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An Integrative, Querencia-Informed Approach to First-Year Engineering

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Abstract

In this Complete Research paper, we describe a newly-designed integrative, first-year engineering course and report on a study investigating its role in supporting identity formation, persistence intentions, self-efficacy, and consequentiality. This study investigates the theory-driven design of a first-year course and its impact on diverse students' ability to frame design problems. Guided by two frameworks—funds of knowledge, which leverages students' cultural and everyday experiences, and querencia, a place-based learning approach emphasizing attachment and reciprocity with place—the course integrates sociotechnical design challenges. Using design-based research, the study explores how these frameworks support students in activating their funds of knowledge and addressing local issues. Data collection included student work artifacts, video/audio recordings, and pre/post surveys measuring identity, persistence intentions, design self-efficacy, and consequentiality. Quantitative analysis employed descriptive statistics and regression, while qualitative analysis expanded an existing coding scheme to include querencia. Results show that most students initially framed locally relevant problems, often tied to recent events like wildfires and flood risks, though some identified global issues without local connections. After team collaboration and scaffolding, all students developed locally-relevant problem statements. This highlights the potential of integrative first-year courses to foster design problem framing through connections to students' local knowledge and experiences.

Motivation

Studies of first-year experiences provide guidance on how such courses support students' sense of belonging, self-efficacy, and understanding of the work engineers do [1, 2]. The variability in approaches has provided insight into these effects. For instance, first-year design experiences appear to have long-lasting impacts, as students who have such experiences are more effective team members in their senior capstone course [3]. Integrative and sociotechnical design experiences can provide an engaging introduction to engineering and computer science degrees [4]. An integrative course intentionally combines methods, findings, and values from multiple disciplines to enable students to think and act across disciplinary boundaries. Integrative courses emphasize collaboration, synthesis of disciplinary perspectives, and the application of knowledge to real-world problems. By creating connections between engineering, liberal arts, and other disciplines, integrative courses aim to prepare students for complex, sociotechnical challenges that require holistic and multifaceted approaches [4]. However, less is known about the role such experiences play in supporting diverse students to develop design problem framing capacity, and at an entry level rather than in their capstone experiences. The current study investigates the theory-driven design of a course and its impact on students.

Background

Two strengths-based frameworks guided this study and course design—funds of knowledge and querencia. Funds of knowledge refers to students' everyday and cultural experiences that can serve as a foundation for further learning in formal settings [5]. In engineering, scholars have identified a number of funds of knowledge, including ways students' experiences in their cultures and communities prepare them to be astute designers; for instance, students growing up in lower-income families typically have experiences repairing and tinkering, negotiating, and networking, and sharing resources [6, 7]. However, if these funds of knowledge go unacknowledged, they commonly remain inert. Instructors can activate students' funds of knowledge, helping them understand that their prior everyday experiences are a valuable resource in their formal learning [8]. While this can be challenging in higher education settings, where it is not typically possible for instructors to visit students' home communities to understand their cultural and everyday experiences and then design curricula that connect to those experiences, there are ways to identify such funds of knowledge [9]. For instance, faculty may survey their students [6] or ask students to write reflections that connect their funds of knowledge to course activities [10].

Querencia, a specific form of place-based learning, refers to attachment to a place that signals reciprocity with place [11]. Place attachment, as studied in fields like environmental science and sustainability, initially emphasized the idea that humans ascribe special value or meaning to certain places, especially places of great natural beauty [12]. Such notions were leveraged in place-based education approaches to teaching environmental science, aiming to build on learners' love of such places as a way to strengthen their commitments to protecting natural spaces and cultivating pro-environmental behaviors [13]. Within the geosciences, place-based learning has considered contested and colonized spaces, suggesting that geoscience may be layered into other understandings of and connections to place that students already have [14-16]. Such approaches are much less commonly used in engineering [17, 18]

While some variants treat querencia expansively, suggesting it may be any place where one feels safe [19], we align with the northern New Mexican use of this term which anchors to place [20]. While people may be born in a place, they may also be descendants or colonizers of that place, complicating their relationship with and responsibilities to both place and community [21]. In this way, querencia commonly aligns with an Indigenous stance on place, emphasizing relationships and reciprocity with place, a view in which humans are not separate from the natural world, but rather both dependent on and responsible to it [22-25]. Relationships with place are intersected with technological and extractive uses that wreak destruction on ecosystems and health, and dislocate people and cultures, but also cultivate resilience [26]. This post-humanist relationality with place suggests a stance in which land has its own agency and varied roles, including that of teacher and codesigner [24, 27].

