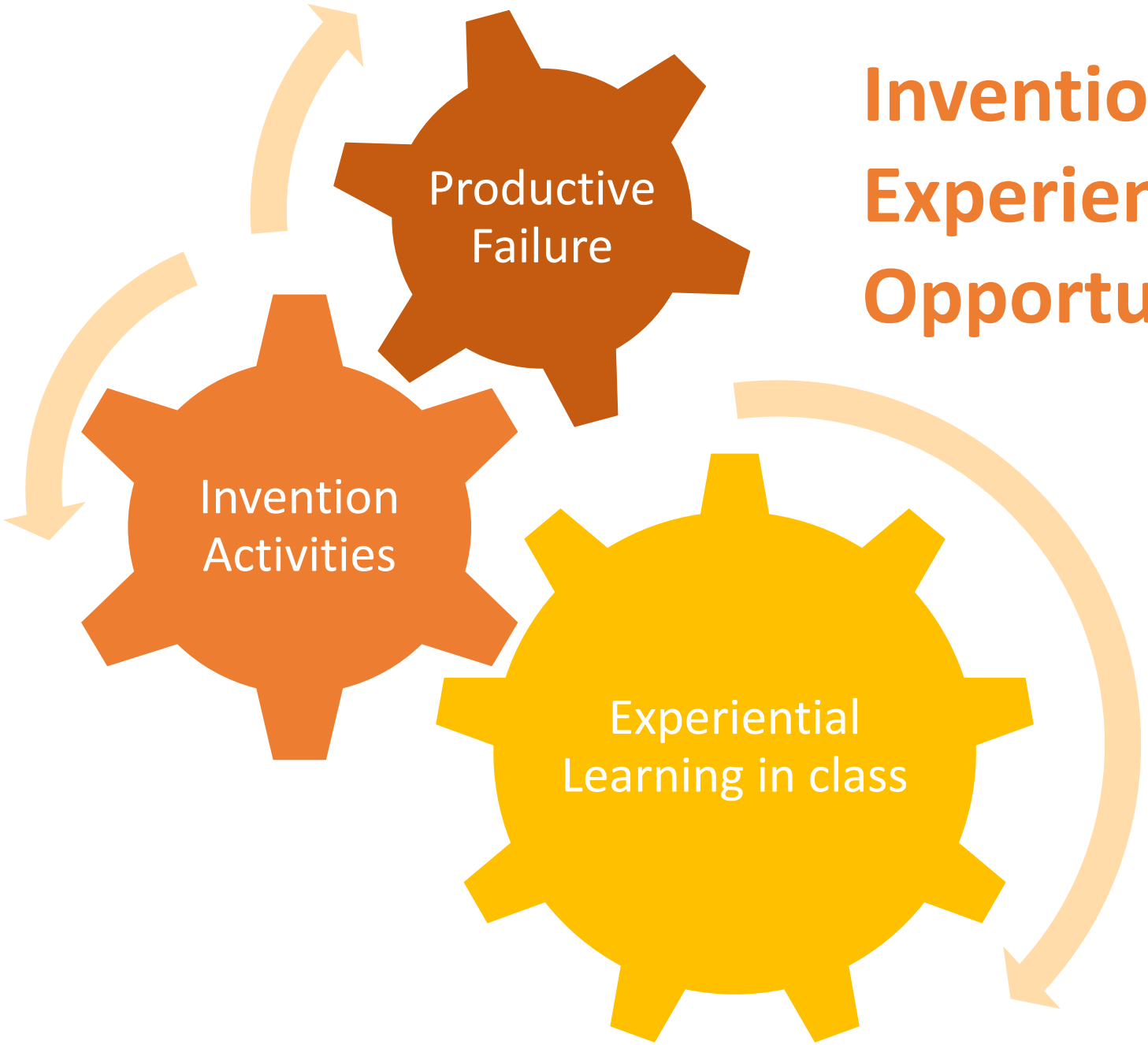


Invention Activities as Experiential Learning Opportunities

Tara Ivanochko

Earth Ocean and Atmospheric Sciences

Brief Introduction

Productive Failure:

- Students generate answers to novel problems prior to receiving instruction on the topic
- Student may fail to generate correct solutions
- Student learn from the subsequent instruction

Examples from Math and Statistics are common:

- Students asked to come up with a way to capture variability in data without having been taught about Standard Deviation

Kapur, M. (2008) Productive Failure, Cognition and Instruction, 26:3, 379-424, DOI: 10.1080/07370000802212669

Brief Introduction con't…..

