

# Teaching & Learning

How can we use what we know about how people learn to create effective learning experiences?





# Discussion & Workshop Norms

Listen actively and share ideas

Share and ask for evidence

Keep an open, curious mind

Disagree productively

Work toward a deeper understanding





# Lichen Description



# Quick Write:

*Think about when you really learned something well.*

- a) How did you learn it?
- b) What did you do first, second, etc?





# Sequencing an Activity

*to make an effective learning experience*

1. Put strips in a logical order to support learning.
2. Discuss why they should be in that order.
3. Don't need to include all strips – can add steps if necessary.

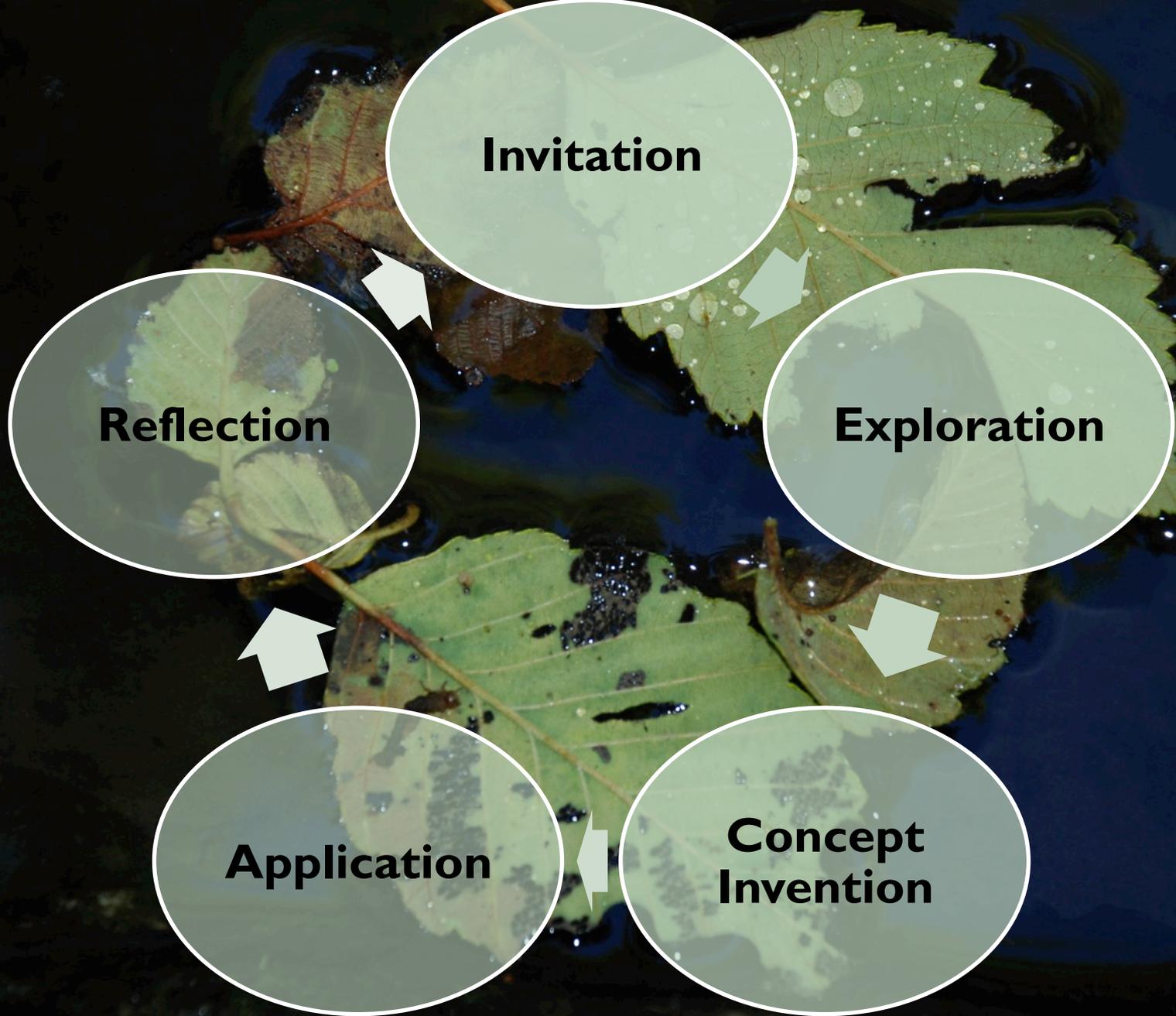


# Discovering the Learning Cycle

1. Read description of your assigned Learning Cycle phase.
2. Discuss the focus and goals of this phase with your table group.
3. Choose one or more lichen activity strips you think address the goals of this phase.
4. Be ready to explain how they accomplish the goals of the phase.