Methods/Assessment

Study Design

We used design-based research [28, 29], the hallmark method of the learning sciences, to jointly investigate the theories of funds of knowledge and querencia, while studying their impact on learning. We sought to answer a research question:

- How might an integrative first-year course with querencia design challenges support students to activate their funds of knowledge?

Setting & Participants

This study is set in an integrative engineering first-year course at a Hispanic-Serving Institution that is Carnegie-classified as a Very High Research and Community-Engaged institution. The University is in an urban setting in the American Southwest. Our School of Engineering includes six departments, serving approximately 600 first-year students. A longstanding concern the School has faced is the attrition of students, especially those students from minoritized racial and ethnic groups and first-generation students. In particular, a majority of students arrive at the university not yet ready for calculus, which can delay entry into core courses.

As one part of addressing this issue, we designed and implemented activities in a new first-year, 3-credit course for engineers, computer scientists, and construction managers. The course includes one long design challenge related to water resilience, a shorter design challenge about decarbonizing strategies statewide, and a sequence of individually-completed assignments intended to foster students' sense of belonging. In order to accomplish this, we leveraged literature on funds of knowledge and querencia to guide the design of a new integrative first-year course. The project deliverables scaffold students to frame a design problem that includes their experiences. The design problems (Project 1 & 2) are situated in our state and draw upon students' knowledge of place in ways that are respectful and responsive to these places.

In order to design a course that could both provide an integrative and interdisciplinary foundation, as well as be ready to scale the course up to the entire School of Engineering, we opted to codesign the course with faculty from all six departments, and coteach the course with instructors from three departments, as well as an instructor from our Engineering Student Success Center. Because we piloted the course using an existing mechanism—a first year experience section—the course was necessarily small, capped at 20 students.

Project 1: Water Resiliency

In our first design project, we focused on the general topic of "Water Resiliency" while emphasizing the scarcity of water in NM and the increasing threat of climate change on our lands and our people. We provided a few examples of water related concerns such as emerging contaminants like PFAS, hormones, and pharmaceuticals in our water sources, water used for fracking affecting our agriculture, waste from our uranium and acid mines leading to contaminated water sources, and flood risks due to fires that have damaged our landscape. We explained that engineers, computer scientists, and construction managers can address many different types of problems due to water scarcity in New Mexico and that a diverse team is essential for identification of these community needs. We focused a few classes on understanding the role of each of these stakeholders in problem solving and provided a few examples, via experimentation, of the tools that each of the stakeholders use in identifying, measuring, and addressing these water related challenges. We also emphasized the importance of obtaining a broad view from many stakeholders for framing the problem and attempting to solve the problem. This included inviting community leaders with expertise in the challenges that NM faces due to water scarcity to serve on a panel. Panelists included an education specialist from the UNM Center for Water & the Environment, a research expert on ecohydrology and nutrient processing in groundwater and stream ecosystems, a manager at the NM Fish & Wildlife agency with 15 years of experience in the desert SW on recovery of threatened and endangered species, and a financial analyst from the NM Senate Majority Office who makes determinations on funding for our community needs. Our students were encouraged to ask questions to gain a broad understanding of the specific challenges faced in NM due to water scarcity in order to develop solutions that may address one of those challenges.

