Summative Evaluation:
UFERN Framework Professional Learning Community

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Introduction to UFERN Framework Professional Learning Community

The *UFERN Framework Professional Learning Community* project was funded as a supplement to the existing NSF-funded *Undergraduate Field Experiences Research Network* (UFERN), which sought to build a vibrant, supportive, and sustainable collaborative network that fostered effective undergraduate field experiences. The goals of the *UFERN Framework Professional Learning Community* (PLC) supplement were:

- To support a small group of field educators in intentional design, implementation and assessment of student-centered undergraduate field experiences in a range of field learning contexts;
- To develop effective strategies for supporting undergraduate field educators in using the UFERN Framework as an aid for designing, implementing, and assessing student-centered undergraduate field experience programs;
- To assemble vignettes featuring applications of the UFERN Framework in a range of program contexts; and
- To expand the community of field educators interested in designing, implementing, and assessing student-centered undergraduate field learning experiences.

Sixteen educators participated in the PLC, which targeted participants who taught and facilitated a range of undergraduate field experiences (UFEs) that varied in terms of setting, timing, focus and student population. Due to the COVID pandemic, the originally-planned three-month intensive training took place over nine months (January to October 2021). It consisted of seven video conference sessions (via Zoom) with presentations and homework assignments. It included independent work, as well as guided group discussions with project leaders and other participants, which were supported by online collaborative tools.

The PLC was designed to give participants opportunities to learn about, reflect on, and apply the UFERN Framework. The 16 participating educators were introduced to and discussed the Framework, its key components (design factors, student context factors, and student outcomes), and supporting resources. They then developed a new (UFE) or revised an existing one. Throughout, the PLC project leaders emphasized improving student experiences and outcomes with a focus on student-centered teaching, access and inclusion.

Evaluation, Targeted Outcomes and Data Collection

Dr. Cathlyn Davis served as the evaluator of the larger UFERN project and the PLC supplement. As described in the PLC supplement proposal, the evaluation objectives were to (1) provide feedback on the quality and usefulness of the PLC sessions and supporting resources for participants, and (2) monitor effectiveness of the programs in increasing self-efficacy of the participants to make modifications in their UFEs. She attended the PLC sessions and provided guidance to the project leaders to refine the PLC activities. In addition to observing sessions, she designed a post-PLC online questionnaire, which asked respondents to reflect on the framework and the PLC in terms of developing and implementing UFEs. The questionnaire was administered between October 4, 2021 and October 20, 2021, and 14 of the 16 PLC participants (respondents) completed it. Below is a summary of key findings based on these data followed by a more detailed description. The questionnaire is provided in the Appendix.

Summary of Key Findings

The questionnaire respondents gave high praise to both the Framework and PLC, and described clear benefits of both in supporting UFEs. Respondents felt the Framework components helped them articulate relevant student outcomes, develop activities that targeted those outcomes, apply assessments of these outcomes, and make revisions in light of the assessment. The Framework broke the design challenge down into manageable steps and promoted reflection on a broad range of student needs (e.g., belonging, interest, retention and career pathways) and factors that could be changed in response to these needs (e.g., activities, assessments, data sharing and logistics). Likewise, respondents identified multiple elements and topics of the PLC that were "very to extremely useful," including help from PLC facilitators (project leaders), homework structure and examples, and opportunities for exchanges with other participants. They did identify some areas for improvement, which primarily centered around the first and last PLC sessions. These included reducing the pace and content, and allowing more time to review the Framework, prepare and complete the homework, and interact with the project leaders.

A little more than half of respondents revised an existing UFE, while the rest created a new one. They mentioned a diversity of elements that characterized their UFEs but all of the UFEs demonstrated some connection to student-centered teaching such as focusing on place and building comfort with fieldwork. All but two of the respondents implemented their new or revised UFE. They primarily targeted and ultimately engaged STEM majors with some focused on historically-excluded students. Most UFEs centered on ecology/environmental science and in-person summer field courses at some type of field site. For these residential experiences, students primarily stayed with other students and faculty. All of the respondents who implemented stated that they will continue using their new or revised student-centered UFEs; for some, this decision was based in part on positive formal and anecdotal feedback from students.