# The Learning Cycle

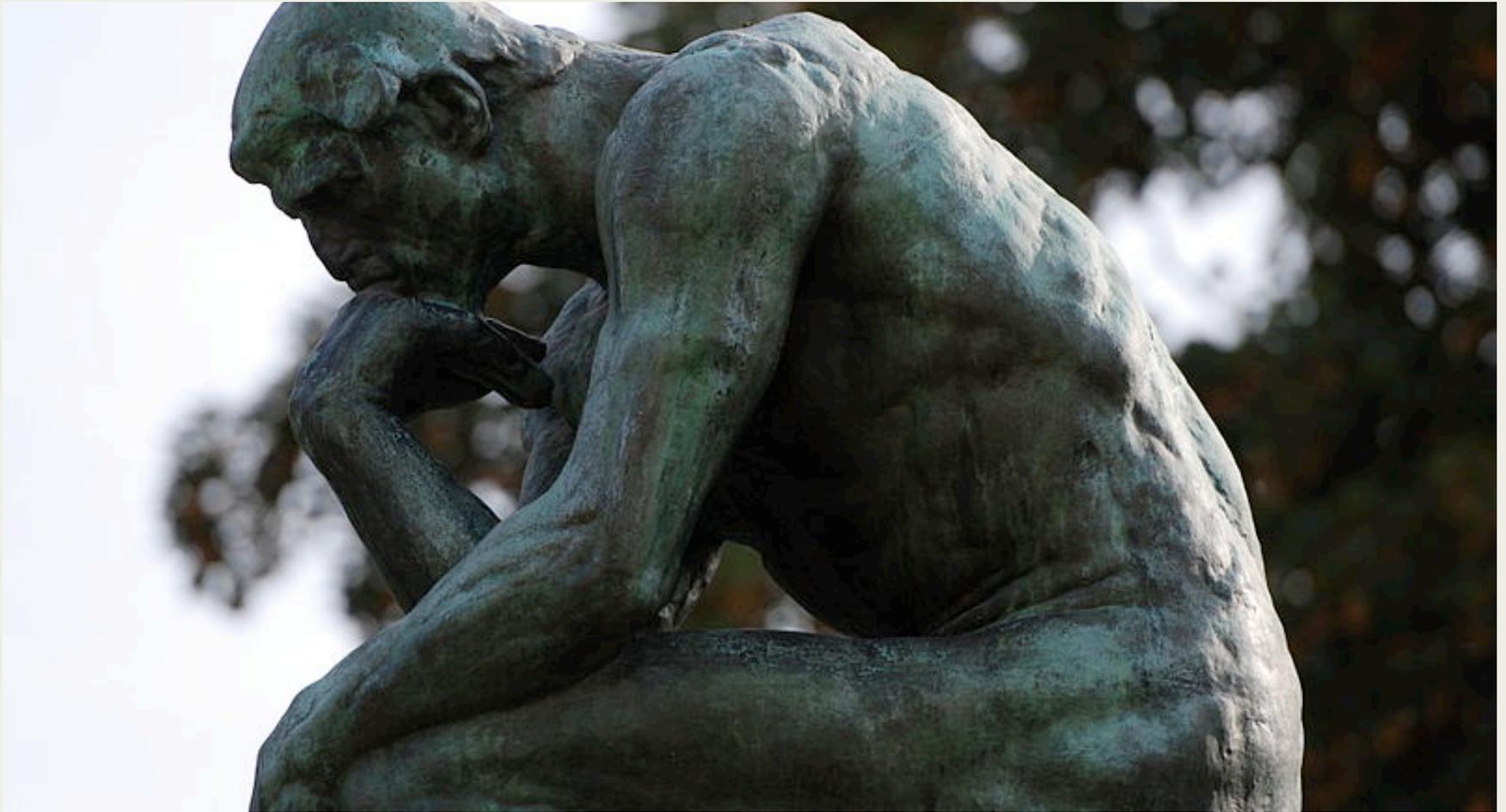


# Deep learning involves challenge & meaning-making

- *actively* struggling with ideas and questions
- making connections
- figuring things out



Learning is more about figuring things out than accumulating information.



# Keys to Using the Learning Cycle: It's Flexible!



## Invitation

- Students discuss if they have ever seen anything like it before
- Students discuss what it reminds them of

## Exploration

- Pairs observe, describe & compare different types of lichen.



# Concept Invention

- Students share findings
- Instructor shares the term, “lichen”
- Students discuss evidence for whether it’s plantlike or fungi
- Instructor explains relationship between algae & fungi
- Instructor introduces 3 types of lichen & key



## Application

- Pairs use the lichen key to identify lichen types

## Concept Invention

- Pairs search for patterns of lichen growth
- Whole group discusses findings & patterns of lichen growth
- Instructor introduces pattern of lichen succession



## Application

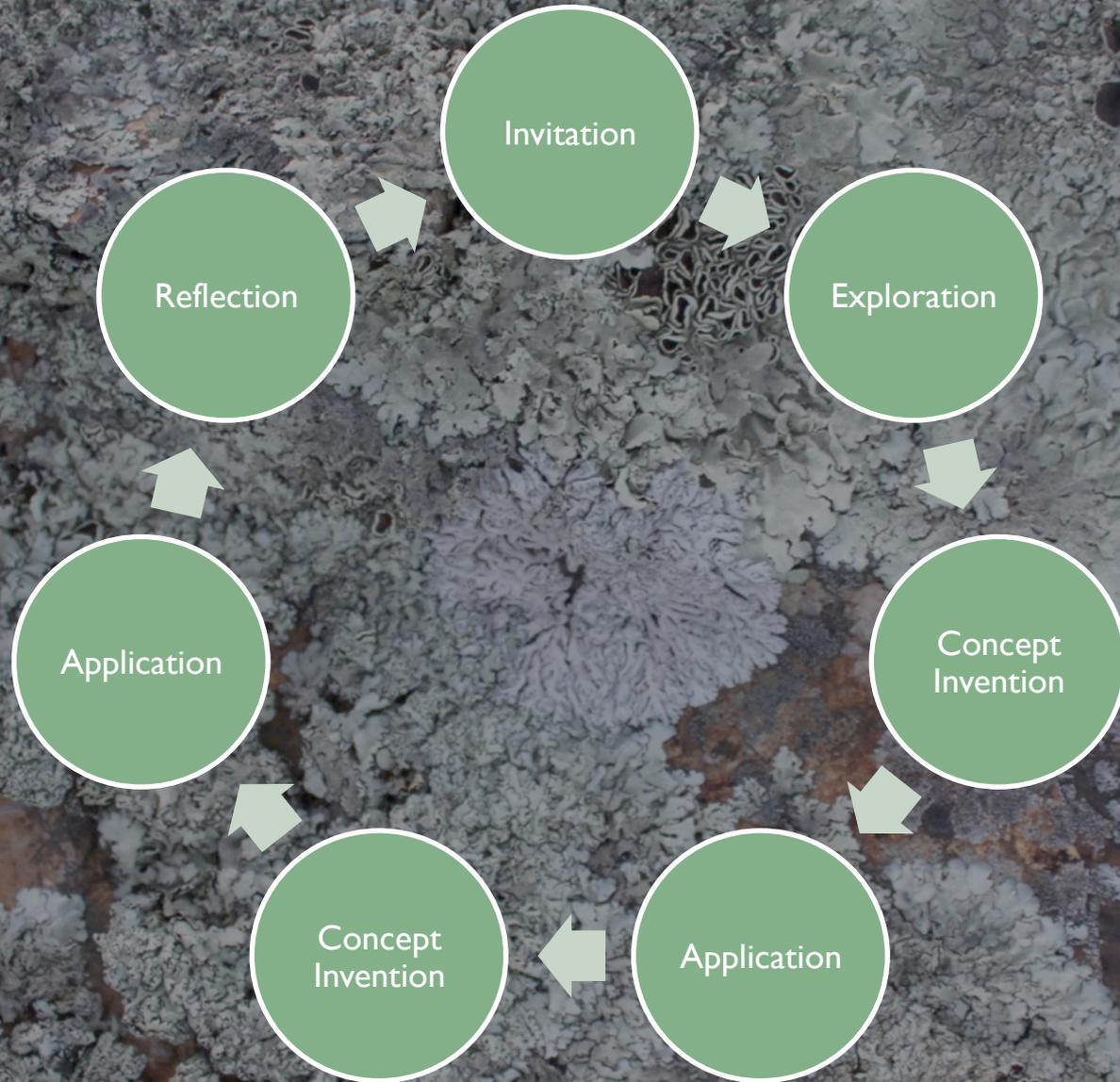
- Pairs search for evidence of this order of lichen growth

