

‘Picking your path’ towards accessible and inclusive geoscience field education



UNIVERSITY OF
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School of Geography, Earth
and Environmental Sciences



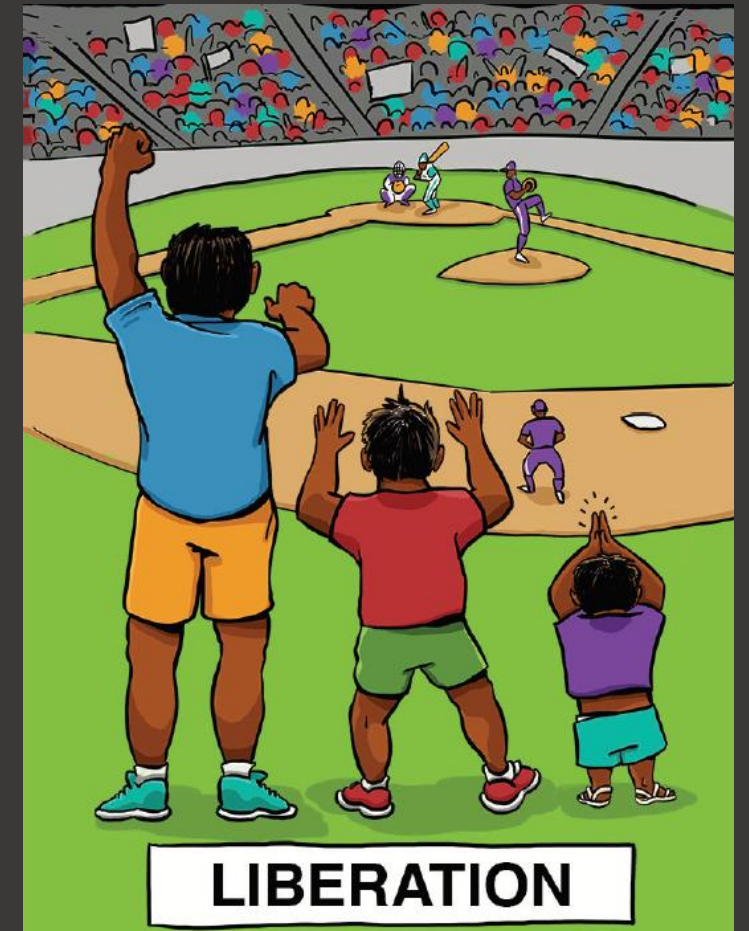
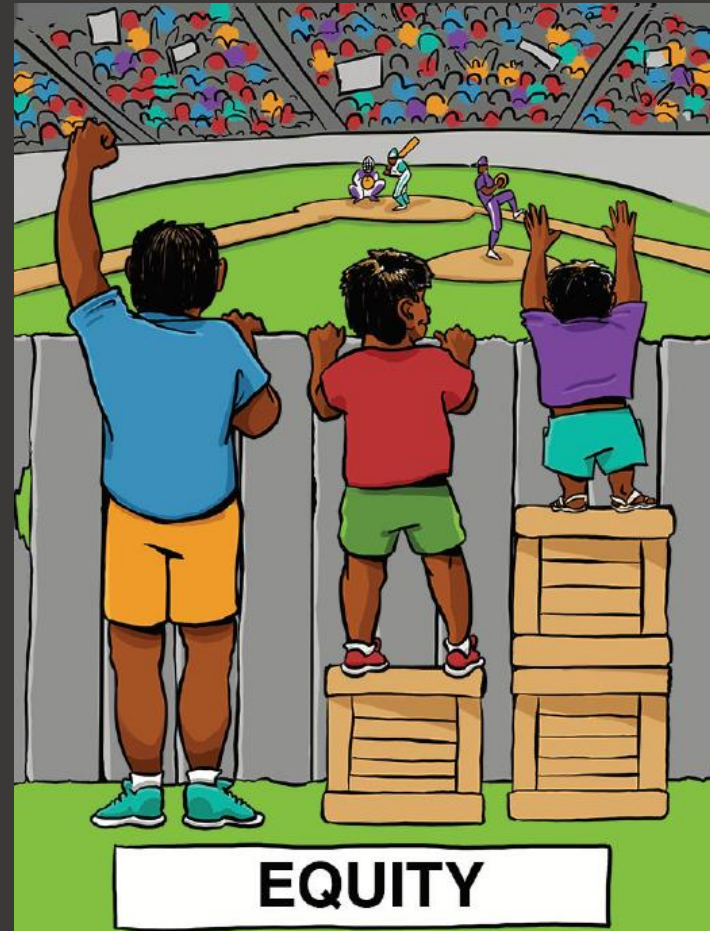
iAGD
International Association
for Geoscience Diversity

DiG
UK
Diversity in Geoscience

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ACCESS

INCLUSION



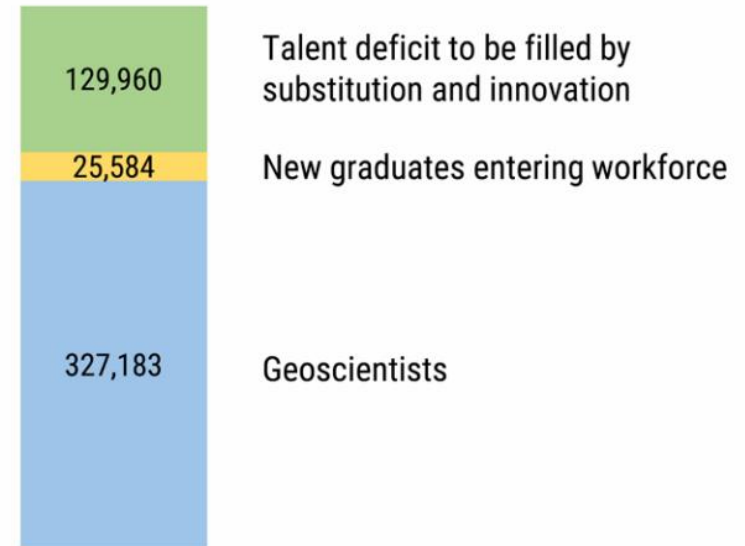
Big issue #1: there are not enough geoscientists

American Geosciences

Institute predict that by 2029:

- Jobs in geoscience will increase by 4.9% to >480,000
- 27% of existing geoscience workforce will be retiring
- There will be a geoscience workforce talent deficit of ~130,000