Teams of 4-5 students were asked to frame a specific problem that impacts New Mexico and work to develop a proposed solution that would improve the lives of New Mexicans. No specific budget was imposed, but we asked the teams to justify the cost of their solutions. They needed to consider the technical feasibility of their solution and defend their decisions during presentation. We asked all team members to participate in making decisions and tracked this participation via assignments which asked the students to document the contributions of each member. Teams were asked to use a variety of resources for references. The aforementioned assignments asked for students to indicate their sources (internet search engines, peer-reviewed publications, Wikipedia, library resources, etc.) and their use, if any, of artificial intelligence tools. Seven deliverables were collected from the teams that systematically scaffolded the team's development of their solutions. The deliverables were broken down as follows: 1. Define the problem, 2. Team charter & (further) define the problem, 3. Frame the problem based on research, 4. Stakeholder analysis & evaluate solution ideas, 5. Prototype testing & modeling, 6. Analysis & communicating your results, and 7. Final design presentation and prototype display. We implemented a self- and peer-evaluation at the end of Project 1 in order to obtain candid feedback from each student on their perceived contributions to this project and their teammates' contributions (and how they might differ from what was documented when not confidential).

Project 2: Decarbonizing New Mexico

The second project asked students to propose a holistic system to decarbonize New Mexico by 2050. The project lasted seven weeks and included four deliverables. Throughout the deliverables, students learned about carbon dioxide emissions, developed mathematical reasoning, and proposed a decarbonization system by adapting The Wedges Game [30] to the context of only New Mexico instead of the entire world.

In deliverable 1, students established a team contract with the same structure as the contract for the water resiliency project. Then, each team explored assigned decarbonization strategies relevant to New Mexico following the technologies proposed by The Wedges Game, such as implementing transportation efficiency, nuclear energy, solar energy, biofuels, among others. The game included descriptions of each strategy. Students used that description and conducted additional research to investigate the technical, environmental, social, and economic implications of implementing that strategy in New Mexico by 2050. This research about different technologies served to integrate our Querencia approach, since students had the opportunity to read and learn about New Mexico's current challenges and opportunities.

In deliverable 2, students (1) designed a data-driven approach to learn about carbon dioxide emissions and (2) planned for the quantitative analysis of decarbonization strategies. The first part involved students collecting data from different carbon dioxide sources with an Arduino sensor. Then, they used the data to practice data visualization and analyze the impact of those emissions on the environment. The second part involved students estimating the impact that specific decarbonization strategies could have in NM. For example, if a student chose the strategy of switching to all electric vehicles in NM, they would estimate how much carbon dioxide could be reduced if that strategy is fully implemented in 2050. Additionally, they estimated how the strategy might change if a new AI facility—which would require a significant amount of energy and would also draw new workforce, with their cars, to the state—were built in NM. This deliverable asked students to define what calculations they would need to do and what data they would need to find.

In deliverable 3, students executed their analysis plan to evaluate the feasibility of their previously identified decarbonizing strategy. Students used a template in Excel to determine how much carbon dioxide emissions would be reduced if the strategy was fully implemented in 2050. Students had the opportunity to apply and learn about New Mexico by calculating a reasonable strategy to decarbonize NM. For example, in the strategy of changing all vehicles to electric-based ones, students learned about how many vehicles were bought last year, the most common vehicles in the state and how much carbon emissions they generate, how expensive it would be to ask every resident to change its vehicle for a new one, etc. Finally, students described their assumptions, and concluded if the strategy would be a good idea for the state.

In deliverable 4, students wrote a persuasive letter to a NM senator describing their decarbonization proposed system and gave an oral presentation for a more general public arguing why their proposal should be implemented. All teams reviewed 15 different strategies to decarbonize New Mexico in 2050 and each team chose the most feasible 3 strategies considering the amount of carbon dioxide emissions reduced, and the economical, social, and environmental impacts of implementing the strategies.

Project 3: Becoming an Engineering, Computer Scientists, or Construction Manager

The third project focused on professional identity formation and academic skill development. Students completed six deliverables to address different aspects of their sense of belonging and increase their understanding of what their intended major focuses on. In addition to developing a resume, students turned in several deliverables:

The first deliverable tasked students with writing a professional email, investigating a professional organization, and attending a student organization event. The aim of this first deliverable was to introduce the students to professional communication and start the process of their involvement with both the professional field and their peers. This first part of this assignment provided supportive information on how to write a professional email and required them to send an email to all of the course instructors for practice and feedback. Next students were instructed to investigate a professional organization of their choice, preferably related to their career interests.

