

Leveling the playing field: making fieldwork in SESE and CLAS more equitable and accessible

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Executive Summary

For many disciplines, fieldwork is an integral part of coursework, instruction, and research, however it poses significant and manifold barriers to many whose backgrounds differ from the traditional majority group(s). This is especially true within the framework of justice, equity, diversity, and inclusion (JEDI), as well as when considering accessibility challenges. These barriers arise for a number of reasons and have their own unique ramifications, but all cause net harm. Not only does this negatively affect individuals, but also has larger systemic effects on entire academic fields, as talented individuals are disenfranchised and leave their studies or work altogether. These issues are stark in field-based disciplines, such as geology, but exist in all fieldwork settings. This white paper introduces actionable recommendations in order to address these challenges, both in the short and long terms. They are designed to increase the safety and improve the experiences of all students working in the field, and their implementation will lead not only to enhanced learning and teaching environments, but to the retention of more talent in academic and industrial fields.

1. Motivation

Fieldwork is a fundamental part of sciences within the School of Earth and Space Exploration (SESE) like geology, as well as other fields within the College of Liberal Arts and Sciences (CLAS) like geography, anthropology, ecology, and many more. For students, fieldwork provides an opportunity to tangibly interface with concepts that have been learned in the classroom. For instructors, it provides a distinct teaching environment and a way to better illustrate field-related course material. For researchers, it can be a vital tool for data collection, analysis, and experimentation. For undergraduate students in particular, field trips can expose aspiring scientists to potential field-based career paths, as well as aid in the development of a host of personal, interpersonal and professional skills (e.g., Elkins & Elkins, 2007; Feig, 2010; Fuller, 2006; McKenzie et al., 1986). Indeed, there is virtually no argument against the intrinsic value of fieldwork, however its modern implementation often lacks necessary inclusivity measures (e.g., Giles et al., 2020; Stokes et al., 2019). As fieldwork is such an important part of research and education for so many in SESE and CLAS, this harmful deficiency must be addressed.

Barriers to marginalized students in fieldwork occupy a vast range. These barriers include, but are not limited to, the cost associated with field gear and travel, the time commitment of field courses, trips, and campaigns, hostile policies and/or attitudes in communities that are local to field sites, limited accessibility or total inaccessibility to content for people with disabilities/impairments, and a heightened threat of sexual harassment and assault (e.g., Clancy et al., 2014; Giles et al., 2020; Nelson et al., 2017; Olcott & Downen, 2020). The consequences of

these barriers are, generally speaking, two-fold. First, individual students suffer as a result of having to grapple with these barriers, sometimes sustaining lasting trauma. Second, entire scientific fields suffer because these conditions create negative environments that cause or force students to leave their disciplines. This manifests as a systematic exclusion of talented individuals because of their non-traditional backgrounds, a lack of diverse perspectives on complex scientific problems, and a hinderance of overall scientific progress. Furthermore, these detrimental effects are often compounded due to individual students' intersectional identities (Alfred et al., 2019; Bernard & Cooperdock, 2018; Marín-Spiotta et al., 2020). Elimination or significant mitigation of fieldwork-associated barriers to students from marginalized groups is thus crucial to improving student experience, retention rates, and overall academic advancement. Fortunately, this work is achievable with short-term changes that are straightforward to implement, and long-term changes that will fundamentally improve fieldwork environments. Recommendations for these changes are described in the following section.

2. Recommendations

The recommendations in this section are presented in two categories: 1) short-term (ST) recommendations that are straightforward and can be implemented quickly, and 2) long-term (LT) recommendations that will require larger-scale changes to field curricula, policy, and instruction, which will ensure sustained, positive change. Some of the items, which have both short- and long-term components, appear in both sections. These recommendations, summarized in Appendix 1, are focused on improving the experiences and safety of undergraduate students in the field but may be applicable to others as well, such as faculty who conduct fieldwork with their research teams.