## Reflection

- Students describe what they learned about lichen & how they learned it
- Students discuss what they still wonder about lichen



# Lichen Exploration Learning Cycle



# Keys to Using the Learning Cycle: Meaning-making happens at every stage



# Keys to Using the Learning Cycle: Think Creatively about Concept Invention

- **Ask students:**
  - What did you notice?
  - What questions do you have?
  - What are some possible explanations for that?
  - Can you explain what makes you think that?



# Keys to Using the Learning Cycle: Think creatively about concept invention (cont.)

- **Ask yourself:**
  - What are students trying to figure out?
  - What opportunities exist for discussions?
- **Do:**
  - Help students make connections.
  - Encourage students to notice patterns and cross-cutting ideas.



Keys to Using  
the Learning  
Cycle:  
**Use  
assessment  
liberally**



# Common Mistake #1:

Introducing concepts and vocabulary before invitation and exploration



# Common Mistake #2:

Skimping on or skipping altogether one or more phases of the learning cycle, most commonly:

- Meaning-making after exploration
- Application
- Reflection



# Common Mistake #3:

Relying mostly on one phase of the cycle, e.g., exploration or concept invention.



# Learning Cycle applied at different scales:

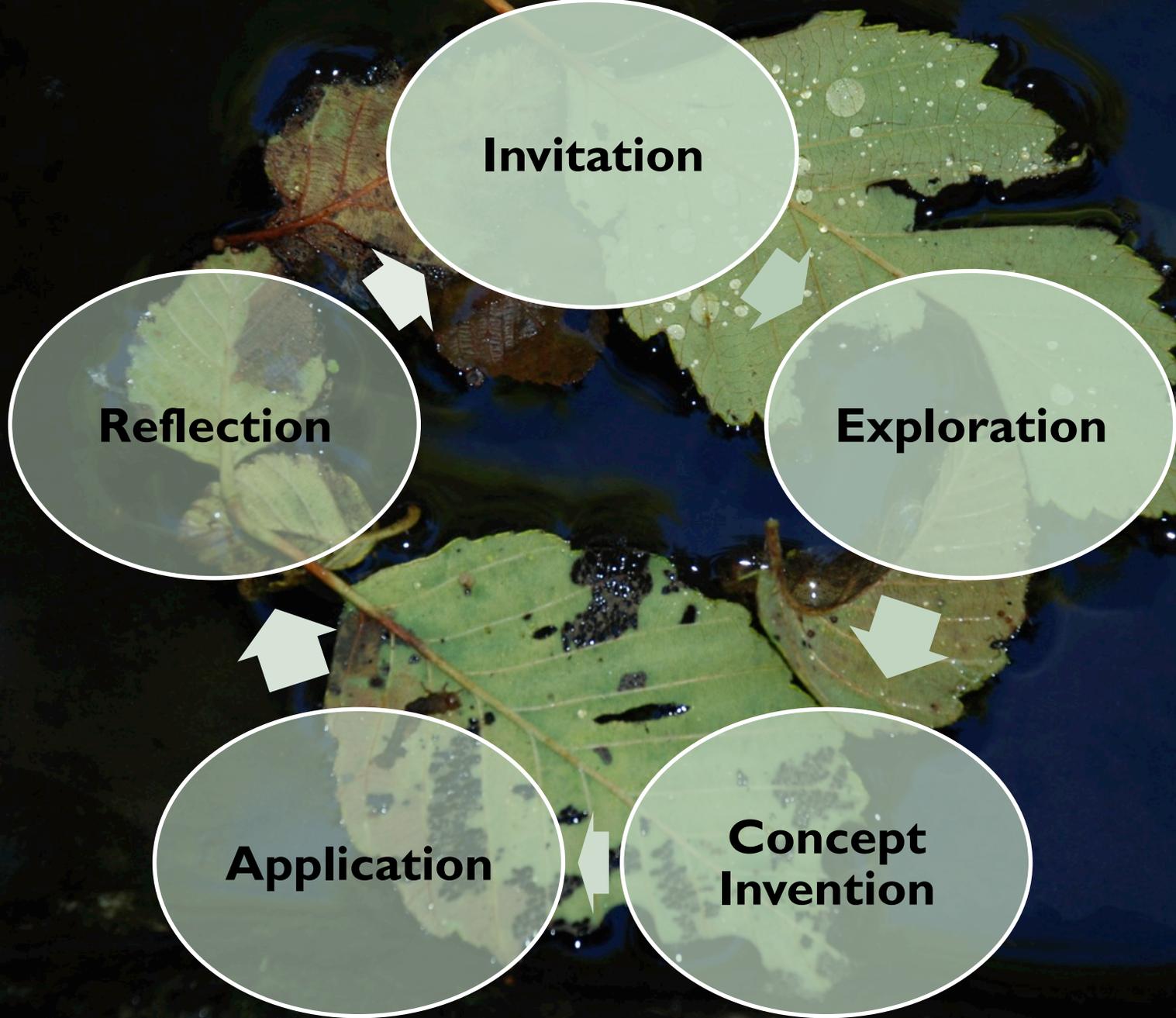
- **Short:** a brief experience
- **Medium:** a complete activity
- **Long:** a series of activities on a topic



# Short Learning Cycle



# The Learning Cycle



# Long Learning Cycle



# The Learning Cycle is not Enough..



A carefully structured sequence of activities enhances the possibilities of learning, but it does not ensure learning. The careful probing by teachers, subtly challenging the students, and knowing when to provide a hint or clue that will help the student reconstruct an idea are all interpersonal activities... The teacher is essential to complete the process of conceptual change.

- Rodger W. Bybee



# Reflection:

- Write your current ideas about planning experiences according to the learning cycle.
- Describe specific things you can do to make your instruction more learning cycle-based.



The following slides are for the optional follow-up activity, *Planning a Long/Extended Field Experience (whole hike) Learning Cycle*.

