

# Workshop on teaching biological complexity using evolutionary transitions in individuality

## Logistical information

Workshop goal: Each teacher will leave with at least one hands-on activity for their class that uses ETIs to teach topics related the evolution of biological complexity.

The workshop will run from June 16 to June 20, 2025. It will start at 9 each day at end by 5pm. In the mornings, we'll initially meet in Biosciences West room 302, 1041 East Lowell Street, University of Arizona, Tucson.

The exact timing is flexible and will be adjusted as necessary.

This workshop is funded by the National Science Foundation.

## Monday

### Primary objectives

1. Learn the basics of evolutionary transitions and the role of cooperation in evolution.
2. Identify your class's educational needs and how ETIs could fit into your existing curriculum.
3. Learn how to identify algae and practice microscopy and pipetting.

### Schedule

*Informational presentations and discussion: BSW 301 and 302*

8:30-9:00: Arrival, coffee and check-in (BSW 302)

9:00: Meet and greet.

9:20: Dinah Davison: Welcome and workshop overview.

9:30: Rick Michod: Translating research on ETIs into the teaching of biological complexity.

9:50: Josh Hoskinson: A learning progression for teaching ETIs in K-12.

10:00: Small group discussion on what the key ETI concepts are, how they connect to what you already teach, and what you're still confused about.

10:30: Coffee break

11:00: Whole group discussion about concepts you're confused about (led by Dinah).

11:15: Josh Farr: Lessons to teach ETIs in high school.

11:45: Small group discussions on how the lesson plans could relate to their classroom content and how they could use them (building off the earlier concept-focused discussions).

12:10: Whole-group discussion on how what they've learned could be translated into their classroom.

12:30: Lunch

### *Lesson planning: BSW 301*

1:30: Individual reflection and writing on what your needs are in the classroom in terms of lessons and skills. What do your students struggle with? What are your initial thoughts on how ETI concepts can be used to fill these gaps?

1:45: Whole group discussion and brainstorming about individual reflections.

### *Skill development: Koffler 410*

2:20: Walk to Koffler and break.

2:50: Dinah Davison: Middle school multicellularity lab and skill development overview.

3:00: Algae identification, microscopy learning, and pipetting practice (tied to multicellularity lab).

4:45: Recap and plan for the rest of the week.

## Tuesday

### Primary objectives

1. Learn about the tools needed to translate ETIs into the classroom.
2. Create learning objectives specific for your classroom.
3. Learn how to culture algae in the classroom.

### Schedule

#### *Informational presentations and discussions: BSW 301 and 302*

8:30-9:00: Arrival and coffee

9:00: Josh Hoskinson: NGSS alignment of key ETI concepts.

9:15: Individual reflections and writing on what standards you don't currently have good activities to teach. Also review what you wrote yesterday about the concepts and skills that your students struggle with. Start thinking about how the concepts and skills your students struggle with intersect with the standards that you don't have good activities to teach.

9:25: Small group discussions about which standards you have a hard time teaching.

9:30: Small group discussions: What are the concepts/skills that your students struggle with? What are the standards that you don't have good activities to teach? What are the key concepts that you think would work well for your grade band? Where do they intersect with each other?

9:45: Whole group discussion on the intersections identified above and the key concepts that lie in those intersections.

10:00: Reflection and writing about what concepts or skills you want students to learn based on the points of intersection with ETI concepts that you identified. This will form the basis of the lesson(s) that you'll be creating.

10:10: Small group brainstorming discussion about the learning objectives that you identified.

10:30: Coffee break.

11: Dinah Davison: Tools for teaching ETIs.

11:20: Small group brainstorming on how these tools could be used to teach the intersection points and learning outcomes identified before the break.

11:45: Whole group discussion about using the tools to teach the intersection points.

12:00: SoRi La: Teaching ETIs at the college level: using the tools to teach key concepts.

12:15: Discussion on whether these more advanced examples of applying the tools to teach ETI concepts could be applied to the intersection points and learning objectives you previously identified.