2.1 Short-Term Recommendations

The recommendations in this section focus on how instructors can improve active learning environments and field activities quickly and meaningfully, by bolstering students' sense of belonging and safety.

- 1. Be an active ally and advocate for your students.** Fostering a safe and inclusive learning environment as an instructor is imperative. Instructors should be actively anti-discriminatory, and make it clear through words and actions that their goal is accessibility and safety. For example, this can be done through quickly addressing harmful behaviors such as homophobic, sexist, or ableist comments. As a key component of accessible and equitable learning spaces, students should always feel comfortable self-advocating (Roberts et al., 2016; Stokes et al., 2019).
- 2. Discuss policies, expectations, and plans before leaving.** Instructors should have a dedicated class meeting before leaving for the field to explicitly discuss behavioral expectations. This meeting should include information about reporting mechanisms for

anyone who experiences harm or discrimination (e.g., sexual harassment or assault), and to discuss the plans for bathroom stops, sleeping and hygiene accommodations, and internet/phone accessibility. Instructors should be clear about zero-tolerance policies and/or consequences for bad behavior and misconduct, and ensure that the process of reporting incidents is as clear and straightforward as possible.

- 3. Acknowledge the first stewards of the land that enables your field instruction.** Fieldwork has long taken advantage of colonization and stolen land. Instructors must acknowledge any Native peoples whose land enables their work in syllabi and/or field material, and include this in the meetings described in ST recommendation #2. This is also expanded upon in LT recommendation #1.
- 4. Minimize costs.** Costs associated with fieldwork are an extremely significant barrier for many students, particularly for undergraduates (Scerri et al., 2020). Instructors should actively review field itineraries for places to cut initial costs. An example of this would be to begin a shareable document that serves as a gear library, where members of the department can list loanable gear for class field trips or longer field camps. Additionally, cooking at camp or making sandwiches during the day instead of going out to eat is good practice. Longer-term solutions are necessary however, which are expanded upon in LT recommendation #2.

2.2 Long-Term Recommendations

This set of recommendations describes actions that will require more substantial changes to field curricula, instruction, and policy. These actions will take more time than those in section 2.1 to develop and carry out as they are designed to build a strong foundation of JEDI and accessibility in SESE and other CLAS fieldwork. Some of these items are more detailed, as they are comprehensive and multi-faceted.

- 1. Develop relationships with the Native peoples of the land you use.** As with ST recommendation #3, it is imperative that the first stewards of the land of field localities are acknowledged. In order to build a meaningful foundation of justice in fieldwork, however, this work must be expanded to include the development of a relationship with local tribes, especially if a site holds Native significance.
- 2. Minimize costs.** As touched on in ST recommendation #4, cost is a significant barrier for many in field-related disciplines. Long-term solutions to this that departments should take are, for example, purchasing camping gear and necessary field tools that can be issued to students for field trips and longer field camps, minimizing “special fees”, and minimizing or subsidizing the excess costs of weeks-long field camps.