Invention Activities:

- Opportunities to engage in productive failure
- Creative, low stakes opportunities to prime students for meaningful learning
- When coupled with subsequent instruction, invention activities can lead to strong learning gains

Schwartz, D.L., & Martin, T. (2004) Inventing to Prepare for Future Learning: The Hidden Efficiency of Encouraging Original Student Production in Statistics. Instruction, Cognition and Instruction, 22:2, 129-184, DOI: 10.1207/s1532690xci2202_1

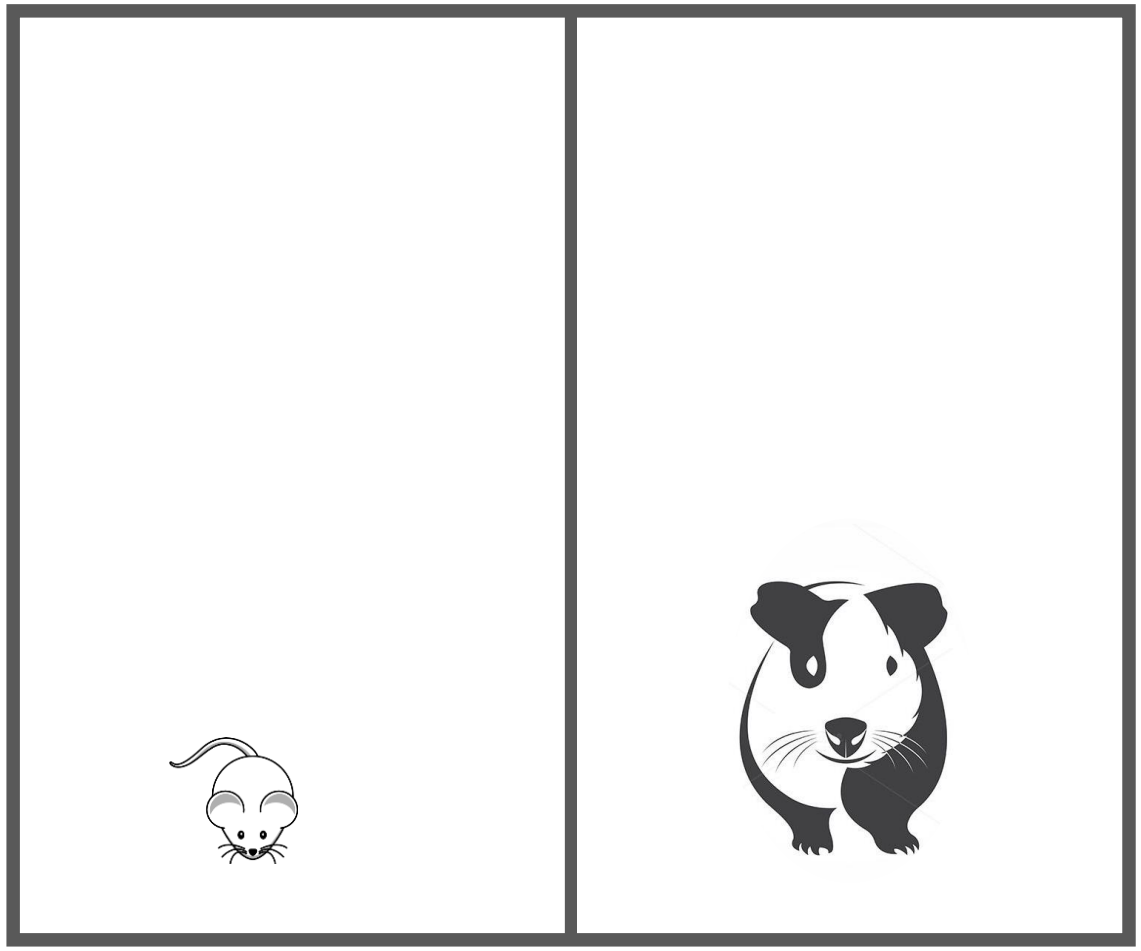
Roll, I., Holmes, N.G., Day, J., Bonn, D. (2012) Evaluating metacognitive scaffolding in Guided Invention Activities. Instr Sci (2012) 40:691–710. DOI 10.1007/s11251-012-9208-7

Brief Introduction con't…..