Geoscience Workforce Talent Deficit in 2029

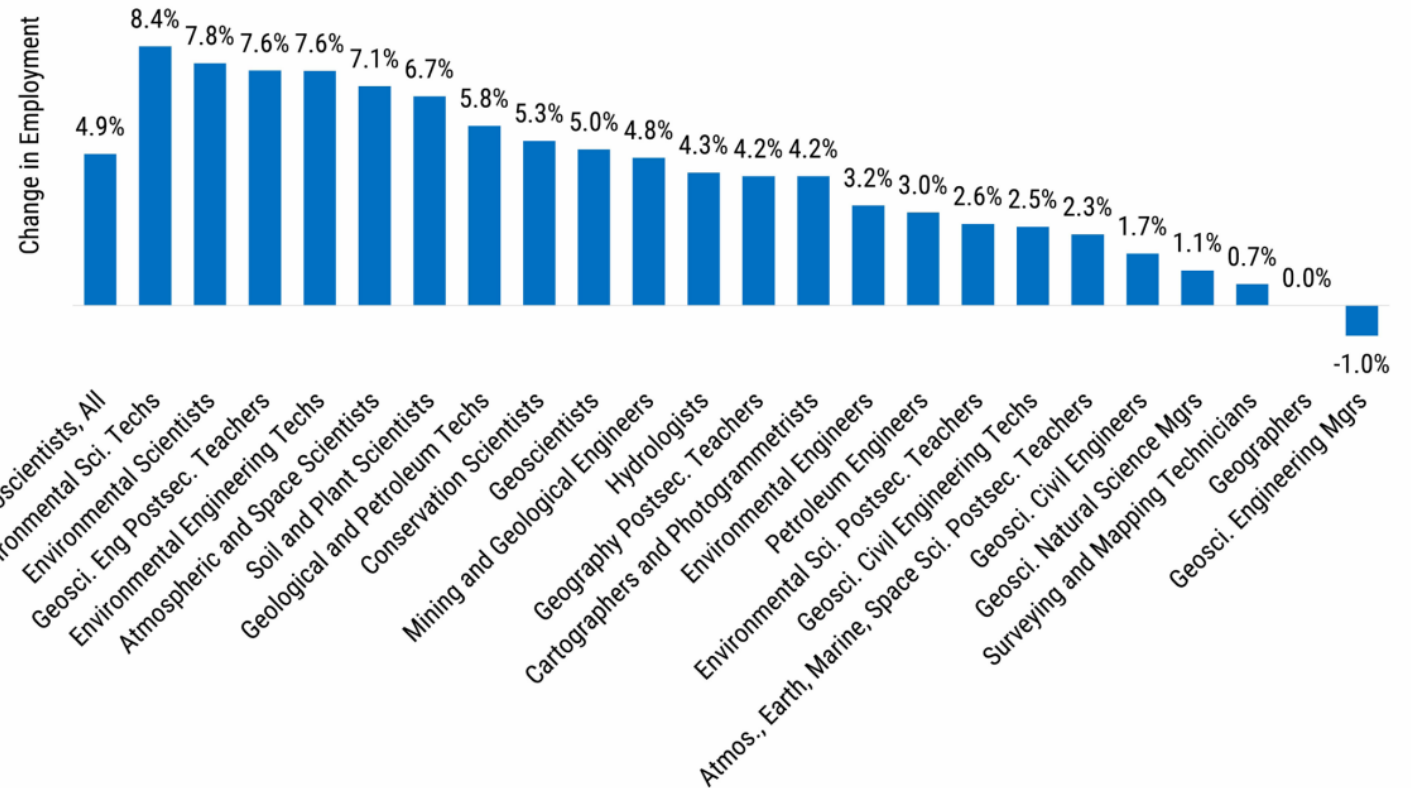


Credit: AGI; data derived from the U.S. Bureau of Labor Statistics, Employment Projections and Current Population Survey, and from AGI's Directory of Geoscience Departments

Big issue #2: lack of diversity in geoscience

- Geoscience is one of the least diverse disciplinary fields (Gewin, 2023)
- People with disabilities are the largest minority group in the US (e.g. Carabajal *et al.*, 2017)

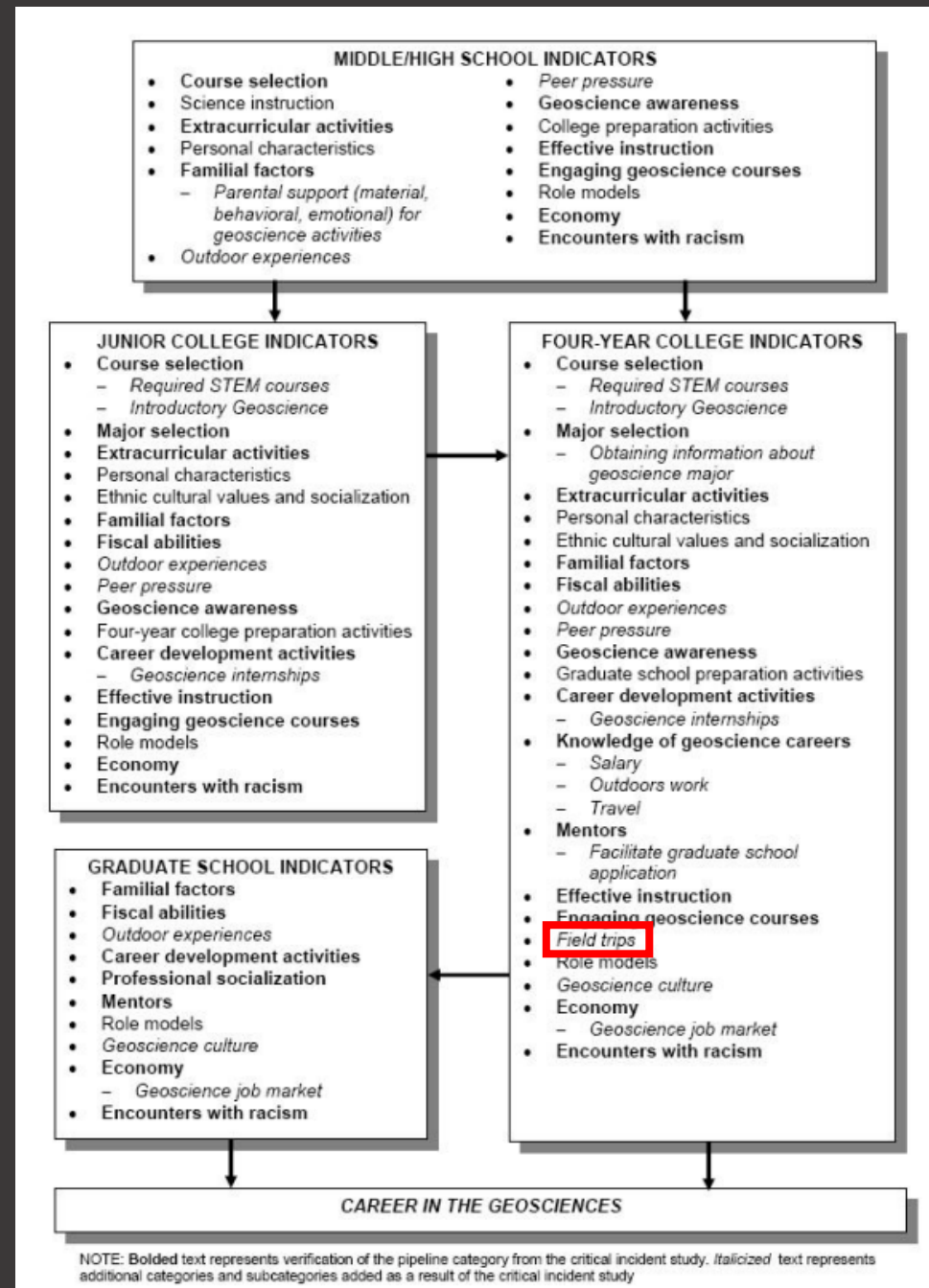
Projected Geoscience Workforce Changes by Occupation (2019-2029)