- 3. Develop a risk assessment that focuses on student background.** Departments should develop a standardized, comprehensive risk assessment that, in addition to including information about outdoor hazards, oblige instructors to consider the experiences of their minoritized and non-traditional students. This should include potential threats from communities that are local to field sites, (e.g., countries with anti-LGBTQ+ laws, communities that have any record of racial violence/hostility, etc.). If necessary, these assessments should be accompanied in some capacity by relevant trainings (e.g., how de-escalate tense situations) (Anadu et al., 2020; Olcott & Downen, 2020).
- 4. Design field trips and material to be more accessible for students with disabilities or impairments.** Accessibility to field sites and material can be extremely or entirely prohibitive to people with disabilities and/or impairments. Field sites should be scouted and chosen to ensure maximum physical accessibility, and instructors should take advantage of technology and multiple teaching modalities. If all sites cannot be made accessible for people with physical disabilities and/or impairments, remote synchronous and asynchronous learning should be employed via technology like walkie-talkies, iPad applications, Local Area Networks (LANs), GoPro cameras, etc. (Whitmeyer et al., 2020). Additionally, multiple modalities for experiencing field trips should be developed and made available for people with cognitive disabilities or learning impairments, such as tactile geological maps of field areas, audio recordings of lessons, and/or field assistants (e.g., Feig et al., 2019; Hendricks et al., 2017; Stokes et al., 2019; Whitmeyer et al., 2020). Sufficient time should be given to students to finish tasks without rushing to keep up with the class. Keep in mind that, while additional learning modalities are necessary for some individuals, multiple modalities are good resources for *all* students to have access to.
- 5. Critically evaluate learning outcomes and be flexible.** As academia and society become more technologically advanced, and as more data become available to academic communities, both small- and large-scale reconsiderations of the role of fieldwork must occur (Giles et al., 2020; Scerri et al., 2020; Stokes et al., 2019). For any course with a field component, instructors must ensure that field activities are scientifically relevant and in line with current field practices, especially if they are at sites that are directly inaccessible (LT recommendation #4) or potentially dangerous to some students (LT recommendation #3). Learning outcomes should focus on students' academic and professional development as scientists, and field trips should be designed accordingly. In accordance with this and on a larger scale, weeks-long field courses should not be mandatory. As geoscience and other fields that have traditionally involved significant fieldwork components become more diverse, and to facilitate that growth of diversity, it is no longer appropriate to require that all students spend weeks in the field. For example, students with children may not be able to leave home for the duration of the course, and others who want to pursue non-field-based paths may wish to take a different, more relevant course. An online or other alternative option should be developed and made available. Finally, for field trips or field courses, instructors must always be prepared to be flexible with their learning outcomes. Given that field environments can be variable and

unexpected events can occur suddenly that affect a student's safety or ability to continue a project, the instructor should be willing and able to adapt their lessons and plans.

3. Projected Outcomes and Impacts

SESE and CLAS have both responded to the widespread social justice movements of 2020 by renewing and bolstering their commitments to making their academic spaces more just, equitable, diverse, and inclusive. Additionally, challenges related to the COVID-19 pandemic have forced both entities to apply their resources toward effective online learning, which has been informed in part by work that has long been active in the accessibility community (e.g., Carabajal et al., 2017; Cooke et al., 1997; Nairn, 1999; Sugerman, 2001; Whitmeyer et al., 2020). Implementing the recommendations presented here is directly in line with the proposed and ongoing efforts of these commitments and responsibilities, as they not only protect students, but allow for more equal learning experiences and career preparation. With dedication to ensuring these measures, the resulting improvements in accessibility, safety, and the overall environment of fieldwork will ultimately yield higher retention rates of non-traditional students, and healthier, happier, and more productive academic environments for all. These recommendations illustrate ways to make effective, meaningful, non-performative change, and are critical to showing SESE and CLAS members that they are essential and valued in their academic communities.

4. Annotated Bibliography

Alfred, M. V., Ray, S. M., & Johnson, M. A. (2019). Advancing Women of Color in STEM: An Imperative for U.S. Global Competitiveness. *Advances in Developing Human Resources*, 21(1), 114–132. <https://doi.org/10.1177/1523422318814551>

This article discusses the systemic and societal causes for the underrepresentation of women in color in STEM, and the importance of early JEDI interventions.

Anadu, J., Ali, H., & Jackson, C. (2020). Ten steps to protect BIPOC scholars in the field. *Eos*, 101. <https://doi.org/10.1029/2020EO150525>

This article discusses issues that BIPOC in particular face in the field and gives ten detailed action items on how to combat them.

Bernard, R. E., & Cooperdock, E. H. G. (2018). No progress on diversity in 40 years. *Nature Geoscience*, 11, 292–295. <https://doi.org/10.1038/s41561-018-0116-6>

This article shows that the geosciences are one of the least diverse STEM fields, and that that issue has been persistent for the last four decades.

Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017). A synthesis of instructional strategies in geoscience education literature that address barriers to inclusion for students with disabilities. *Journal of Geoscience Education*, 65(4), 531–541. <https://doi.org/10.5408/16-211.1>

This is a review of instructional strategies in the geosciences that focuses on mitigating barriers for students with disabilities.

Clancy, K. B. H., Nelson, R. G., Rutherford, J. N., & Hinde, K. (2014). Survey of Academic Field Experiences (SAFE): Trainees Report Harassment and Assault. *PLoS ONE*, 9(7). <https://doi.org/10.1371/journal.pone.0102172>

The survey and results that are described in this article show that sexual harassment and assault are a major barrier for women in fieldwork.

Cooke, M. L., Anderson, K. S., & Forrest, S. E. (1997). Creating Accessible Introductory Geology Field Trips. *Journal of Geoscience Education*, 45(1), 4–9. <https://doi.org/10.5408/1089-9995-45.1.4>

This article presents three accessible field exercises based on best practices, and in accordance with federal accessibility laws.

Elkins, J. T., & Elkins, N. M. L. (2007). Teaching geology in the field: Significant geoscience concept gains in entirely field-based introductory geology courses. *Journal of Geoscience Education*, 55(2), 126–132. <https://doi.org/10.5408/1089-9995-55.2.126>

This study shows that students showed statistically significant improvements in geology concept knowledge after taking a field-based introductory course.

Feig, A. D. (2010). Technology, Accuracy and Scientific Thought in Field Camp: An Ethnographic Study. *Journal of Geoscience Education*, 58(4), 241–251. <https://doi.org/10.5408/1.3534863>

This article discusses the technological dependencies that students can develop, and the knowledge gaps that can result. It advocates for the importance of field instruction.

Feig, A. D., Atchison, C. L., Stokes, A., & Gilley, B. (2019). Achieving Inclusive Field-based Education: Results and Recommendations from an Accessible Geoscience Field Trip. *Journal of the Scholarship of Teaching and Learning*, 19(2), 66–87. <https://doi.org/10.14434/josotl.v19i1.23455>

This article describes a Geological Society of America accessible field trip that took place 2014, including the tools and strategies used. It presents the results and makes recommendations for accessible and inclusive field trips.

Fuller, I. C. (2006). What is the value of fieldwork? Answers from New Zealand using two contrasting undergraduate physical geography field trips. *New Zealand Geographer*, 62, 215–220. <https://doi.org/10.1111/j.1745-7939.2006.00072.x>

This article describes the results of surveys and focus groups of undergraduate students after taking two geography field trips. The results of the study show that fieldwork is highly valued by students.

Giles, S., Jackson, C., & Stephen, N. (2020). Barriers to fieldwork in undergraduate geoscience degrees. *Nature Reviews Earth & Environment*, 1, 77–78. <https://doi.org/10.1038/s43017-020-0022-5>

This article gives an honest discussion of realistic barriers that diverse students face during fieldwork, and expresses a need for the updating of field curricula.

Hendricks, J. E., Atchison, C. L., & Feig, A. D. (2017). Effective Use of Personal Assistants for Students With Disabilities: Lessons Learned From the 2014 Accessible Geoscience Field Trip. *Journal of Geoscience Education*, 65, 72–80. <https://doi.org/10.5408/16-185.1>

This article describes a fieldtrip with a personal assistant for students with cognitive disabilities. It indicates that personal assistants, if available, can be effective in improving accessibility.

Marín-Spiotta, E., Barnes, R. T., Berhe, A. A., Hastings, M. G., Mattheis, A., Schneider, B., & Williams, B. M. (2020). Hostile climates are barriers to diversifying the geosciences. *Advances in Geosciences*, 53, 117–127. <https://doi.org/10.5194/adgeo-53-117-2020>

This paper discusses current and historical issues in the geosciences and STEM in general, and the problems with metaphorical structures, like the "leaky pipeline", traditionally used to address a lack of diversity. It advocates for a larger-scale overhaul of academic culture and behavior.