# It's Complex

Different scales of learning cycles combine

**Cool  
find  
Short  
cycle**

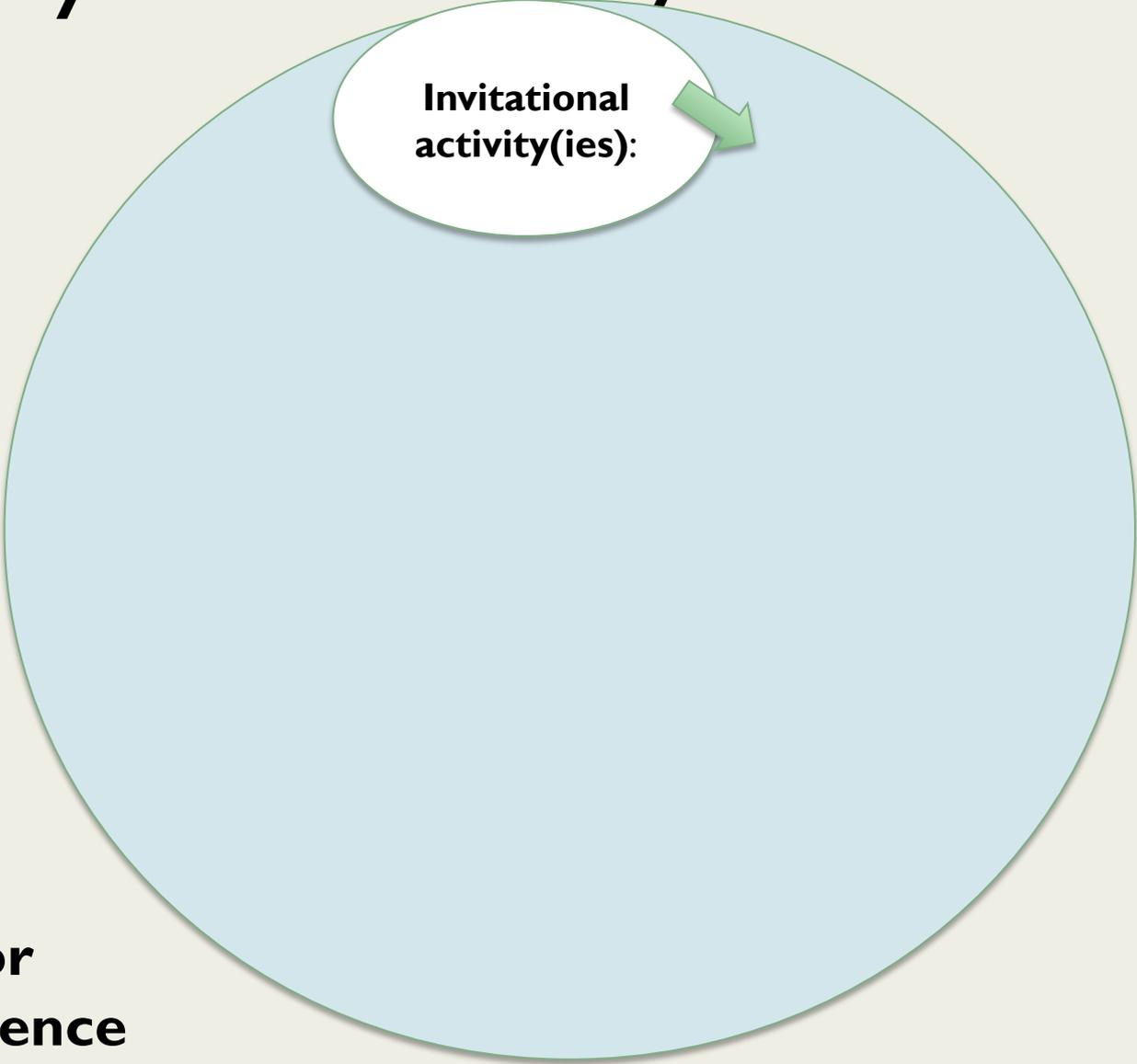
**Activity  
Medium  
cycle**

**Long cycle:  
Full outdoor field experience**