The second deliverable focused on professional pathways to support students in diving a bit deeper into their intended future careers. This deliverable contained two parts: a) write a minimum of two questions you want to ask an alum or other STEM professional about their work and career pathway. These questions were later shared with our STEM mentors and the responses were shared with the students. And b) research one career within engineering, computer science, or construction management - write about something you already knew, something you found interesting, and something you were surprised to find out. Related to this, students then created a professional, persuasive product to help recruit high school students. The aim was to help students have a deeper understanding of the educational and career pathways, what professionals like about their selected careers, and how to find more information about the degree programs available.

The third deliverable focused on learning resources. The goal of this deliverable was to facilitate student involvement in co-curricular opportunities to enhance their learning and experiences as a first-year student. Students were asked to attend three activities or events offered by our Engineering Student Success Center (including tutoring) and then write a brief summary of the event, including tips and advice for their peers about what they found most beneficial from the experience. This reflective process was intended to engage them in the experience for a deeper learning and benefit.

The fourth deliverable focused on students' funds of knowledge. The goal of this deliverable was to help the students reflect on who they are, their motivations, and strengths so that in future times of struggle they could remind themselves of why they were meant to be an engineering, computer scientist, or construction manager. Students were asked to compose a 1-page letter to their future selves or a person of their choosing, describing characteristics, interests, and experiences you possess that will make you a great engineer, computer scientist, or construction manager.

In addition to the three main projects, instructors began class meetings with a generative prompt that asks students to write about their funds of knowledge relevant to the course activities, such as their reason for pursuing their degree, as well as prompts related to their identity beyond their chosen major.

Data Collection & Analysis

Following informed consent (19 consented), we collected artifacts of student work, video/audio recordings, and a pre and mid-point (between Project 1 & 2) survey measuring identity, persistence intentions, design self-efficacy, and consequentiality. Quantitative analysis includes descriptive statistics and sequential regression analysis. Qualitative analysis employs a previously developed coding scheme to identify students' funds of knowledge. We expanded this scheme to focus on querencia more deliberately.

Results and Discussion

The first-year engineering students engaged in three projects that supported them to recognize and partially activate their funds of knowledge while using their local knowledge (querencia). This section presents the results of our survey. Then, we describe how students showed querencia and their funds of knowledge when working on their projects.

Students who reported a stronger sense of belonging in engineering after the first project and who initially expressed higher commitment also reported a higher commitment to completing their degree in engineering after the first project, $F(2, 13) = 55.40$, $p < .001$, $r2 = .88$ (Table 1).

Table 1: Linear model of persistence intentions

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.37	0.80		-0.46	0.66
Persistence intentions, Pre	0.48	0.23	0.36	2.10	0.056
Identity, Post	0.66	0.18	0.62	3.59	0.003

We next sought to explain variance in their sense of belonging (Table 2). We found that students who reported that the project was relevant, that they made consequential decisions themselves, and who felt that their cultures were compatible with engineering also reported a stronger sense of belonging after the project, $F(3, 12) = 16.25$, $p < .001$, $r2 = .75$. In contrast to typical findings, self-efficacy did not explain variance in either persistence intentions or identity.

Table 2: Linear model of students' identity/belonging in engineering, after the first project

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-4.21	2.27		-1.86	0.09
Relevance	0.76	0.19	0.65	4.00	0.00
Cultural compatibility, Post	0.28	0.15	0.31	1.93	0.08
Individual consequentiality	0.70	0.38	0.24	1.85	0.09

A sense of querencia, or a deep connection to place, was integrated in the two socio-technical problems. Initially, we prompted students to individually identify possible water resilience problems in New Mexico. Most students framed problems that were locally relevant, and commonly these were related to recent events. For instance, a recent wildfire caused damage to a small town, and as is common, has since been threatened by increased flood risk. Some students identified this as an issue they wanted to explore and address as engineers, computer scientists, and construction managers. Specifically, one student recognized some limitations of New Mexico infrastructure when handling flooding:

> In New Mexico the water infrastructures are extremely old. As time progresses not only do these systems become more unreliable, but they become increasingly vulnerable to extreme weather events and natural disasters.

