Supplemental Material

CBE—Life Sciences Education

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Supplemental Materials

Interview questions:

Pre-PD:

Background and Teaching Experiences:

What kinds of experiences do you have teaching college biology?

Please describe what your typical lecture class is like (100 majors level if possible).

Please describe what your typical laboratory class is like (100 majors level if possible).

Research Experiences:

What is your research background? (topic and how much)

Are you currently engaged in research? If so, please briefly describe.

Please briefly describe your experiences in mentoring research (how do you that?, in class, vs. independent research).

Have you facilitated undergraduate students to develop their own research projects? If so, please provide an example(s).

Your philosophy/beliefs of mentoring student research.

Teaching and CURE questions:

Are you familiar with active learning?

- If so, how would you define active learning?
- Will you provide example(s) that you use.

Are you familiar with backwards design?

- If so, how would you define backwards design?
- Will you provide example(s) that you use.

What are the major characteristics of a CURE (course-based undergraduate research experience)?

How did you first become aware of CUREs? (This teaching method, not our current project)

Why are you interested in using a CURE?

Have you used CURE in your teaching? If so can you describe how you use it?

How is a CURE different from a traditional laboratory course?

What do you think are the possible benefits of using a CURE, in terms of student learning or other student outcomes?

What do you think are the possible drawback of using a CURE, in terms of student learning or other student outcomes?

Rogers Framework Questions:

When you were considering implementing a CURE, what things did you consider before deciding to implement the CURE?

What problems/challenges do you foresee in implementing the CURE?

What types of supports do you think you will need to overcome these challenges?

What types of support do you have at your institution to implement new teaching experiences like this CURE? Barriers?

How confident are you in teaching a CURE to your students right now?
Summer PD:
What are hoping to learn during this summer workshop?
Do you have any suggestions on how to make the summer workshop most helpful for you to implement CURE next year?
Do you have any questions for me?

Post-Implementation:

Knowledge Questions:

How would you define active learning?

How would you define backwards design?

What are the major characteristics of a CURE?

How is a CURE different from a traditional laboratory course?

Are you still interested in using a CURE in your classroom? Why?

What is your philosophy of mentoring student research?

Rogers Framework Questions:

Overall, how was teaching the Tigriopus CURE?

- What were the impacts of the CURE:
  - On students?
  - On instructors?

What were the most difficult parts in implementing the Tigriopus CURE?

What were the best things about implementing the Tigriopus CURE?

Where were the drawbacks (things to improve) about implementing the Tigriopus CURE?

What were the most important supports that you received in implementing the Tigriopus CURE?

- Our grant team?
- Their administrative/institution?

Was there any other support that the grant and their personnel that could have been provided?

Are you planning on continuing to teach the Tigriopus CURE in the future? Why or why not?

- If no – is/are there things that you need that would make you reconsider?
- If yes – What additional supports might you need next time?
  - Are you planning on making any changes the next time you teach it? If so, what?

Anything you want to add?

Any questions for me?

Post-Adoption:

Rogers's framework questions:

Are you implementing the T. CURE again?

Why are you implementing it again (or not)? *(If not, the interview stops here.)*

What factors did you consider in making this decision?

Were you the only faculty member involved in making this decision?

If not, who was? Or if it was a group, who were involved making the decision?

Have you discussed the CURE with other colleagues not involved in teaching it?

What was the department/institutions response to the results of teaching it?

What resources are needed to continue offering this CURE?

Does the department/institution support sustaining the CURE going forward?

Has offering this CURE impacted faculty not directly involved in teaching it? (e.g. interest in CUREs, changes in teaching loads, preparation, shared space, conversations about benefits or challenges of the CURE).

What are the challenges you encountered (if any) in implementing the CURE again?

What are the benefits of continued offering of the CURE?

How important was the initial grant support (money, PD, support) in your decision to implement the CURE the first time?

How does withdrawal of the grant support influence your decision to sustain?

Do you anticipate any new, unique challenges in teaching the CURE again?

Curriculum changes:

Did you decide to make any changes to the curriculum?

If so, what are you changing?

Why are you making those changes?

In adopting this curriculum, how important was being able to change the curriculum in you decision? Why?

Have changed the CURE in any due to department/institution input?

Would you willing to share your changed curriculum?

Table S1: Tigriopus CURE Codebook

Category/Theme/Subtheme	Description	Number of faculty	Number of Interviews	Number of codes
1.Resources	**Anything which was provided or needed to implement or adopt the *Tigriopus* CURE or CUREs in general.**			
1a. Institutional Support	*Any mention of barriers, supports, challenges at department or institutional level*			
1a.1. Not Supportive	Institution and or department not supporting or making it difficult to implement or adopt the *Tigriopus* CURE.	4	4	8
1a.2. Supportive	Statements about support from the institution and department.	8	12	31
1b. Group support	*Any support, perceived as a need or actualized, provided by peers; either long distance (separate institutions) or within faculty own department/institution.*			
1b.1. External	Support outside their institution	6	7	16
1b.2. Internal	Support within the same institution	5	11	32
1c. Grant resources	*Resources that are provided or needed from the grant*			
1c.1. Financial	Money or material resources	5	9	24
1c.2. Grant personnel support	Calling in, advice on sustaining organism or algae or another mention of help provided by grant staff	8	9	46
1c.3. Professional Development	Professional development provided, needed, or not supplied.			
1c.3a. PD Needed	Things that PD was needed for but not provided.	6	8	18
1c.3b. PD	Things the that the PD provided	5	8	20