Where does fieldwork fit into this?

Geoscience pipeline model (Levine *et al.*, 2007)

- Prevalence / importance of fieldwork distinguishes geosciences from other STEM
- Positive fieldwork experiences associated with recruitment and retention



NOVICES IN

GEOSCIENCE PIPELINE

EXPERTS OUT

Making fieldwork accessible and inclusive for all students

School of Geography, Earth and Environmental Science

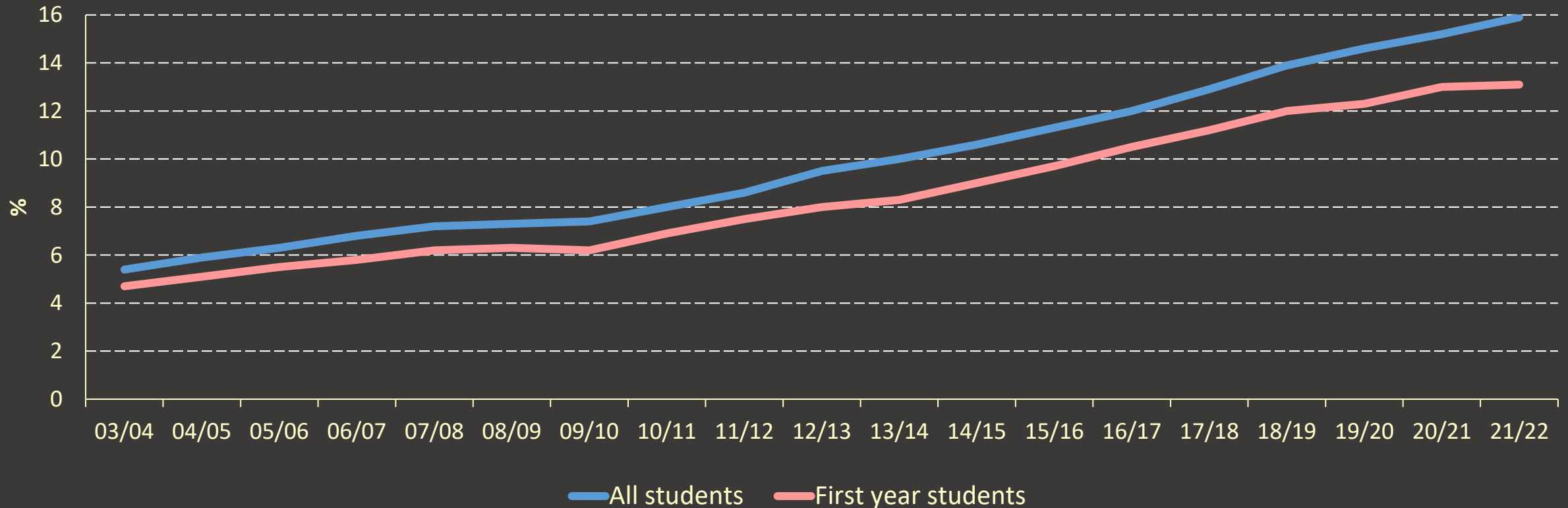


“If field experiences are integral to professional preparation, then they must be made equitable for all students” (Marshall & Thatcher, 2019)

What do the data (from the UK) tell us?