In her Deliverable 1 of the water resiliency project, she learned about current problems in New Mexico and realized how old some of the infrastructure is. Other students framed global problems, such as microplastics, but did not identify a local connection. Through team collaboration and scaffolded guidance, all groups ultimately developed locally relevant problems, such as mitigating flash flooding impacts in Roswell or Ruidoso and providing clean water to Navajo reservations affected by mining contamination. These findings highlight the importance of leveraging students' local knowledge and connection to place to help first-year students effectively frame meaningful and context-sensitive engineering design problems.

In addition to supporting querencia, we designed the learning environment to facilitate students' recognition and activation of their funds of knowledge. At the beginning of students' first and second project, they needed to complete a team contract as part of their assignments. There, we asked students to share their strengths and hobbies with their team members and how they developed them. The students highlighted a range of professional skills critical for success in engineering, including teamwork, problem-solving, creativity, leadership, and communication. When students described how they developed those skills, they shared several funds of knowledge. For example, one student self-recognized perspective taking skill, stating: "Growing up around different cultures has helped me think about design in a way that's inclusive of various perspectives." Similarly, many students referenced tinkering skills acquired through home or work activities, such as carpentry and cooking. Specifically, one student remarked: "I'm also good at building things from ideas that just pop up in my head." These examples align with previously identified funds of knowledge in first-year engineering students, such as perspective-taking and tinkering [6, 7]. Encouraging students to share their personal experiences in team contracts created a pivotal opportunity for both students and instructors to recognize and value the diverse funds of knowledge present in the classroom, enhancing the relevance and inclusivity of the learning environment.

Recognizing and activating students' funds of knowledge in the classroom is critical for transforming these experiential and cultural resources into valuable assets that support their success. We observed evidence of students drawing on local knowledge and recognizing their funds of knowledge, particularly in the initial stages of their projects. However, we found limited evidence of how students consistently integrated these insights throughout the engineering design process. For instance, one student shared his personal experience with well water systems when framing his problem:

> My family uses well water for everything we need, us and our 3 neighbors share the same well water system. It is bound to have issues in the next 10 years and will need to be upgraded/fixed. There will be failing pumps, mineral buildups, bacteria, and more. Another issue is when will the well water supply run out of water? It is important, not only for my family but those who also use well water, to have security and access to clean water for many generations to come.

This reflection highlights the student's ability to connect its funds of knowledge with the broader challenges of water resilience, using his familiarity with well water systems and their maintenance issues to contextualize the importance of improving water systems across New Mexico. While this represents an important first step in recognizing and valuing funds of knowledge, future research needs to be done around how to explicitly scaffold students' activation of their funds of knowledge. Recognizing and activating funds of knowledge validates students' unique experiences and cultural backgrounds, and ensures they are integrated into the learning process [8], enabling students to apply their lived experiences to solve complex, real-world problems and develop a deeper connection to their professional identity.

Implications

Overall, our findings suggest that projects that are relevant to students' experiences, that engage them in making consequential decisions, and that affirm that their own experiences are relevant to engineering, computer science, and construction management can directly contribute to students' sense of belonging, in turn, supporting their persistence intentions. However, a key limitation of the current study is the small course size. Future studies will follow both the development and expansion of the course, permitting iterative replication and improvements based on our analysis. In turn, this will allow us to continue to study the impacts that bringing together funds of knowledge and querencia can have in supporting student learning.

We summarize instructor insights and plans for future versions of this course, which we aim to scale from this initial small implementation into a school-wide required course. First, our findings suggest that the focus on querencia supported students to use their knowledge of and connections to place as they learned and framed design problems. We had multiple ways to identify students' funds of knowledge, including generative starters, the letters in the third project, and team contracts, the last of which were surprisingly detailed given that the students were otherwise unfamiliar with one another. Using design challenges that were locally-situated also provided opportunities for students to use their funds, however, we plan to strengthen the mechanics by which we activate those funds of knowledge. It is possible that students discussed and built upon their funds in many ways not captured in our data, yet we want to systematically develop scalable means for supporting instructors to activate these resources. One approach we plan to implement is to more closely link the identity letters with the design project. Teams can compare how they are similar to and different from the stakeholders.