McKenzie, G. D., Utgard, R. O., & Lisowski, M. (1986). The Importance of Field Trips: A Geological Example. *Journal of College Science Teaching*, 16(1), 17–20.

This paper gives a historical perspective on the importance of fieldwork for the intellectual development of geology students.

Nairn, K. (1999). Embodied Fieldwork. *Journal of Geography*, 98(6), 272–282. <https://doi.org/10.1080/00221349908978941>

This paper discusses how students learn to think and act like field scientists (particularly field geographers) and how students with disabilities experience this "embodiment".

Nelson, R. G., Rutherford, J. N., Hinde, K., & Clancy, K. B. H. (2017). Signaling Safety: Characterizing Fieldwork Experiences and Their Implications for Career Trajectories: Lived Experiences in the Field. *American Anthropologist*, 119(4), 710–722. <https://doi.org/10.1111/aman.12929>

This is a follow-up study to Clancy, et al., 2014. This paper dives more deeply into the initial survey data to determine longer-lasting effects of sexual assault and harassment that occurs in the field.

Olcott, A. N., & Downen, M. R. (2020). The challenges of fieldwork for LGBTQ+ geoscientists. *Eos*, 101. <https://doi.org/10.1029/2020EO148200>

This article describes the survey results of the experiences of LGBTQ+ geoscience researchers. The survey focuses on intersectional identities of the subjects, and shows that many feel unsafe during fieldwork. A striking imbalance with respect to power dynamics is present in the data.

Roberts, E. L., Ju, S., & Zhang, D. (2016). Review of Practices That Promote Self-Advocacy for Students With Disabilities. *Journal of Disability Policy Studies*, 26(4), 209–220. <https://doi.org/10.1177/1044207314540213>

This paper focuses on self-advocacy as a key part of accessible and inclusive instruction, and gives a review of practices used to foster environments where students are comfortable advocating for themselves.

Scerri, E. M. L., Kühnert, D., Blinkhorn, J., Groucutt, H. S., Roberts, P., Nicoll, K., Zerboni, A., Orijemie, E. A., Barton, H., Candy, I., Goldstein, S. T., Hawks, J., Niang, K., N'Dah, D., Petraglia, M. D., & Vella, N. C. (2020). Field-based sciences must transform in response to COVID-19. *Nature Ecology and Evolution*, 4, 1571–1574. <https://doi.org/10.1038/s41559-020-01317-8>

This article discusses the issues that the COVID-19 pandemic has made apparent in field-based sciences, and gives ways that these fields should transform in response to the lessons learned. Several of these are congruous with accessibility recommendations due to the increase in online instruction.

Stokes, A., Feig, A. D., Atchison, C. L., & Gilley, B. (2019). Making geoscience fieldwork inclusive and accessible for students with disabilities. *Geosphere*, 15(6), 1809–1825. <https://doi.org/10.1130/GES02006.1>

This article describes an accessible Geological Society of America field workshop, and advocates for the employment of accessible field curricula in the geosciences.