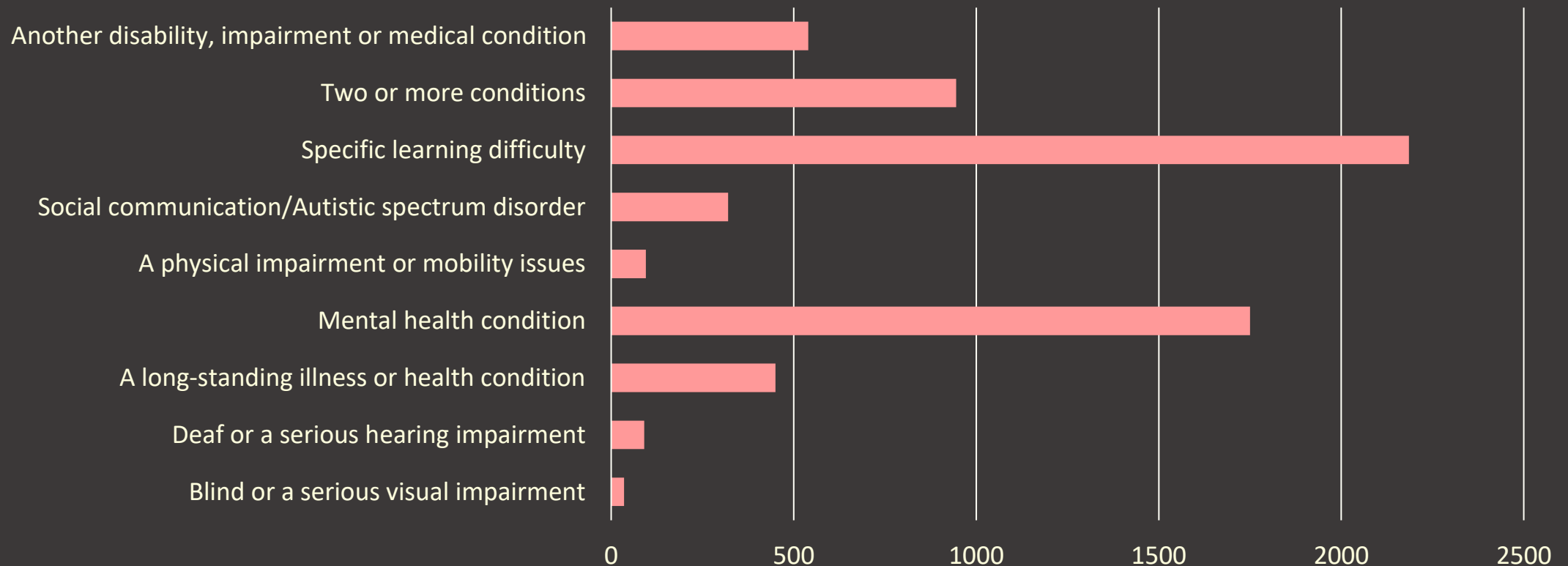
1. The number of students in HE declaring a disability is increasing

Proportion of students with disabilities 2003-2022 (Advance HE, 2023)



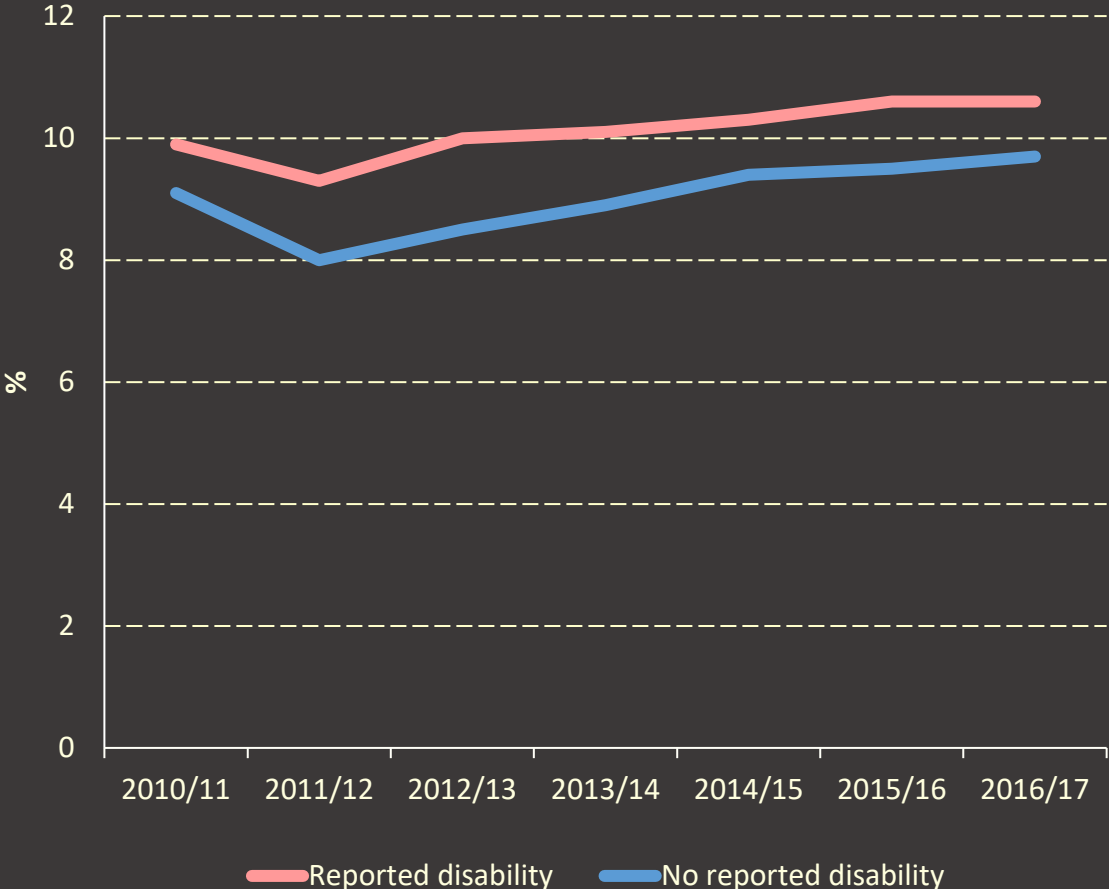
2. The majority of disabilities declared on geoscience programs are 'unseen' conditions

Students enrolled on GEES programmes and impairment type 2021-22 (Advance HE, 2023)