# Cycles within cycles...

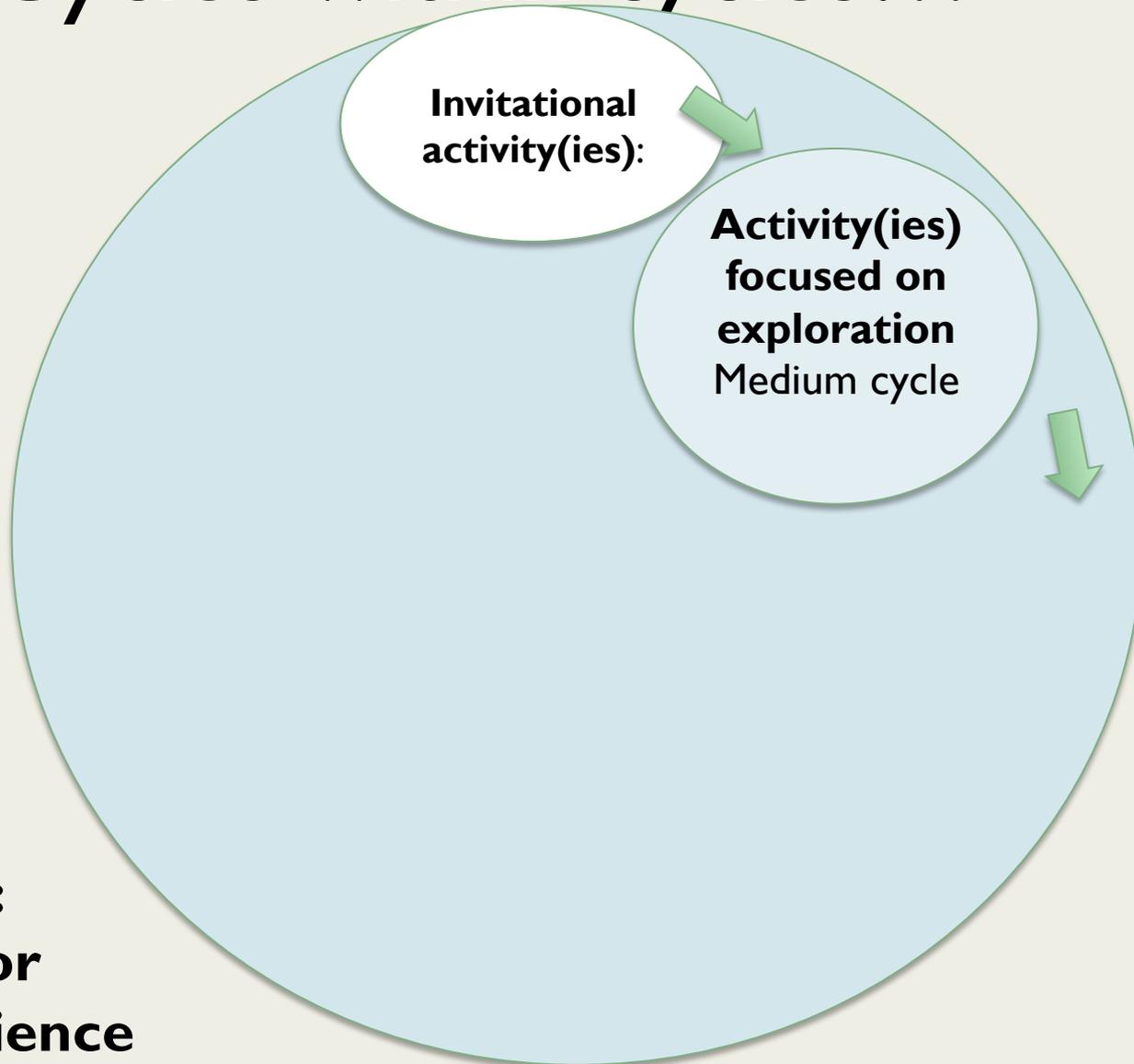
**Invitational  
activity(ies):**



**Long cycle:  
Full outdoor  
field experience**



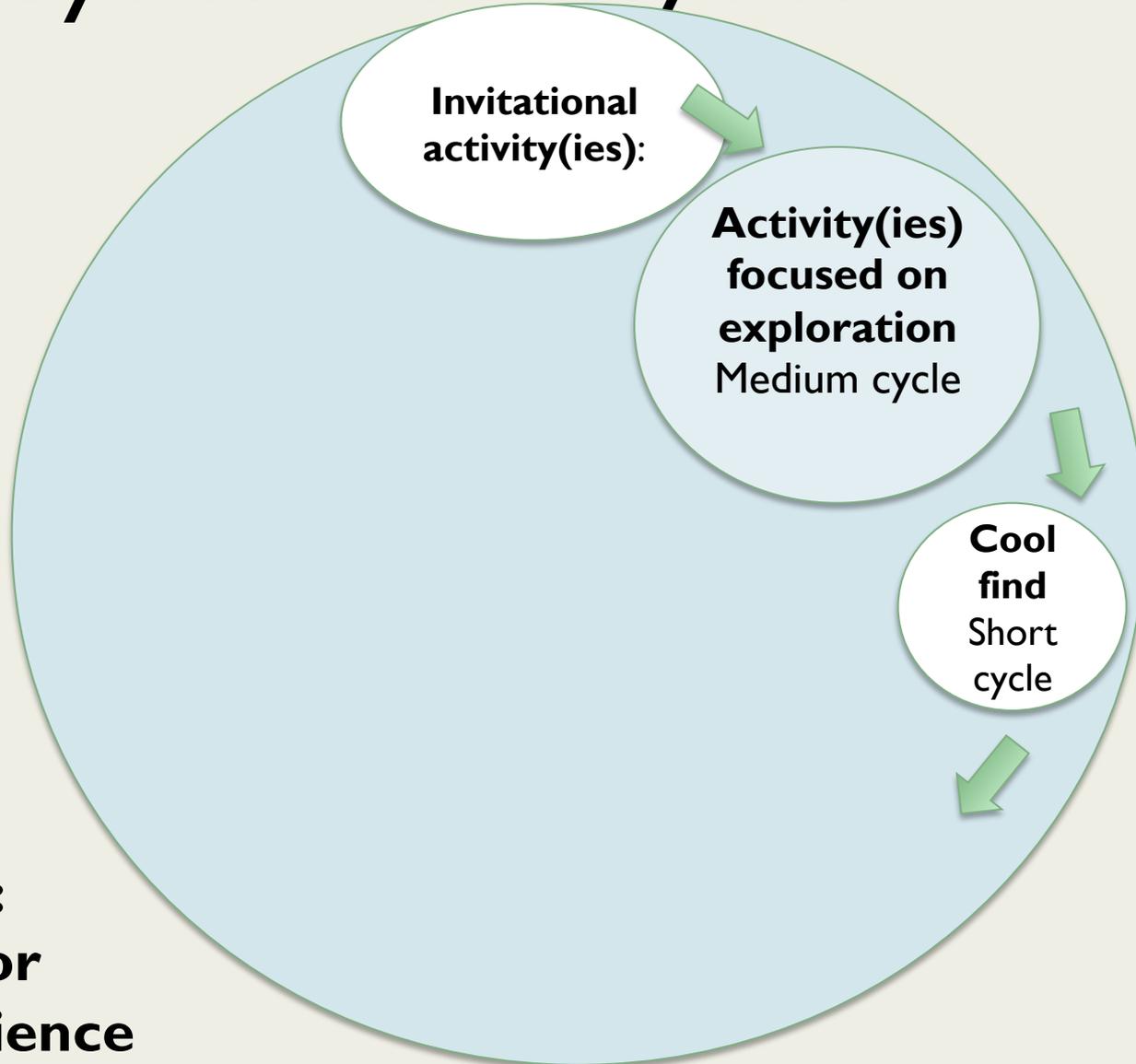
# Cycles within cycles...