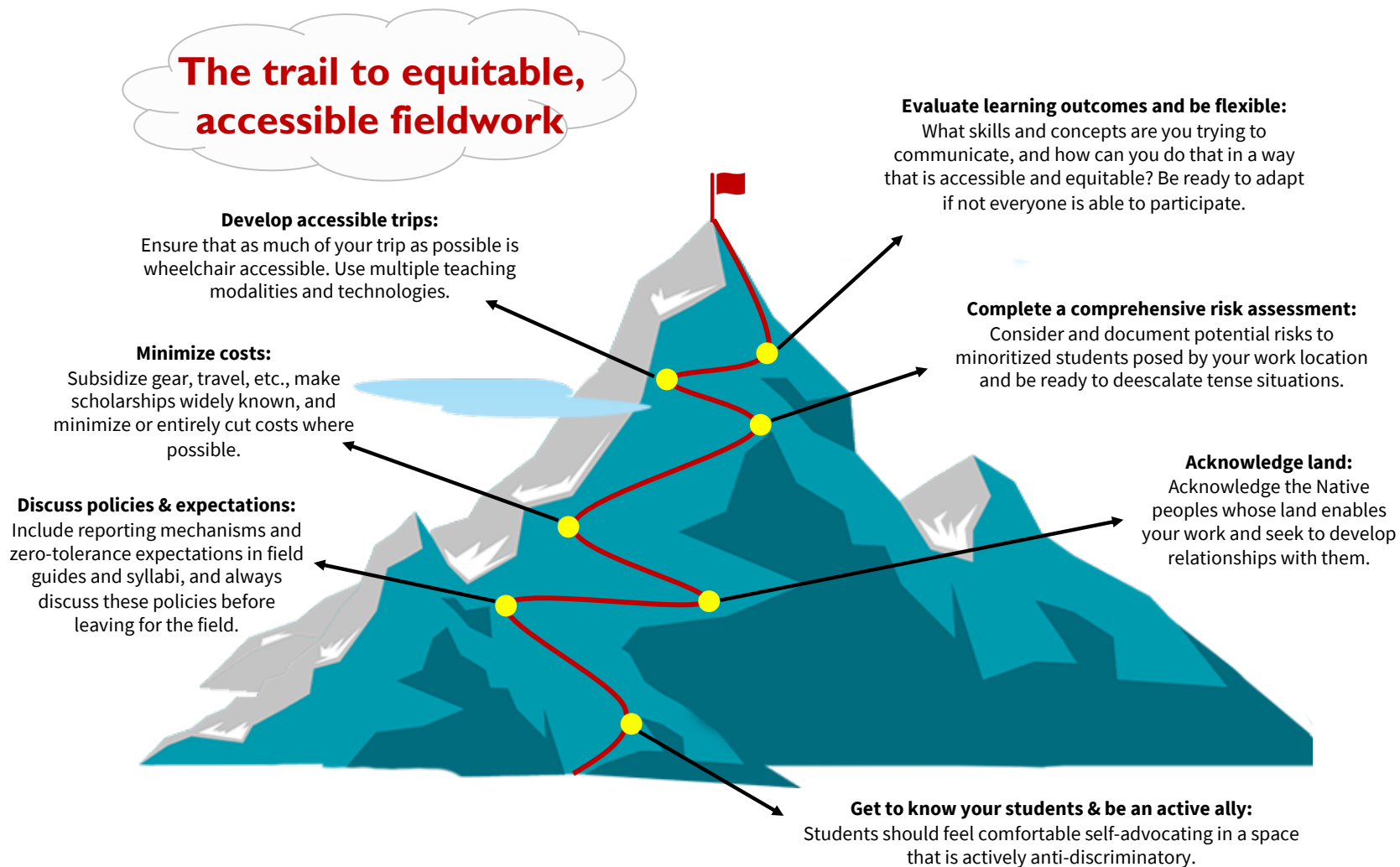
Sugerman, D. (2001). Inclusive outdoor education: Facilitating groups that include people with disabilities. *Journal of Experiential Education*, 24(3), 166–172. <https://doi.org/10.1177/105382590102400307>

This article develops and describes the Model for Inclusive Facilitation for making outdoor education accessible for people with disabilities.

Whitmeyer, S. J., Atchison, C., & Collins, T. D. (2020). Using Mobile Technologies to Enhance Accessibility and Inclusion in Field-Based Learning. *GSA Today*, 30(9), 4–10. <https://doi.org/10.1130/GSATG462A.1>

This article describes two field trips where diverse technologies were used to promote accessible learning. They report on the technology that they used, including the drawbacks, and ultimately conclude with recommendations for the use of technology in fieldwork.

6. Appendix 1



“The trail to equitable, accessible fieldwork” summarizes seven actions that can be taken to make fieldwork environments more safe, accessible, inclusive, and equitable.