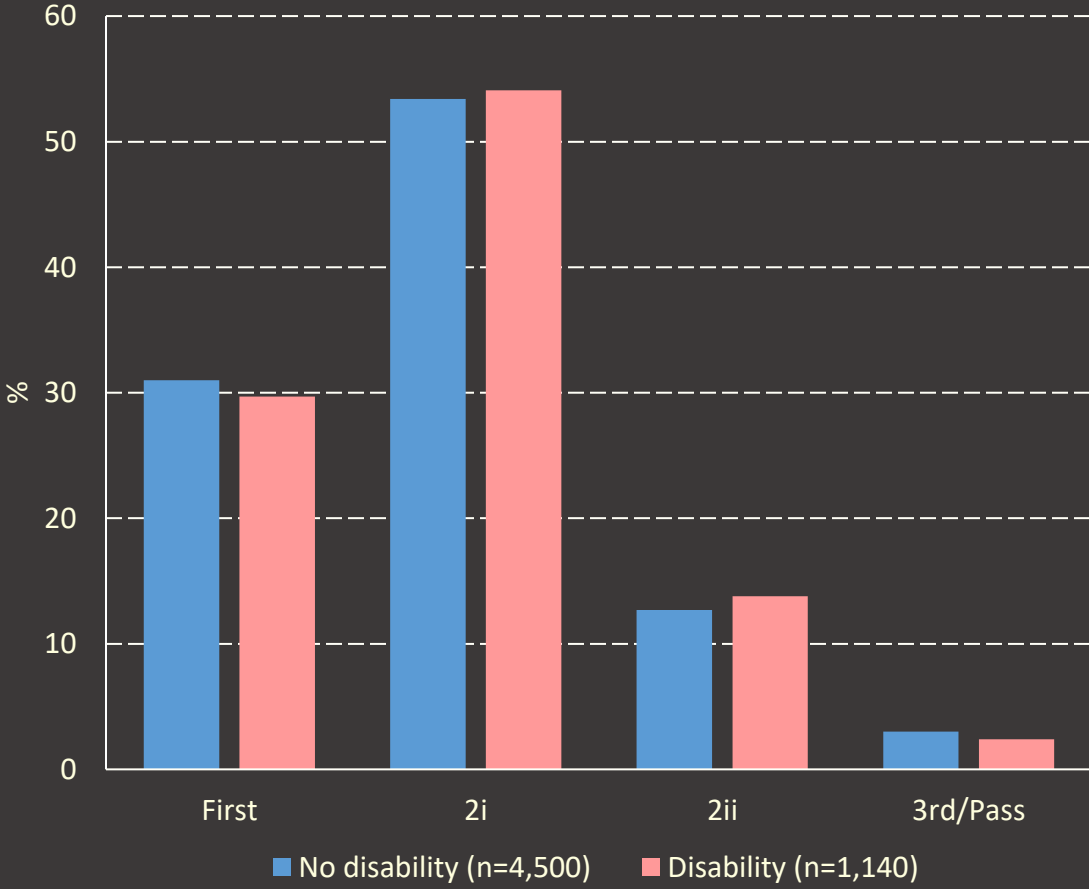


3. Students with disabilities are just as likely to succeed academically

Non-continuation rate among UK undergraduate students (OfS, 2021)

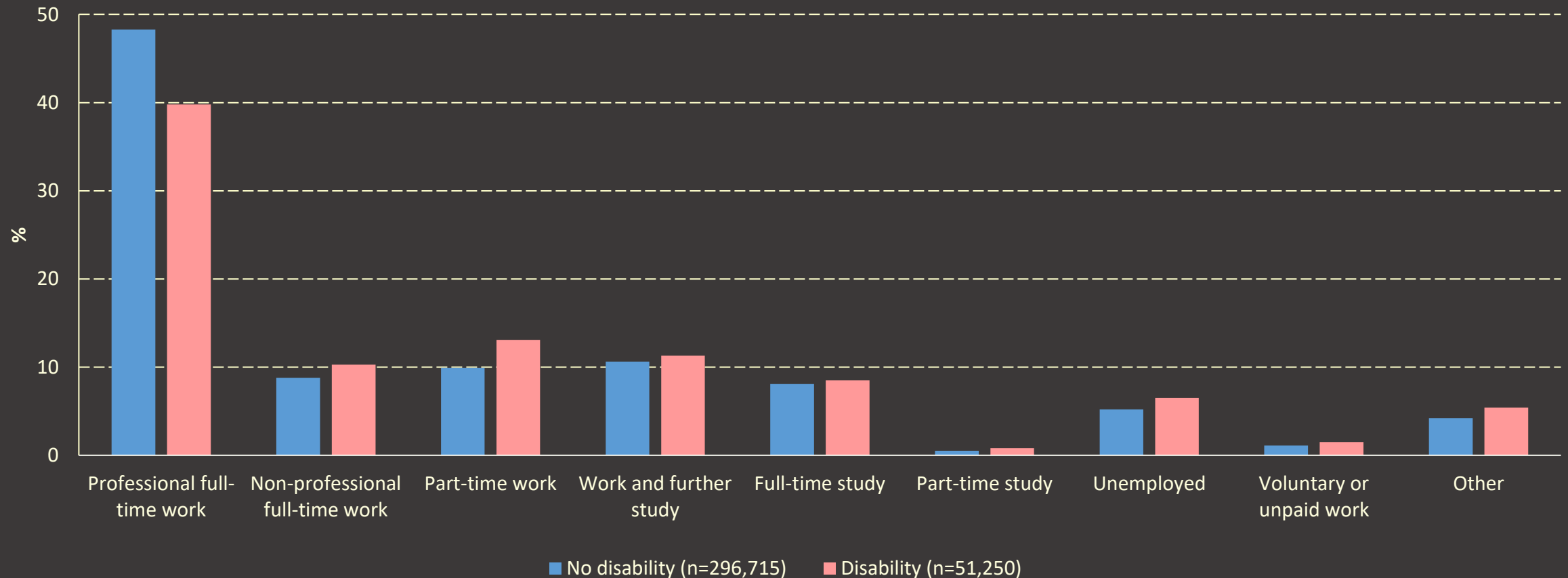


Attainment gap between GEES students declaring and not declaring a disability 2021-22 (Advance HE, 2023)



4. Students with disabilities are less likely to gain professional employment

Graduate outcomes: students declaring and not declaring a disability 2021-22 (Advance HE, 2023)



What are the main barriers to fieldwork?

Physical access and logistical barriers

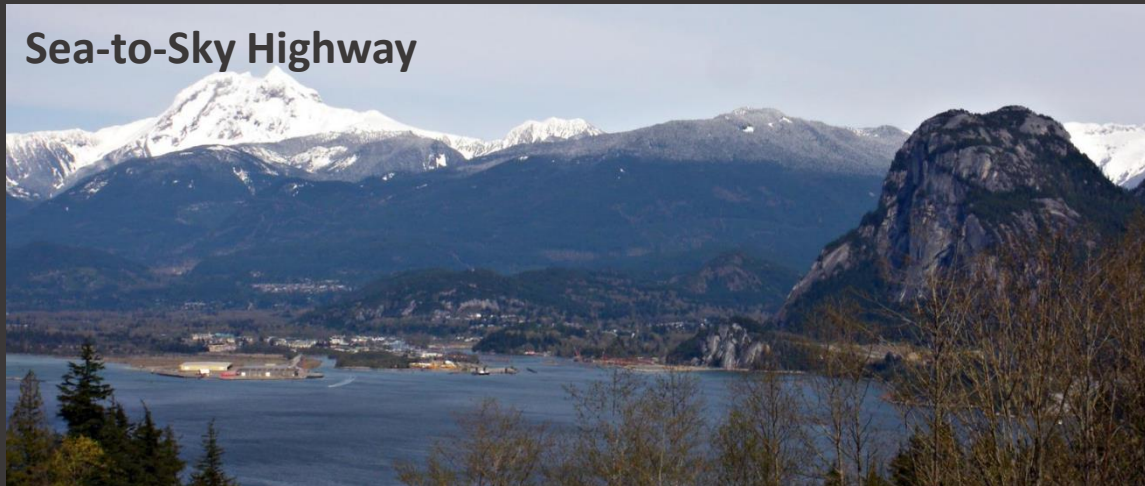
- Mobility / negotiation of terrain
- Removal from familiar environments
- Adjustments to / support with activities