Detailed Findings

Framework impact on designing and implementing new or revised UFE

Respondents were asked to describe how the UFERN Framework helped them design and implement their new or revised UFE. Twelve of the 14 respondents provided an answer. They explained how the Framework helped them reflect on both student and design factors in ways that promoted student-centered learning. The factors that they cited included student interest, STEM learning, belonging, retention and relevancy to biology career pathways, while design factors included logistics, accessibility, sharing data and instructional activities. One respondent said,

> *The Framework helped me to focus on the student interests and gave a good guide for what aspects of the course to think about at different times in the planning.*

They noted that the Framework organized their thinking by breaking design decisions into these two types of factors (student and design) and offering a step-by-step process. As one respondent noted,

> *The UFERN Framework helped me examine ALL aspects of my UFEs, from the recruitment/application stage to the design and implementation stages. It has resulted in significant changes, particularly with understanding student context factors and aligning the design factors with my intended student outcomes.*

The step-by-step process ensured respondents did not overlook important considerations. It also helped them separate aspects of their UFEs that were fixed from those that they could change through shifts in the design and implementation. One respondent captured this benefit by reporting,

> *UFERN helped me break down the different components of my course (student factors vs. design factors) and focus on what I could actually change. I can't change the students who enroll in my course (it's required of all biology majors; student factors are constraints) or the timing of the course, but I can change the curriculum and assessments (design factors) to better meet them where they are and make an engaging course that is relevant to any career path in biology. The framework really forced me to focus on what the students were telling us was wrong with the course, and gave me ideas for how to re-envision the lab in a student-centered way.*

Respondents also wrote very positively about the inclusion of assessment considerations and tools (e.g., the CIMER tool) in the Framework, which helped them think about how to measure efficacy of their

learning experiences. Overall, they felt the Framework and its focus on assessment positioned them to directly align the outcomes of their UFEs with their instructional approach and activities, as well as be responsive to student feedback. For example, a respondent said,

> *Help[ed] think about what [I] 'hope to create' with field-based labs and how [to] accomplish [this] with consideration of accessibility, sharing data and more*

PLC impact on designing and implementing new or revised UFE

Respondents were asked to rate the usefulness of various elements and topics of the UFERN PLC in helping them design and implement their new or revised UFE (Table 1). For all but three elements/topics, most of the fourteen respondents rated these as "very useful" and "extremely useful." The highest ratings were for help from PLC facilitators, small/large group discussions, and identifying student context and design factors. These ratings aligned with the open responses (provided after Table 1). Somewhat lower was Introduction to the UFERN Framework (Session I), Summer 2021 follow-up, and October 2021 follow-up and final reflection.

Table 1: Respondents rating of usefulness of PLC elements and topics (N=14)

	Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	I didn't use this	Total
The general timing of PLC meetings	0	0	2	8	4	0	12
The length of each PLC meeting	0	0	3	7	4	0	11
The total number of PLC meetings	0	0	2	8	4	0	12
Whole group discussions during PLC meetings	0	0	1	5	8	0	13
Small group discussions during PLC meetings	0	0	1	5	8	0	13
Individual or small group discussion outside of PLC meetings	0	1	1	6	5	1	11
Help from PLC facilitators	0	0	0	6	8	0	14
PLC homework and associated templates	0	1	1	8	4	0	12
PLC slides and recordings	0	0	2	7	4	1	11
Shared resources such as articles and weblinks	0	0	1	8	5	0	13
Introduction to the UFERN Framework (Session I)	0	0	4	3	7	0	10

	Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	I didn't use this	Total
Identifying student context and design factors in your own UFE (Session II)	0	0	1	4	9	0	13
Exploring how to assess your UFE (Session III)	0	0	3	4	7	0	11
Planning changes to your UFE with the UFERN Framework's four entry points (Session IV)	0	0	2	10	2	0	12
Sharing your UFE and learning about other UFEs via posters (Session V	0	0	2	10	1	1	11
Summer 2021 follow-up	0	3	1	8	0	2	8
October 2021 follow-up and final reflection	0	1	4	6	0	2	6
Other (Please list and rate)	0	0	0	0	0	1	NA

Respondents were asked to share any improvements to these PLC elements and topics to better support future educators as they design and implement UFEs. Eleven respondents provided an answer. Two requested more time to fully understand the fundamental aspects (Session I), while another asked for more time on the *Gather.town* app. One respondent suggested adding more meetings to share successes and failures after implementing. Two wanted more time to interact with project leaders (compared to other PLC members), while one asked for time to work with a partner tackling similar objectives. One noted that the assessment session was "a bit overwhelming" and suggested a more thorough review of fewer case studies and best-practices. Similarly, another respondent thought reviewing the IRB process would be helpful.

