



# The Nature of Undergraduate Field Experiences: A Framework to Guide Program Design and Research

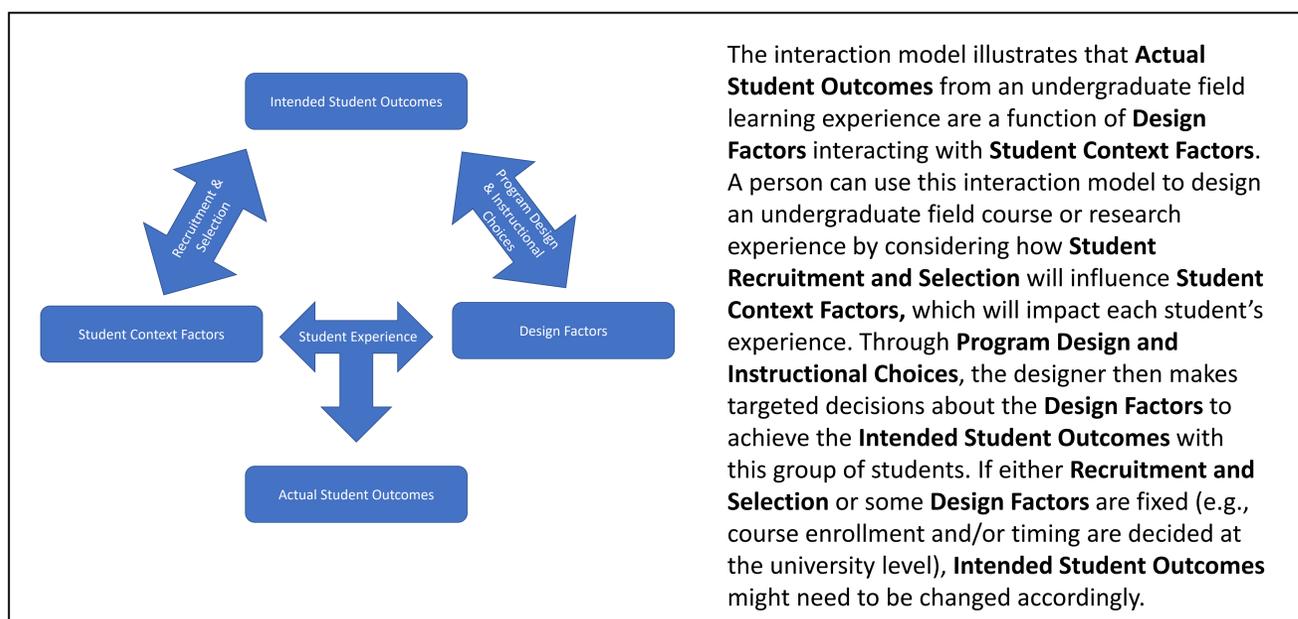
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What do you need to think about when designing and assessing undergraduate field learning experiences? The **UFERN Design Framework** can be used to guide the design and assessment of student-centered field program design, research about field learning processes, and consider how to broaden participation in field-based sciences.