Social inclusion

- Engaging in social interaction and building relationships
- Developing identity and sense of belonging



Key research activities



Type of fieldwork Single-day field excursion (Vancouver)

Week-long residential field course (Wales)

Fieldwork design Workshop-style: students and faculty working collaboratively. Pre-existing fieldwork adapted to be accessible for students with diverse needs.

‘Typical’ residential field course with faculty-led and student-led activities. Designed to be inclusive for students with diverse needs.

Participants 14/15 students and 3/14 faculty self-identified as having a physical, neurodiverse or mental health condition

4/12 students declared a neurodiverse and/or mental health condition, and 2/12 declared a mobility impairment

Key references Feig *et al.* (2019), Stokes *et al.* (2019)

Houghton *et al.* (2020)

Suggested design principles for inclusive fieldwork

Multiple means of access

Identify locations that offer multiple options for accessing the geology

Multisensory engagement

Make learning materials available in formats that are accessible to different senses, e.g. visual, audio etc.

Pace and timing

Ensure that the time available for the learning activity and pacing of delivery is sufficient

Collaborative learning activities

Encourage interaction between students and their peers, and with faculty, during all fieldwork tasks, including downtime

Academic as opposed to physical rigor

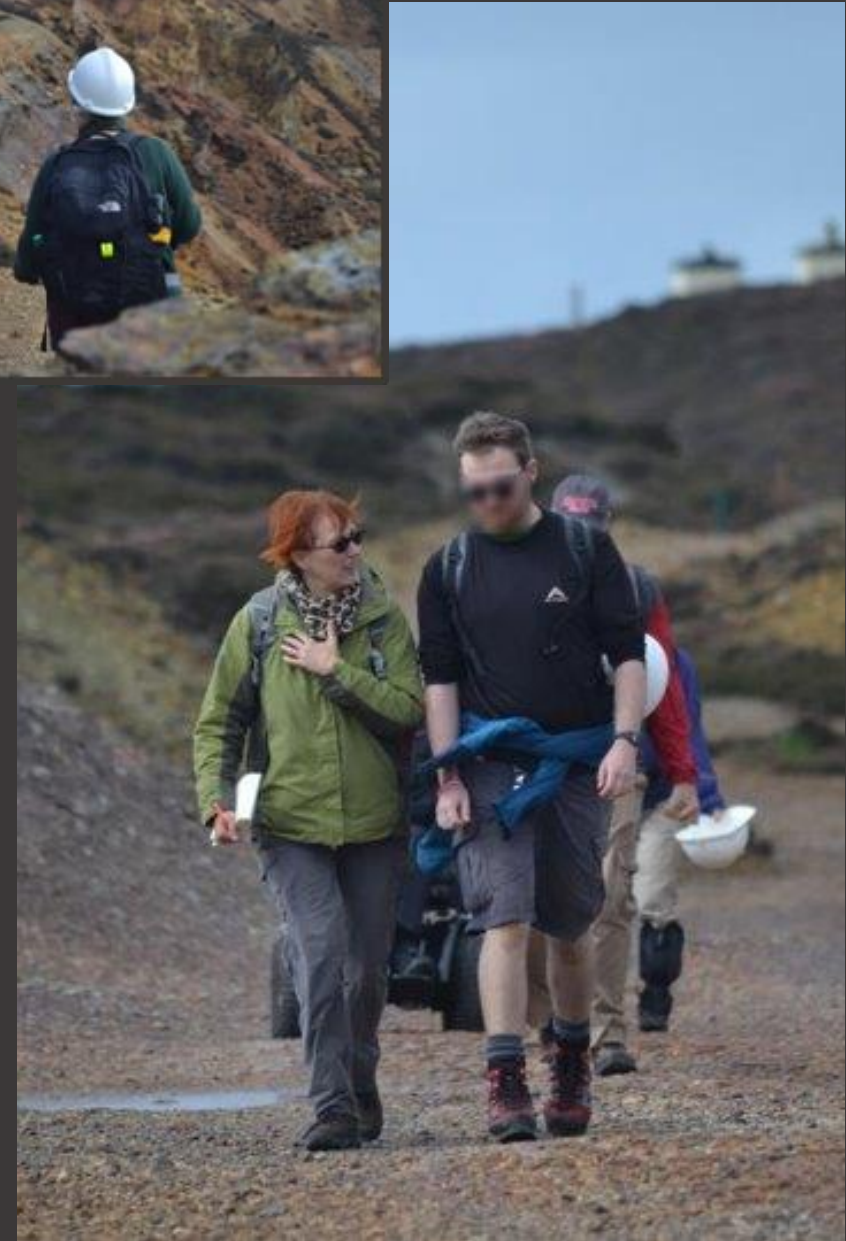
Design activities / choose locations to accommodate different levels of physical ability