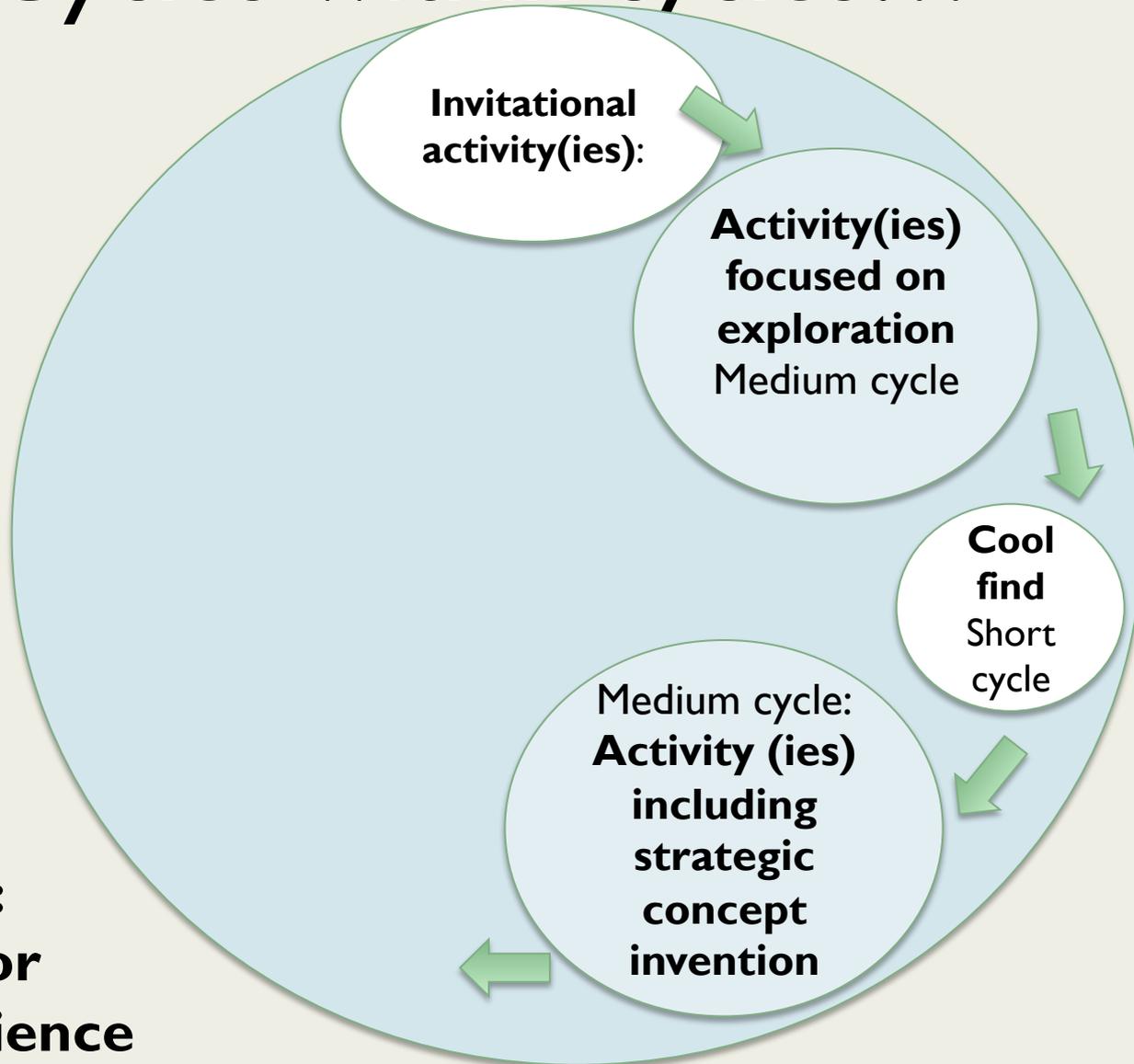
**Long cycle:  
Full outdoor  
field experience**



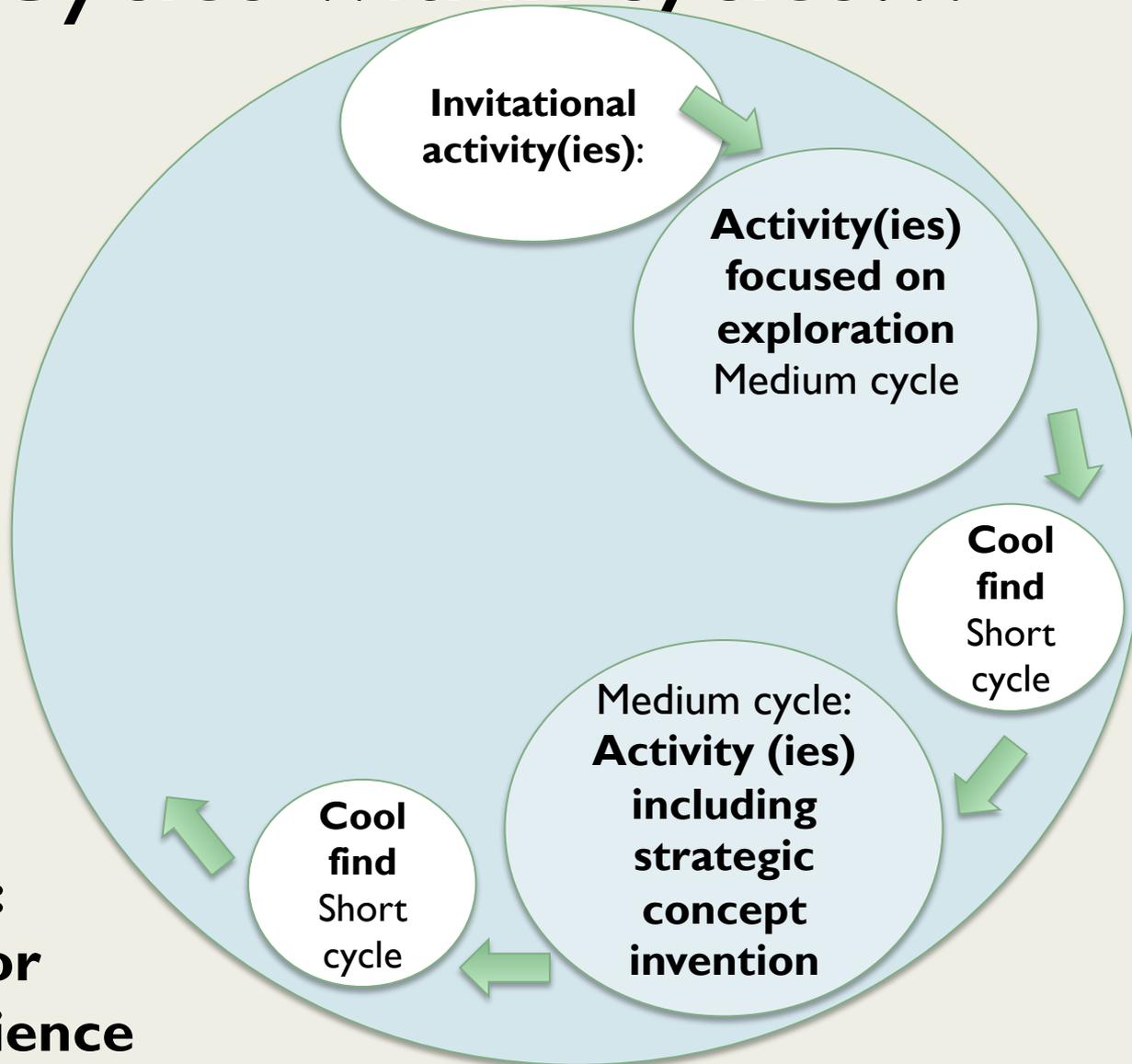
# Cycles within cycles...