12:30: Lunch

### *Lesson planning: BSW 301*

1:30-1:50: lesson planning: finalize your learning objectives and start brainstorming your lesson plans. What teaching tools will you use to meet these learning objectives?

1:50: Whole-group discussion of and feedback on your learning outcomes and the tools you'll use to meet these learning outcomes.

### *Skill development: Koffler 410*

2:20: Michod lab tour (BSW 413).

2:30: Walk to Koffler and break.

3:00: Dinah Davison: How to culture and use algae in the classroom.

3:10: Practicing skills needed to culture and use algae in the classroom: transferring algae, sterile technique, making media, etc.

4:00: Dinah Davison: Additional topics that the volvocine algae can be used to teach.

4:15: Small group brainstorming about how you might use volvocine algae in your classroom.

4:30: Whole group discussion and brainstorming.

4:45: Recap and plan for the rest of the week.

## Wednesday

### Primary objectives

1. Create a lesson plan framework using your learning objectives.
2. Identify the additional skills or concepts you want to better learn to teach your planned lesson.
3. Learn how to collect algae from the wild.

### Schedule

*Skill development including informational presentations: Reid Park and Koffler 410*

8:20-8:30: Meet at campus if you want a ride to Reid Park.

8:50-9: Meet at Reid Park in the grass between the parking lot, the rose garden, the bathrooms, and the large pond.

9:00: Algae collecting at the Reid Park duck pond. Everyone collects their own sample to take back to campus.

9:30: Head back to campus and meet outside the entrance to Koffler 410.

10:15: Dinah Davison: Basics of algae field work.

10:30: Break

11:00: Examine the sample you collected using the skills you developed earlier in the week.

12:00: Whole group discussion of what you found and if/how you could incorporate field work (or naturally collected samples) into your curriculum.

12:30: Lunch

### *Lesson planning: BSW 301*

1:30: Work alone to finalize your learning objectives and develop a lesson plan framework. You can also work in small groups if you're developing very similar lessons.

2:30: Break

3:00: Continue developing a lesson plan framework. Prepare to present it tomorrow morning. Reflect on what skills or topics you want to go over later in the week to help you develop and implement your lesson.

3:45: Meet with the rest of your small group to continue developing learning objectives and lesson plan framework. Also discuss what relevant skills or topics you want to learn later in the week.

4:30: Whole group discussion of which concepts or skills (if any) you want to learn tomorrow to help you implement your lesson.

4:45: Recap and wrap-up.

## Thursday

### Primary objectives

1. Develop activities and assessment for your planned lesson.
2. Put together an overview presentation.
3. Learn the additional skills or concepts identified yesterday.

### Schedule

#### *Lesson planning (BSW 301 and 302)*

8:30-9:00: Arrival and coffee

9:00: Dinah Davison: Plan for the day

9:05: Go over the learning objectives and lesson plan framework that you developed yesterday and prepare to share them with the group.

9:20: Group sharing and feedback on learning objectives and lesson plan framework.

10:30: Break

11:00: Create activities and assessment strategies for your planned lesson.

12:30: Lunch

1:00: Work in small groups (as you see fit) to further develop your activities and assessment strategies.

2:30: Break

*Skill development (Koffler 410 or BSW 301)*

3:00: Learn the skills or concepts identified during the group discussion yesterday (exact timing and topics tbd depending on the outcome of Wednesday's discussion).

4:45: Wrap-up.

## Friday

### Primary objectives

1. Finalize your presentation.
2. Present your planned lesson to the group and receive feedback.
3. Learn any additional skills or concepts that we didn't cover on Thursday.

### Schedule

*Teacher lesson presentations (BSW 301 and 302)*

8:30-9:00: Arrival and coffee

9:00 Plan for the day

9:05: Finalize lesson plan presentations (on your own or in small groups)

10:30: Break

11:00: Teachers present their lesson plans.

12:30: Lunch

1:30: Teachers present their lesson plans.

2:30: Break

*Skill development*

3:00: Final skills training (as necessary).

4:00: Wrap-up discussion.