Invention Activity – Jared Taylor, Skylight Development Grant 2010

Example from Cell Biology:

- Invention: devise a way to allow the guinea big to move between the two spaces while restricting the mouse to one side only
- The scenario later equated to selectively permeable cell membranes

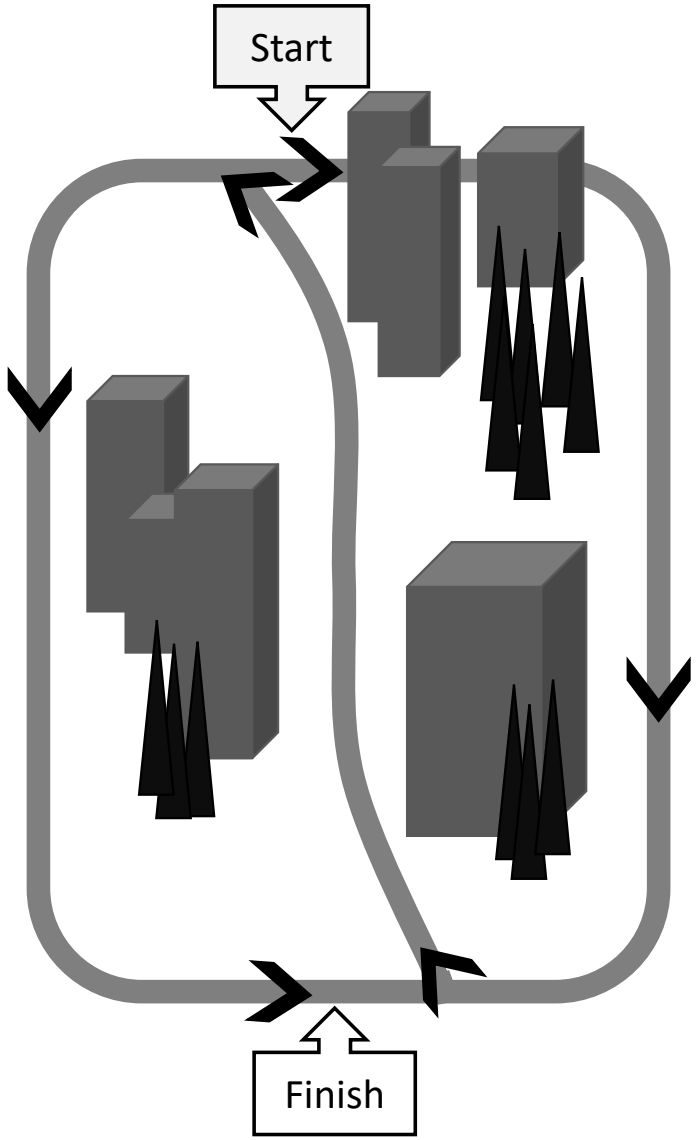


Adapting Invention Activities for my Classroom

Invention Activity:

In teams: You are a reporter providing a commentary on a 3-hour race (participants run the track 3 times).

- What will your listeners want to know?
- How often will they want to know it?
- Where would you sit to watch this race?
- What would you see from your vantage point?



Adapting Invention Activities for my Classroom

Challenging Concept:

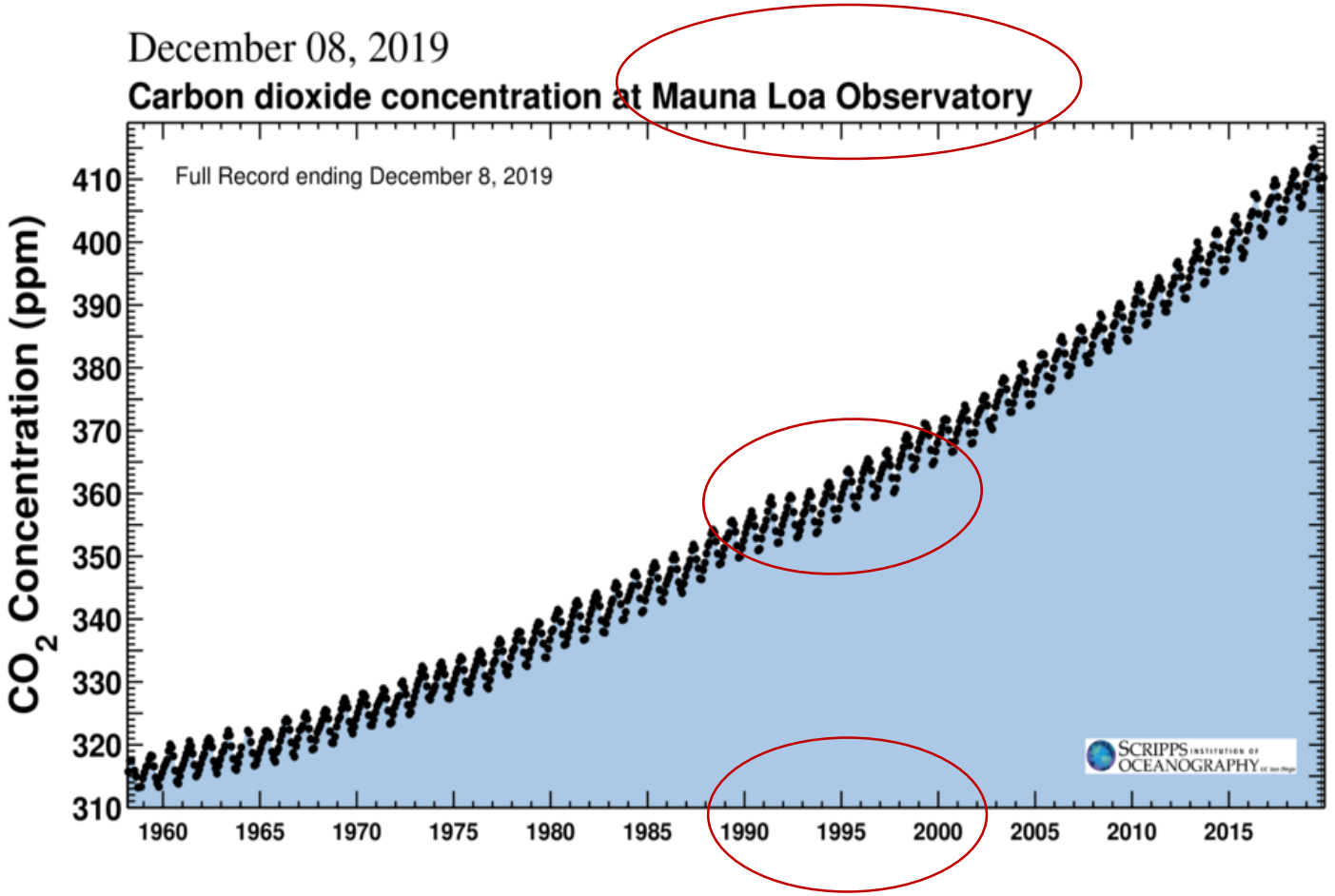
- Data collection must be designed to capture the timescale of variability associated with the phenomenon of interest

Big Questions:

- Where should I sample?
- How frequently do I need to sample to capture the important features of the phenomena?

Major Project :

Writing a scientific research proposal



Designing for Productive Failure

Productive failure is a learning design that embodies four core interdependent mechanisms:

- activation and differentiation of prior knowledge
- attention to critical conceptual features
- explanation and elaboration of these features
- organization and assembly of the critical conceptual features

Kapur, M./ & Bielaczyc, K. (2012) Designing for Productive Failure, Journal of the Learning Sciences, 21:1, 45-83, DOI: 10.1080/10508406.2011.591717

Designing for Productive Failure

Key Elements of the Activity:

- Finding the “sweet spot” where students are challenged yet not frustrated
- Creating a safe environment in which options can be explored
- Collaboration – more than one solution discussed
- Activity followed by instruction / introduction to solution

Kapur, M./ & Bielaczyc, K. (2012) Designing for Productive Failure, Journal of the Learning Sciences, 21:1, 45-83, DOI: 10.1080/10508406.2011.591717