# Cycles within cycles...



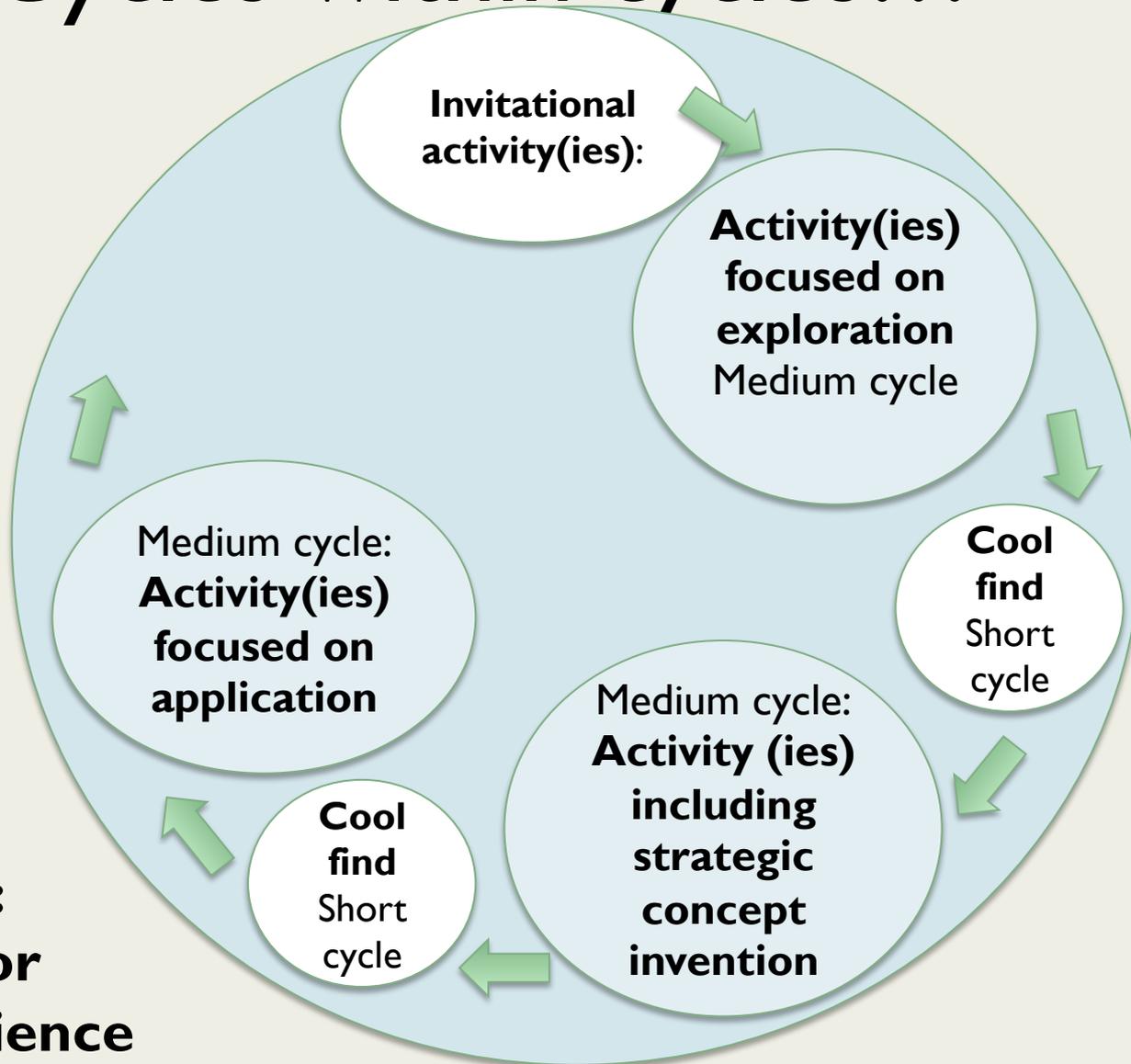
# Cycles within cycles...



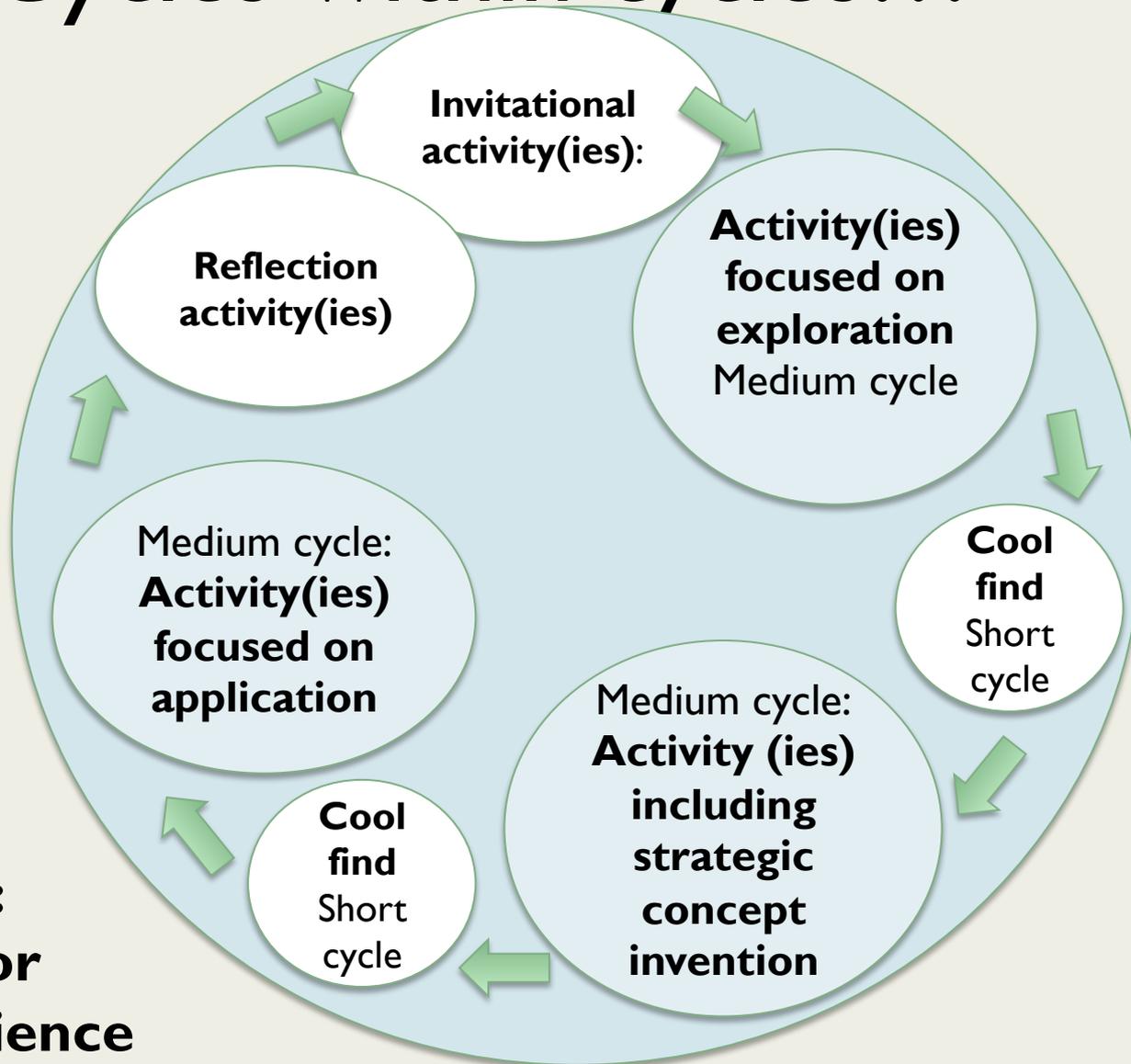
**Long cycle:**  
**Full outdoor**  
**field experience**