Promoting self-advocacy

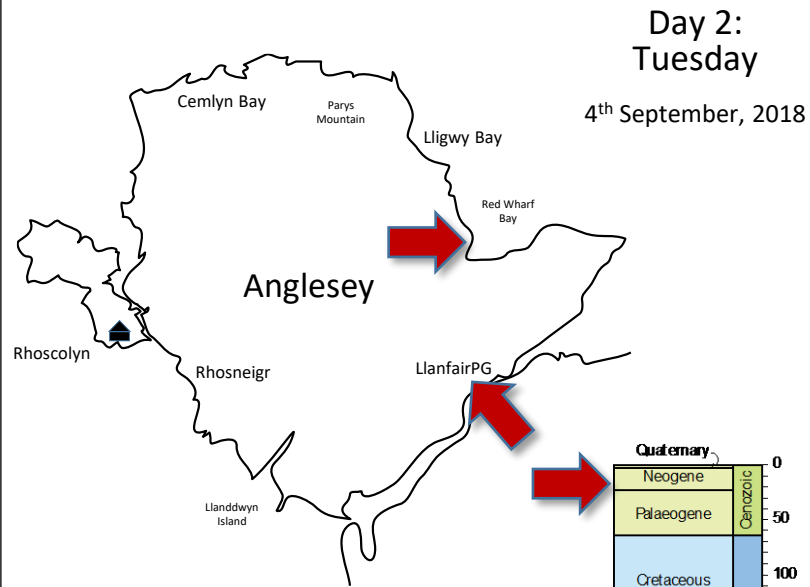
Invite students to make their needs known prior to and during field activity

Find out about students' needs and previous fieldwork experiences

- Fieldwork is daunting
- Perceived by others as lazy and a burden
- Feeling alone, misunderstood and unsupported
- “The last guy back to the bus”



Consider planning, schedules, pace and timing

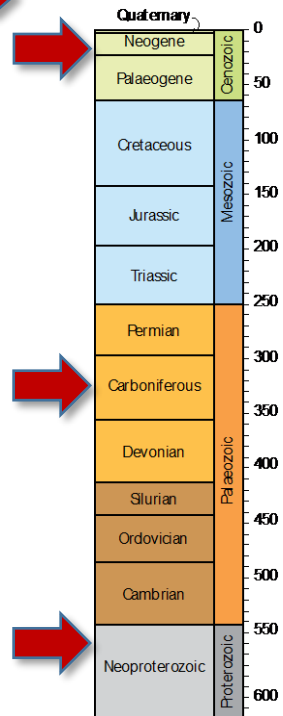


- Information delivered beforehand helps to reduce anxiety
- Provide a clear schedule of activities including break times, but be prepared for ‘uncertainties’!
- Prioritise spending more time at fewer locations

Red Wharf Bay
Cliff and foreshore outcrops of Carboniferous limestone, sandstone and shales and a Miocene(?) aged beach deposit.

LlanfairPG
In the woods, beneath the Marquess of Anglesey's statue, are a series of Neoproterozoic blueschist outcrops.

9am: Depart (40 minute drive)
10.15am: At Red Wharf Bay
1pm: Lunch
2pm: Depart for LlanfairPG (15 minute drive)
2.30pm: At LlanfairPG
3.30pm: Leave for hostel
4.00pm: Back at hostel



Offer different means of accessing learning

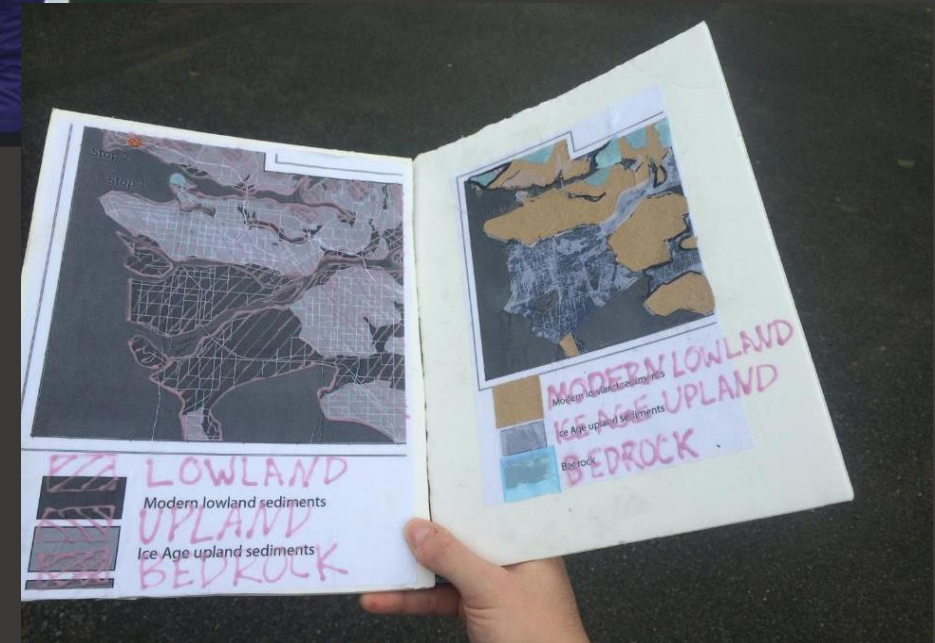
“...people, you know, they split up, they did their own thing, they explored the way that they would—and then, again, reconvening and sharing all of their experiences with each other at the end. That I think made it more accessible, because you picked your path, but there were so many options and your experience and observations were just as valuable as everyone else’s” (Greta, S2SH)



Recognise that field learning is multisensory

Sight is not the only sense – there is more to geology than what we observe!

Also consider learning resources such as handouts



Fieldwork is also a social process

Design tasks and activities to encourage collaboration and knowledge-sharing...



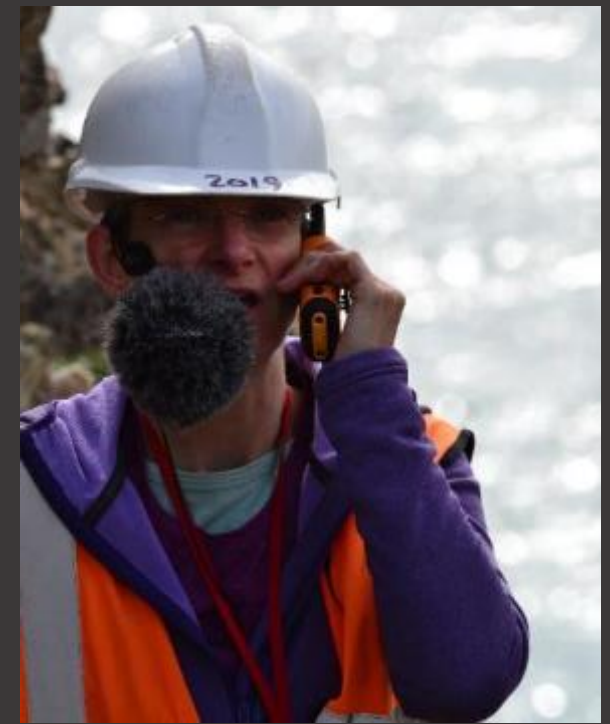
...but social interaction may be extremely challenging for some students

Communication is key!