Category/Theme/Subtheme	Description	Number of faculty	Number of Interviews	Number of codes
Provided				
2. Benefits	**Any benefit to students, faculty, institution, perceived or actualized.**			
2a. Benefits to Students	*Positive impacts to students from CUREs*			
2a.1. 21st century skills	Skills that the students learn, often related to employability, but including things like critical thinking, curiosity, problem-solving, teamwork, synthesis, creative/innovative, and other non-prescribed outcomes.	6	8	19
2a.2. Attitudinal	Impacts on students' attitudes and motivations.			
2a.2a. Confidence	Confidence in scientific skillset, comfortable with scientific method, process, and skills.	3	3	10
2a.2b. Engagement	Enthusiasm for class, scientific process, increased participation in class, and engagement outside of class hours.	7	12	45
2a.2c. Ownership	Indications of student's feeling of ownership in the lab or their projects.	4	8	18
2a.2d. Science Identity	Students seeing themselves as scientists.	4	5	7
2a.3. Learning	Any references to student learning outcomes.			
2a.3a. Learning real science	Learning aspects of authentic scientific process, including discovery, iteration, and questioning.	8	12	50
2a.3b. Technical skills	Learning skills related to using equipment, technical skills, and hands-on skills.	3	4	5

Category/Theme/Subtheme	Description	Number of faculty	Number of Interviews	Number of codes
2b. Student Faculty Interactions	*Descriptions of changes to student faculty interactions in CURE*	5	7	19
2c. Faculty Science Identity	*These are instances when the faculty report teaching the CURE influences their own science identity.*	3	4	6
3. Challenges	**Any type of difficulty, barrier, challenge, problem that is mentioned connected to either the *Tigriopus* CURE or CUREs in general.**			
3a. Student Challenges	*Challenges that are specific to students in the CUREs.*			
3a.1. Group work	Interpersonal skills between students or lack thereof.	6	6	25
3a.2. Proposal	Challenges with time for development, feedback, implementation of proposed science or development of the proposal itself.	4	5	9
3a.3. Student Preparedness	Student's ability or actual preparedness for authentic research.	3	3	10
3a.4. Student resistance	Students being unengaged, resistant, and frustrated.	5	7	23
3b. Challenges in Implementation	*Challenges that are specific to the faculty perspective on CUREs.*			
3b.1. Letting go	Dropping things they loved about prior lab, specific labs, lab-lecture continuity, and letting the students make their own mistakes.	6	8	23
3b.2. *Tigriopus* Science	Problems faculty have in learning to use, research, understand, and methodologies of *Tigriopus californicus.*	5	6	19
3b.3. Time	References to increased time it would or did take faculty to do something	6	9	20

Category/Theme/Subtheme	Description	Number of faculty	Number of Interviews	Number of codes
	CURE related.			
3b.4. Uncertainty	Uncertainty about a new innovation or curriculum. Causes apprehension, not sure how to anticipate what to do or to balance competing needs of the class. The newness is causing anxiety or uncertainty.	8	9	22
3b.5. Grading group work	Grading individual and group contributions	2	3	9
4. Feelings about teaching the CURE	**These are feelings faculty describe about teaching the CURE.**			
4a. Positive	*These are positive statements and descriptions about how the faculty member feels about teaching the CURE both perceived and actual*	8	14	67
4b. Negative	*This is any negative feelings or thought perceived or actualized about teaching the CURE.*	6	6	21

Table S2: Tigriopus CURE codes specific to institutions

Code	Definition	Institution	Pre-PD	Post-Implementation	Post-Adoption
Neutral Institutional Support	Neither supportive or non-supportive	Private College	1	1	
Facilities	Challenges with the way facilities were organized or available	MSI University	1		
Research/Teaching Tension	How to balance time between teaching and research	Masters University			2
Restriction on lab time	Institutional limitation on amount of outside work could be required for a lab	Community College		1	

Tables for RQ#3: How do the faculty in four institutions experience CURE implementation?

These tables include codes for themes/sub-themes across all interviews and all participants per institution: pre-PD, post-implementation, post-adoption.

Table S3: Resources Coding by Institution*

	Group Support		Institutional Support		Grant Support		
Institution	Internal	External	Unsupportive	Supportive	PD	Staff	Financial
Private College							
MSI University							
Masters University							
Community College							

*At least one code in the theme/subtheme is indicated by a colored square. A lack of colored square indicates no mention of the theme/subtheme.

Table S4: Benefits Coding by Institution*

Institution	Faculty Science Identity	Student Faculty Interactions	Student 21st Century Skills	Student Learning	Student Attitudinal
Private College					
MSI University					
Masters University					
Community College					

*At least one code in the theme/subtheme is indicated by a colored square. A lack of colored square indicates no mention of the theme/subtheme.

Table S5a: Student Challenges by Institution*

Institution	Group Work	Proposal	Preparation	Resistance
Private College				
MSI University				
Masters University				
Community College				

*At least one code in the theme/subtheme is indicated by a colored square. A lack of colored square indicates no mention of the theme/subtheme.

Table S5b: Implementation Challenges by Institution*

Institution	Letting Go	*Tigriopus* Science	Time	Uncertainty	Grading Group Work
Private College					
MSI University					
Masters University					
Community College					

*At least one code in the theme/subtheme is indicated by a colored square. A lack of colored square indicates no mention of the theme/subtheme.

Table S6: Feelings by Institution*

Institution	Negative	Positive
Private College		
MSI University		
Masters University		
Community College		

*At least one code in the theme/subtheme is indicated by a colored square. A lack of colored square indicates no mention of the theme/subtheme.