# Cycles within cycles...



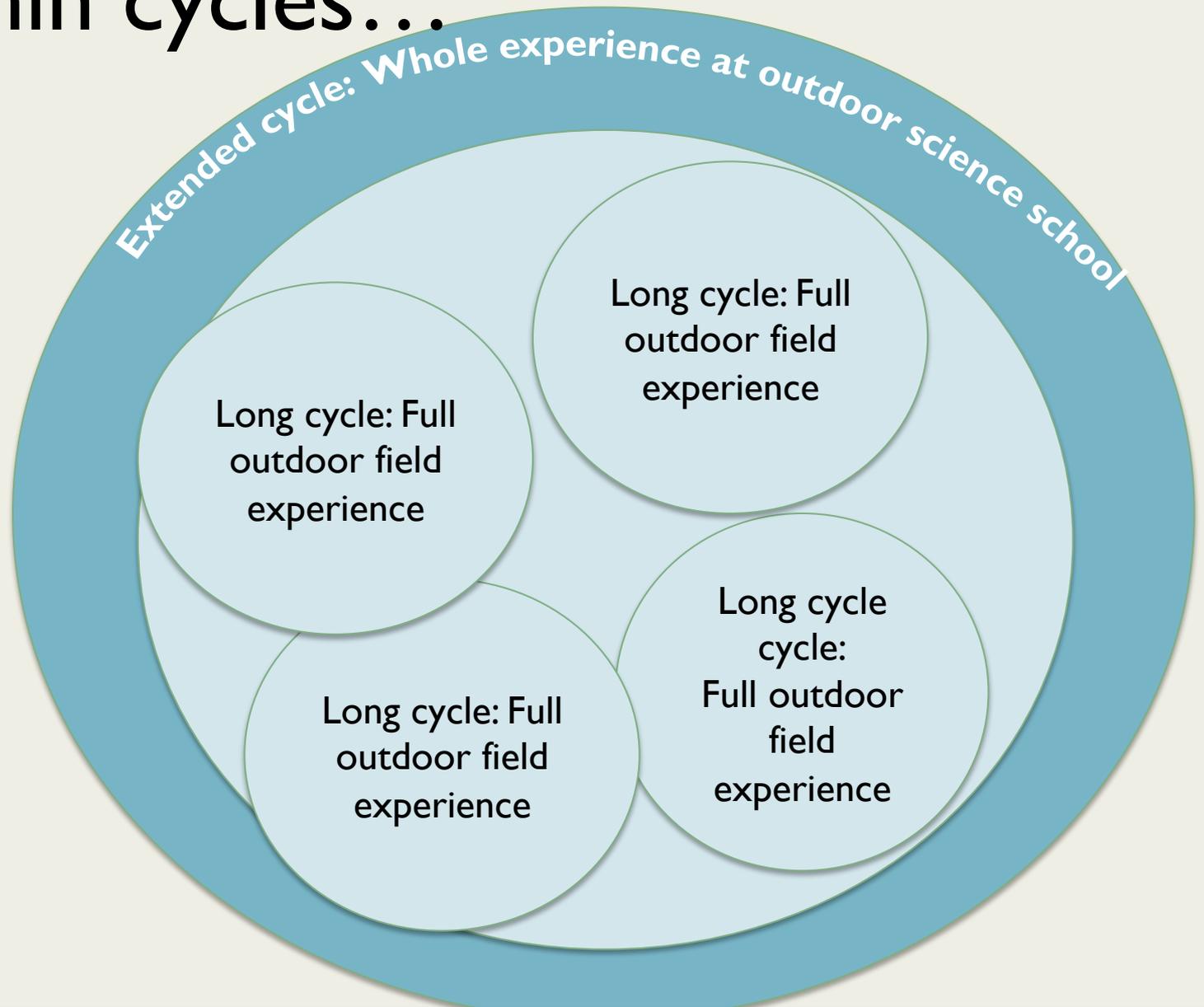
# Cycles within cycles...



**Long cycle:  
Full outdoor  
field experience**



# ...within cycles...



# Long Learning Cycle: Extended Field Experience

- Write activities or questions on sticky notes, and place them on Learning Cycle phases
- Make them learner focused: What are the students doing at this phase?
- Make note of gaps, (e.g., missing “accessing prior knowledge”) and attempt to fill gaps by writing ideas.



# Invitation Phase Goals

- Students access prior knowledge.
- Students discuss connections to prior knowledge and experiences.
- Students become interested in the topic.
- Instructors listen to ideas and avoid most content.
- Instructors set the stage for learning by encouraging inquiry mindset and generating curiosity.



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