Diversity of students = diverse range of communication requirements!

- Tour guide system
- Walkie talkies
- Live feed system
- Skype/FaceTime

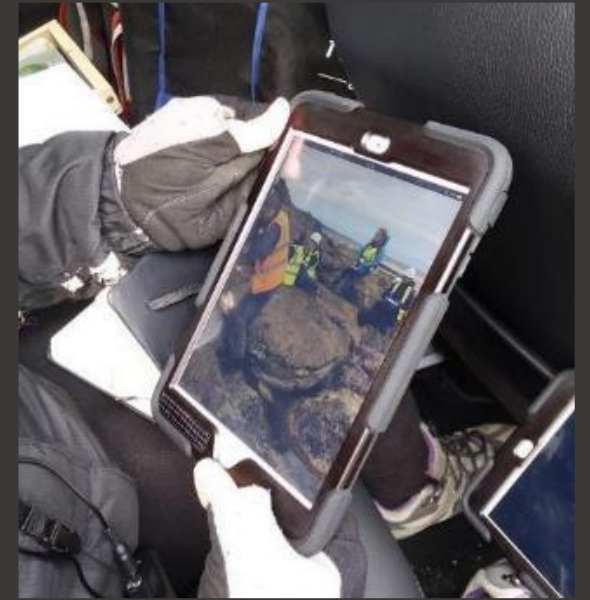
*See Atchison *et al.* (2019) for further case studies involving technology-enabled accessible fieldwork





“The tour guide system’s been really good...cos, now I don’t miss anything, because I can’t deal with being in a crowd or...getting too close, or having to sort of, back off and go somewhere to the side on my own. I can now do all those things, but I don’t miss anything” (Frank, AA)

Live feed methods



- Technology such as a simple LAN or Skype/FaceTime can provide live feed for remotely located students
- The most important thing is to keep all students connected!

Parallel field activities



“...when we were sitting in the car and we have the video, and the pictures, and the hand samples and everything, and...I quite enjoyed that, just ‘cos it felt like I was there, and I was doing something and like, part of the team...”
(Abi, AA)





What is the impact on student experience?

- “Pressure off” and feeling fully included
- Social interaction facilitated, although still challenging for some
- Pace allowed opportunity for exploration and discovery
- Willingness to advocate

What have we learned so far?

- Good pedagogic practice is key to making fieldwork inclusive and accessible
- Technology and alternative activities are important for enhancing access, but should not hinder inclusion
- Traditional fieldwork 'cultures' can exclude students academically and socially
- When students feel included, they feel empowered to advocate for themselves and for others



What still needs to change?



“I think anybody that gets into geoscience, regardless of their age or limitations, should have the opportunity to be able to learn and not be judged...” (Amanda, S2SH)

NOVICES IN



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EXPERTS OUT

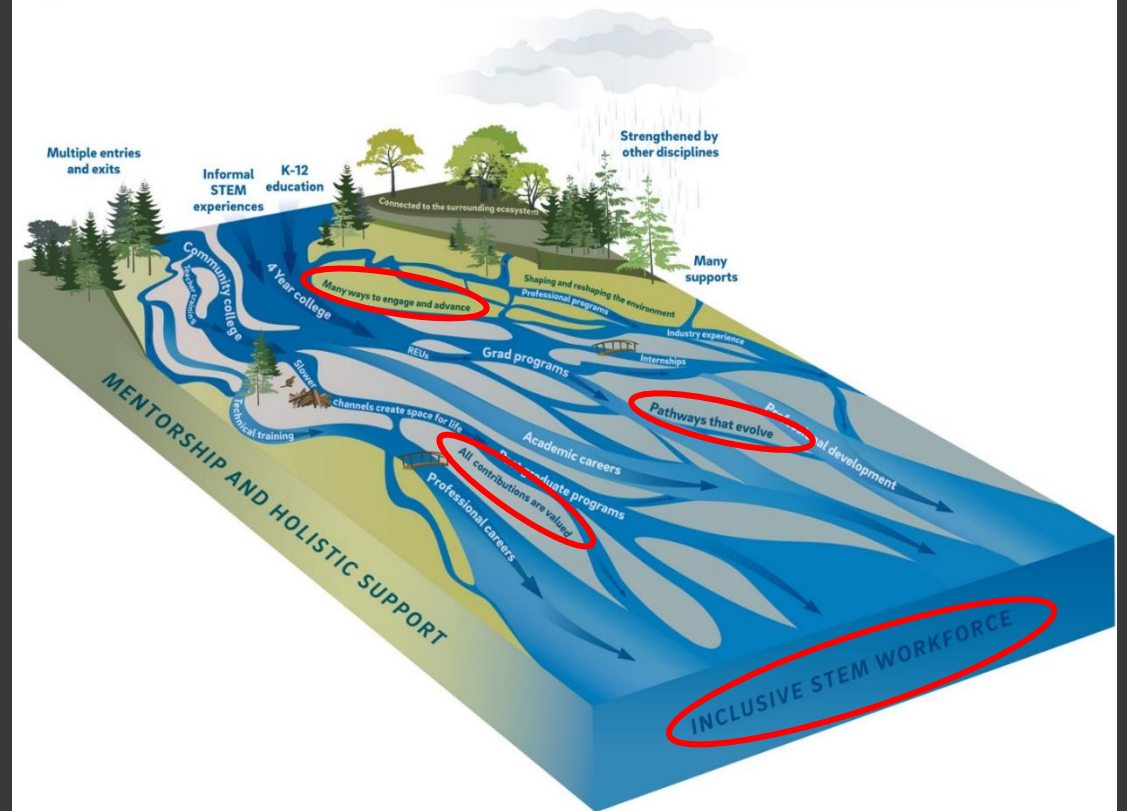
Reimagining the geoscience pipeline?

Eos

Reimagining STEM Workforce Development as a Braided River

A contemporary approach to today's science careers looks less like a structured pipeline and more like a collection of paths that change and adapt to the needs of the individual.

By R. L. Batchelor, H. Ali, K. G. Gardner-Vandy, A. U. Gold, J. A. MacKinnon, and P. M. Asher
19 April 2021



A braided river in New Zealand. Credit: Findley Watt, stock.adobe.com

**THANK
YOU!**



**Questions
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References and further resources

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