Design Factor	Questions	Implications for Student Learning & Personal Growth	Example	Key Citations
Setting	<ul style="list-style-type: none"> <li>How will the physical environment be used to highlight, contextualize, and elicit the content to be taught?</li> <li>How will access to the environment affect the student experience?</li> </ul>	<ul style="list-style-type: none"> <li>Physical access to field sites</li> <li>Diversity of participants</li> <li>Connections with Earth</li> <li>Access to "comfort" and familiar sights (novelty space)</li> </ul>	The REU site on Sustainable Land and Water Resources chose a location and content focus that supports recruitment of Native American participants and the development of sense of place and community.	Van der Hoeven Kraft et al., 2011; Mogk & Goodwin 2012; Gilley et al., 2015; Haynes & Jacobson 2015; Ward, et al., 2018;
Immersion & Sensory Experience	<ul style="list-style-type: none"> <li>To what degree will the sights, sounds, and other sensory cues be used to influence students' cognitive and affective experience with the environment and content knowledge?</li> <li>How will students' sense of discomfort or experience with distracting details of the environment be managed to optimize their experience?</li> </ul>	<ul style="list-style-type: none"> <li>Sense of place</li> <li>Contextualization of content knowledge</li> <li>Multi-sensory cognitive connections</li> <li>Personal relevance</li> <li>Sense of threat or safety</li> </ul>	Students who participated in a geology course module in New Zealand which engaged them in studying a single site while residing at an isolated field station developed a stronger place attachment than when those same students studied several roadside sites while residing at a suburban field station.	Orion & Hofstein, 1994; Cotton & Cotton, 2009; Mogk & Goodwin, 2012; Maltese, Balliet, & Riggs, 2013; Giamellaro 2017; Jolley et al., 2018
Orientation to the Experience & Culture	<ul style="list-style-type: none"> <li>How will orienting students for the experience, including the physical, social, and learning spaces prepare them for the experience?</li> <li>What kind of information can be collected from the students ahead of time to tailor the orientation and learning experience for specific needs?</li> </ul>	<ul style="list-style-type: none"> <li>Feelings about fieldwork experience</li> <li>Distractions from the learning experience</li> <li>Access to equitable learning experiences</li> </ul>	The Rocky Mountain Biological Lab offers three tracks for research experiences which provides opportunities for students at different points in their education.	Boyle et al., 2007; Stokes & Boyle 2009
Timing	<ul style="list-style-type: none"> <li>How will duration and timing of the field experience impact the diversity of participants and their subsequent experience?</li> <li>Can the participants achieve learning and personal development outcomes within the timing of the experience?</li> </ul>	<ul style="list-style-type: none"> <li>Diversity of participants</li> <li>Sense of community</li> <li>Time on task</li> </ul>	The University of Michigan Biological Station Transforming Learning Program offers "short courses" of one to four weeks to bring new audiences to the field station.	Chickering & Gamson, 1987; Hayes & Gershenson, 2016; Jolley et al., 2018
Informal & Formal Social Interactions	<ul style="list-style-type: none"> <li>How will interactions be structured with other students and faculty to support or remove barriers to the learning experience?</li> <li>How will the faculty/student ratio be considered in structuring the formal and informal social interactions?</li> </ul>	<ul style="list-style-type: none"> <li>Development of collaborative problem-solving skills, social skills, professional identity, &amp; cultural competency</li> <li>Potential for discrimination &amp; sexual harassment</li> </ul>	The Kellogg Biological Station requires that all graduate and post doctoral fellows who serve as undergraduate mentors take a mentor training workshop that uses the evidence-based "Entering Mentoring" curriculum.	Streule & Craig, 2016; NASEM 2017; Nelson et al., 2017; Hernandez, et al., 2017; Daniels et al., 2019
Choice & Control, Power Structures	<ul style="list-style-type: none"> <li>How much autonomy will students have in deciding the inputs and outcomes of their experience?</li> <li>Who "holds the knowledge" in the unfolding experience?</li> </ul>	<ul style="list-style-type: none"> <li>Motivation</li> <li>Persistence</li> <li>Student engagement</li> <li>Agency</li> </ul>	The Frontiers Abroad: Geology of New Zealand field course offers a situated style field module with curriculum structure that encourages student decision-making and exploration of a single field location.	Baeten et al. 2010; Hanauer, et al., 2012; Schmidt et al. 2018; Settlege & Southerland, 2019
Instructional Models & Activities	<ul style="list-style-type: none"> <li>How will curriculum &amp; instruction connect the student experience to content knowledge and the study environment?</li> </ul>	<ul style="list-style-type: none"> <li>Positioning of students with sense-making &amp; cognitive work</li> <li>Connections between new experiences &amp; background knowledge</li> <li>Facility with the tools and language of science</li> <li>Transfer of content knowledge</li> </ul>	The Urban Water Innovation Network (UWIN) engages undergraduate students in mentored research projects about local water issues across the U.S. Each student connects their research to a common theme of water sustainability and presents their research at the UWIN annual meeting.	AAAS, 2011; NRC, 2012; NASEM, 2016; NASEM, 2017
Additional Factors	Many additional design factors will have implications for students outcomes including subsequent reinforcing events, curriculum, feedback & formative assessment, and broader relevance. We focused on the seven listed in this framework as the ones most likely to have elements or impacts?			



Student Context Factors	Questions
Motivation & Expectations	<ul style="list-style-type: none"> <li>Why is the student taking this course/experience?</li> <li>How does the experience fit into the bigger picture for them?</li> <li>What do they hope to get out of it?</li> </ul>
Prior Knowledge	<ul style="list-style-type: none"> <li>What knowledge does the student bring that can be built upon for the experience and the development of new knowledge? What information needs to be front-loaded to prepare the student?</li> </ul>
Prior Experiences	<ul style="list-style-type: none"> <li>How have students' prior experiences prepared them and predisposed them to interact with elements of the course or experience (e.g., setting, timing, social interactions)?</li> </ul>
Interests & Identity	<ul style="list-style-type: none"> <li>How do the student's interests and parts of their identity overlap with those of the instructor, the peers, discipline, and/or culture of the field site?</li> </ul>
Worldview	<ul style="list-style-type: none"> <li>What is the student's philosophy of life or conception of the world?</li> <li>What are examples of prior experiences that impact how the students view the world (e.g., language, values, ethics, politics, socioeconomic status)?</li> </ul>
Specific Needs	<ul style="list-style-type: none"> <li>What are specific individual needs of students that should be accommodated (e.g, physical and developmental disabilities, health needs, cognitive and emotional needs)?</li> </ul>



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