When asked for anything else that could be added to the PLC to support UFE design and implementation, the 11 respondents asked for the following:

- More examples, background literature, context for the framework development, and ideas for application
- More focus on student outcomes
- Added elements to the student context factors (risk assessment, management, perceptions)
- Reflections on instructor learning outcomes mapped to student outcomes
- More time for homework coupled with an easy-to-use agenda and a single document with all relevant links

Others applauded the PLC, highlighting the homework structure and examples (such as assessment rubric), as well as the opportunities to network and see what other participants were working on.

Developing Undergraduate Field Experiences

When asked about the UFE produced from participating in the PLC, nine of the 14 respondents reported that they revised an existing one. One mentioned revisions involving story-telling. Three mentioned revisions involving assessment, and three highlighted the addition of more student-centered elements

such as student outcomes focus on their career interests and affective characteristics (determined via pre-activity on student perspectives, background and experiences). As one respondent stated,

> *The UFERN framework help me crystalize what I was actually trying to change and how I could affect that change. By having the breakdown the of the student context vs. design factors, I was able to really tease apart my course and better understand what was within my control and what I had to reframe to work with instead of work against. I focused on improving a student context factor (student motivation and expectations; dependent variable) by changing a design factor (instructional model/activities; independent variable). I am measuring this change through a combination of reflection-questions built into assignments in class and pre/post surveys.*

The remaining five respondents created new UFEs during the PLC, and three of them briefly described these experiences. One addressed outcomes focused on place and outdoor skills during a five-day wilderness rafting trip and via multi-media assessments. Another considered student field comfort and disabilities for an on- and off-campus ecology sampling exercises. The third centered on relationship building between students and the instructor, as well as connections to students' interests.

Implementation of Undergraduate Field Experiences

All but two of the 14 respondents implemented their new or revised UFE (the remaining two could not because of the COVID pandemic and timing issues). Characteristics of these UFEs are listed in Table 2. Ten were or will be field courses with four as research experiences; none were service learning experiences or undecided. Eight were or will be during the summer with five during the academic year and one undecided (none were in both the summer and academic year). All but one was or will be in-person; the remaining one will be a mix of in-person and remote. Nine will be held at a field station, marine lab, geology camp or research site with a few on or near campus and on public or other remote field sites; none were virtually only. They were equally mixed in terms of traveling to more than one field site, and there was a mix of residential conditions (primarily with other students and faculty). There was also a broad range of disciplines with ecology/environmental science the most prominent (eight). They primarily targeted STEM majors (12) with an equal mix of underclassman and upperclassman. Five focused on historically excluded students. Attendance for those who implemented their UFE roughly followed these targeted audiences.

Table 2: Characteristics of Respondents' New or Revised UFE

	Implemented (N=12)	Not implement (N=2)
Format	Field course, (9) Research experiences (3)	Field course (1), Research experiences (1)
When	Summer (7), academic (5)	Summer (1), Undecided (1)
Virtual/in-person	In-person (12)	In-person (1), mixed (1)
Where	Field station (7), campus (3), public (2)	Field station (2)

	Implemented (N=12)	Not implement (N=2)
Travel to more than 1	Yes (6), No (6)	Yes (1), No (1)
Reside with	Students & faculty (6), students (3), on own (1), not relevant (2)	Students & faculty (2)
Discipline	Ecology and Env Science (8), geology (2), Oceanography/marine science/biology (1), geography (1)	Geology/climate science (1) and cross-disciplinary (1)
Audience	STEM major (11), underclassman (7), upperclassman (7), historically excluded (5), non-STEM majors (2)	STEM majors (1), non majors (1)
Attendance	STEM major (11), underclassman (5), upperclassman (8), historically excluded (4)	N/A

All twelve respondents who implemented stated that, based on their implementation, they plan to keep the changes that they made to their UFEs. In explaining why, five stated that student feedback suggested that that their UFE was successful. For example, one of these respondents said,

So far, I've received a lot of positive feedback from the students, and we're only ~1/3 of the semester in.

Two noted that these changes simplified the experience, and two noted there were important gains in terms of student affective outcomes. One respondent did say they plan to do some tweaking.