We recognized the importance of scaffolding the design process, which was unfamiliar to most students. While one way to address this would be to provide direct instruction of the design process prior to engaging students in, research on learning would suggest that such an approach might have limited impact for two reasons. First, knowing *about* a process does not necessarily prepare one to engage in or direct that process, which requires *know-how* [31]. Second, direct instruction without first creating a need-to-know can make it hard for students to make sense out of the information because they do not have a schema for the information [31-34]. Instead, we plan to draw upon research that aims to build *design awareness*, which means being aware of and reflective about where one has been, is, and will go in the design process, including revisiting earlier steps [35]. One approach to build design awareness is for students to create their own representations of the design process. We can incorporate this approach by modifying the first week mini-design challenge, having students reflect on and create their own representations of the process.

Instructors found that engaging students with diverse stakeholder voices was valuable and feasible, but students' ideas were very general. To support greater specificity, in future iterations, we will scaffold students to draft stronger problem statements based in more varied sources prior to meeting with the stakeholders. The instructors emphasized the importance of better timing for stakeholder panels and integrating structured guidance on sourcing diverse information to improve the quality of problem statements and solutions.

We used CATME for team formation [36], yet one team encountered challenges due to absences. One approach to this issue is to dissolve such teams and have them "apply" to join other teams, creating a proposal for what they will contribute and why the team should "hire" them [37]. This approach places each student in a position of identifying strengths and committing to work.

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References

1. Mazzaro, G.J., K. Skenes, and T.A. Wood, *A review of multi-disciplinary introduction-to-engineering courses and unified-first-year engineering programs.* Proceedings of the ASEE Southeast Section Conference, 2023: p. 1-13.
2. Meyers, K.L., et al., *A comparison of engineering students' reflections on their first-year experiences.* Journal of Engineering Education, 2010. **99**(2): p. 169-178.
3. Nuñez-Thompson, A., et al., *Participation in a team-based, first-year engineering design course associated with improved teaming skills during senior capstone engineering design.* Advances in Engineering Education, 2023. **11**(3): p. 2-28.
4. Rossmann, J.S. and M.J. Roth, *A classification system for integrative engineering education.* Proceedings of the American Society for Engineering Education Annual Conference & Exposition, 2017: p. 1-14.
5. Moll, L.C., et al., *Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms.* Theory into Practice, 1992. **31**(2): p. 132-141.
6. Verdín, D., J.M. Smith, and J.C. Lucena, *Recognizing the funds of knowledge of first-generation college students in engineering: An instrument development.* Journal of Engineering Education, 2021. **110**(3): p. 671-699.
7. Wilson-Lopez, A., et al., *Latina/o adolescents' funds of knowledge related to engineering.* Journal of Engineering Education, 2016. **105**(2): p. 278-311.
8. Rios-Aguilar, C., et al., *Funds of knowledge for the poor and forms of capital for the rich? A capital approach to examining funds of knowledge.* Theory and Research in Education, 2011. **9**(2): p. 163-184.
9. Kiyama, J.M. and C. Rios-Aguilar, *Funds of knowledge in higher education: Honoring students' cultural experiences and resources as strengths*. 2018, New York, NY: Routledge.
10. Mejia, J.A. and A. Wilson-Lopez, *STEM education through funds of knowledge: Creating bridges between formal and informal resources in the classroom.* The Agricultural Education Magazine, 2015. **87**(5): p. 14-16.
11. Ault Jr, C.R., *Achieving querencia: Integrating a sense of place with disciplined thinking.* Curriculum Inquiry, 2008. **38**(5): p. 605-637.
12. Williams, D.R. and J.J. Vaske, *The measurement of place attachment: Validity and generalizability of a psychometric approach.* Forest science, 2003. **49**(6): p. 830-840.