When asked, five respondents said they had data that indicated students achieved the targeted outcomes. This included evidence that students found the provided safety training was valuable, enjoyed and gained skills as a storytellers, and had increased interest and understanding in the subject matter. For example, one respondent reported that,

The students used pXRF and this enhanced their interest in the subject material and helped them understand how changes in chemistry manifest in changes in geology.

Two additional respondents had anecdotal information that pointed to possible student gains. For example, one stated,

I don't have formal data, but based on my perceptions, students greatly benefited from a structured assignment that better connected them to a wilderness area, while on a wilderness trip.

Final comments

Nine respondents shared comments when asked if there was anything else to add about the UFERN PLC. Two reiterated the value of interacting with colleagues also working on UFEs. For example, one stated,

> *Coming into the PLC, I was wondering about the wide variety of UFEs and participant backgrounds and how these may be relevant to my specific program. But through the year, I realized that we all had similar outcomes and regardless of the design factors, we had useful, common ideas, activities, and suggestions to share. I am grateful for the opportunity to be involved with this. Thank you.*

Another two echoed earlier comments about the value of the Framework in helping work through the design of student-centered UFEs. One stated,

> *I really thoughts the format of incrementally going through the framework and applying it to our specific class/experience was extremely helpful, it made it easier to get feedback and refine ideas. Most of what I actually implemented in the end came from conversations and suggestions from the rest of the PLC.*

Three expressed gratitude for the experience overall with one capturing the overwhelming positive attitude about the PLC and the Framework.

> *It was VERY useful, thank you!*

UFERN post questionnaire

Congratulations on creating and implementing (or working towards implementing) your student-centered undergraduate field experience! We are interested in understanding the usefulness of the UFERN Framework and the professional learning community in supporting the design and implementation of these experiences. Thus, we ask you to complete this questionnaire with your perspective and feedback ***within the next 14 days****.*

Note we use the following acronyms throughout this questionnaire:
UFERN: Undergraduate Field Experiences Research Network
UFE: student-centered Undergraduate Field Experience
PLC: Professional Learning Community

Thanks for taking the time!

The following questions ask about the usefulness of the UFERN Framework and PLC in designing and implementing your new or revised UFE.

Describe how the **UFERN Framework** helped *you* design and implement your new or revised UFE. Please be specific.

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Please rate the usefulness of each of the following **UFERN PLC elements and topics** in helping you design and implement your new or revised UFE. [SEE NEXT PAGE]

	Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	I didn't use this
The general timing of PLC meetings	○	○	○	○	○	○
The length of each PLC meeting	○	○	○	○	○	○
The total number of PLC meetings	○	○	○	○	○	○
Whole group discussions during PLC meetings	○	○	○	○	○	○
Small group discussions during PLC meetings	○	○	○	○	○	○
Individual or small group discussion outside of PLC meetings	○	○	○	○	○	○
Help from PLC facilitators	○	○	○	○	○	○
PLC homework and associated templates	○	○	○	○	○	○
PLC slides and recordings	○	○	○	○	○	○
Shared resources such as articles and weblinks	○	○	○	○	○	○

Introduction to the UFERN Framework (Session I)	○	○	○	○	○	○
Identifying student context and design factors in your own UFE (Session II)	○	○	○	○	○	○
Exploring how to assess your UFE (Session III)	○	○	○	○	○	○
Planning changes to your UFE with the UFERN Framework's four entry points (Session IV)	○	○	○	○	○	○
Sharing your UFE and learning about other UFEs via posters (Session V)	○	○	○	○	○	○
Summer 2021 follow-up	○	○	○	○	○	○
October 2021 follow-up and final reflection	○	○	○	○	○	○
Other (Please list and rate)	○	○	○	○	○	○

Describe how any of the above **UFERN PLC elements and topics** be improved to better support *future participants* as they design and implement UFEs.

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Describe anything else that could be added to the **UFERN PLC** that could help *future participants* as they design and implement UFEs.

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Did you create a new UFE, or did you revise an existing UFE? [SKIP LOGIC]

- ○ Revised an existing UFE
- ○ Create a new UFE

Briefly describe your new UFE. [SKIP LOGIC: FOR THOSE WHO SELECTED "NEW UFE"]

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Briefly describe how you revised your existing UFE to align with what you learned through the PLC and UFERN framework. [SKIP LOGIC: FOR THOSE WHO SELECTED "EXISTING UFE"]

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Did you implement your new or revised UFE yet? [SKIP LOGIC]

- ○ Yes
- ○ No

For the next set of questions, select the choice that best describes how you plan to implement your new or revised UFE. [SKP LOGIC: FOR THOSE WHO SELECTED "NO" IMPLEMENTATION]

Describe why you haven't implemented it yet?