13. Kudryavtsev, A., R.C. Stedman, and M.E. Krasny, *Sense of place in environmental education.* Environmental education research, 2012. **18**(2): p. 229-250.
14. Semken, S. and E. Brandt, *Implications of sense of place and place-based education for ecological integrity and cultural sustainability in diverse places*, in *Cultural Studies and Environmentalism*. 2010, Springer. p. 287-302.
15. Semken, S. and C.B. Freeman, *Sense of place in the practice and assessment of place-based science teaching.* Science Education, 2008. **92**(6): p. 1042-1057.
16. Semken, S., et al., *Factors that influence sense of place as a learning outcome and assessment measure of place-based geoscience teaching.* Electronic Journal of Science Education, 2009. **13**(2).
17. Forbes, M.H. and S.M. Lord, *Work in Progress: Student Reflections from a Semester-Long Place-Based Photovoltaic Solar Energy Project.* 2023 ASEE Annual Conference & Exposition, 2023: p. 1-12.
18. Hughes, M.D., et al., *Mitigating Rural Flight: The Role of a Place-based Engineering Curriculum in Strengthening Community Assets (Traditional Research Paper).* 2024 ASEE Annual Conference & Exposition, 2024: p. 1-19.
19. Savoian, S., *Querencia.* Summit to Salish Sea: Inquiries and Essays, 2018. **3**(1): p. 10.
20. Arellano, J.E., *La querencia: La raza bioregionalism.* New Mexico Historical Review, 1997. **72**(1): p. 6.
21. Avila, M.V., *Toward a Nuevomexicana consciousness: An exploration of identity through education as manifest through the colonial legacy*. 2019.
22. Tuck, E., M. McKenzie, and K. McCoy, *Land education: Indigenous, post-colonial, and decolonizing perspectives on place and environmental education research*. 2014, Taylor & Francis.
23. Bang, M., et al., *Muskrat theories, tobacco in the streets, and living Chicago as Indigenous land.* Environmental Education Research, 2014. **20**(1): p. 37-55.
24. Kimmerer, R., *Braiding sweetgrass: Indigenous wisdom, scientific knowledge and the teachings of plants*. 2013: Milkweed editions.
25. Basso, K.H., *Wisdom Sits in Places: Landscape and Language Among the Western Apache*. 1996: University of New Mexico Press.
26. Gómez, M., *Nuclear Nuevo México: Colonialism and the Effects of the Nuclear Industrial Complex on Nuevomexicanos*. 2022: University of Arizona Press.
27. Forlano, L., *Posthumanism and design.* She Ji: The Journal of Design, Economics, and Innovation, 2017. **3**(1): p. 16-29.
28. Svihla, V., *Advances in design-based research in the learning sciences.* Frontline Learning Research, 2014. **2**(4): p. 35-45.
29. The Design-Based Research Collective, *Design-based research: An emerging paradigm for educational inquiry.* Educational Researcher, 2003. **32**(1): p. 5–8.
30. Hotinski, R., *Stabilization wedges: A concept & game.* ATMOSPHERE, 2007. **570**: p. 380.
31. Bransford, J.D., A.L. Brown, and R.R. Cocking, eds. *How people learn: Brain, mind, experience, and school. Expanded edition*. 2000, National Academy Press: Washington, D.C.
32. Schwartz, D.L. and J.D. Bransford, *A time for telling.* Cognition and Instruction, 1998. **16**(4): p. 475-522.
33. Gick, M.L. and K.J. Holyoak, *Schema induction and analogical transfer.* Cognitive Psychology, 1983. **15**(1): p. 1-38.

34. Lawson, B., *Schemata, gambits and precedent: Some factors in design expertise.* Design Studies, 2004. **25**(5): p. 443-457.
35. Joya, A.J., et al., *"Where I've been, where I am, where I'm going": Exploring design awareness through an undergraduate student seminar.* Proceedings of the American Society for Engineering Education Annual Conference & Exposition, 2020: p. 1-15.
36. Layton, R., M. Ohland, and H.R. Pomeranz, *Software for student team formation and peer evaluation: CATME incorporates team maker.* Proceedings of the American Society for Engineering Education Annual Conference & Exposition, 2007: p. 12.1286.1-12.1286.5.
37. Gomez, J.R. and V. Svihla, *Supporting diversity in teams through asset mapping.* Proceedings of the American Society for Engineering Education Annual Conference & Exposition, 2018.