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Select the choice that best describes how you plan to implement your new or revised student-centered UFE. If you haven't decided, simply select that option

What will the program format be?

- ○ Field course
- ○ Service learning experience
- ○ Research experience
- ○ I'm undecided

When will it occur?

- ○ Summer
- ○ Academic year
- ○ Both summer and academic year
- ○ I'm undecided

Will it virtual or in-person?

- ○ Virtual only
- ○ In-person only
- ○ Mix of virtual and in-person
- ○ I'm undecided

Where will it take place?

- ○ On or near your university or college campus
- ○ At a field station, marine lab, geology camp, or research site
- ○ Public lands or other remote field site
- ○ It will be virtual only
- ○ I'm undecided

Did students travel and work at more than one field site?

- ○ Yes
- ○ No

Where will students reside during the UFE?

- ○ With other students (but not faculty) who were part of the UFE
- ○ With other students and faculty who were part of the UFE
- ○ On their own or with other individuals who were not part of the UFE
- ○ Not relevant because my UFE was not residential or traveling
- ○ I'm undecided

What will the disciplinary focus be?

- ○ Atmospheric or climate science
- ○ Geology
- ○ Oceanography/Marine science/Marine biology
- ○ Ecology & Environmental sciences
- ○ Other _____
- ○ I'm undecided

Who will you design for? (Select all that apply)

- ☐ STEM majors
- ☐ Non-STEM majors
- ☐ Underclassman (freshman/sophomore)
- ☐ Upperclassman (junior/senior)
- ☐ Historically excluded (i.e., students who are first-generation college undergraduates, from low-income communities, from rural communities, having a disability, identifying from

racial or ethnic group other than non-Hispanic white, and/or identifying as other than cis-male)

- [ ] I'm undecided

For the next set of questions, select the choice that best describes how you implemented your new or revised UFE. [SKIP LOGIC: FOR THOSE WHO SELECTED "YES" IMPLEMENTATION]

What is the program format?

- ○ Field course
- ○ Service learning experience
- ○ Research experience

When did it occur?

- ○ Summer
- ○ Academic year
- ○ Both summer and academic year

Was it virtual or in-person?

- ○ Virtual only
- ○ In-person only
- ○ Mix of virtual and in-person

Where did it take place?

- ○ On or near your university or college campus
- ○ At a field station, marine lab, geology camp, or research site
- ○ Public lands or other remote field site
- ○ It was virtual only

Did students travel and work at more than one field site?

- ○ Yes
- ○ No

Where did students reside during the UFE?

- ○ With other students (but not faculty) who were part of the UFE
- ○ With other students and faculty who were part of the UFE
- ○ On their own or with other individuals who were not part of the UFE
- ○ Not relevant because my UFE was not residential or traveling

What was the disciplinary focus?

- ○ Atmospheric or climate science
- ○ Geology
- ○ Oceanography/Marine science/Marine biology
- ○ Ecology & Environmental sciences
- ○ Other _____

Who did you design for? (select all that apply)

- ☐ STEM majors
- ☐ Non-STEM majors
- ☐ Underclassman (freshman/sophomore)
- ☐ Upperclassman (junior/senior)
- ☐ Historically excluded (i.e., students who are first-generation college undergraduates, from low-income communities, from rural communities, having a disability, identifying from racial or ethnic group other than non-Hispanic white, and/or identifying as other than cis-male)

Who were the majority of your student participants? (select all that apply)

- [ ] STEM majors
- [ ] Non-STEM majors
- [ ] Underclassman (freshman/sophomore)
- [ ] Upperclassman (junior/senior)
- [ ] Historically excluded students (i.e., students who are first-generation college undergraduates, from low-income communities, from rural communities, having a disability, identifying from racial or ethnic group other than non-Hispanic white, and/or identifying as other than cis-male)

Describe if students achieved the outcomes of your new or revised UFE based on any formal data or your perceptions.

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Based on your implementation, will you keep these changes? If so, why? If not, why not?

- ○ Yes. Explain why. _____
- ○ No. Explain why not. _____

[SKP LOGIC: FOR EVERYONE]

Is there anything else you would like to add about your UFERN experience?

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