ACTIVITY BINGO

NUDGING STUDENTS TO MAKE THE MOST OUT OF FIELDWORK

By Mirjam S. Glessmer, Linda Latuta, Francesco Saltalamacchia, and Kjersti Daae

[The bingo activity] made the cruise more fun and productive, because it made me pursue tasks and conversations that I would not have engaged in without the bingo, and I learned a good amount of new things.

– A student in our field course, 2023

In geosciences, fieldwork is a traditional way to teach various applications of disciplinary knowledge and practical skills and to introduce students to the scientific method (Malm, 2021). Many students are excited to join fieldwork and find it motivating and relevant for their future careers. In post-fieldwork surveys, our students at the Geophysical Institute, University of Bergen, Norway, typically describe their fieldwork using words such as *instructive, exciting, fun, interesting, good experience, cooperation*. The dominant discourse among geoscience teachers is also that "'fieldwork is good' for both social and academic purposes" (Malm, 2021). However, for various reasons, not all students take advantage of all opportunities within the scope of the fieldwork. For many students, there is a wide gap between what they learn through participation in a field course and what they need to be able to do later in more independent fieldwork.

Orion and Hofstein (1994) suggest that the educational effectiveness of fieldwork depends on both the fieldwork's quality—the structure and quality of teaching—and the students' familiarity with the fieldwork setting, which they refer to as "novelty space." Fieldwork in geoscience usually takes place outdoors (in our case on research ships) and often requires a lot of previous experience to be comfortable and successful (e.g., knowing how to dress according to weather, hike in difficult terrain, lift heavy equipment, use manuals to operate scientific instruments). When students become overwhelmed with such practical issues, it takes focus and energy away from learning disciplinary knowledge and skills (Orion and Hofstein, 1994). Unfortunately, there is also a long history of propagating stereotypes of what a "successful geoscientist" looks like ("checkered button-down shirts and a beard," as we have heard colleagues say to first-year students). This culture makes it harder for some students to feel that they belong (Malm, 2021), and we know that experiences of positive relationships are important for student learning (Felten and Lambert, 2020).

We want all our students to be able to make the most of the valuable learning opportunities that fieldwork presents, and for that purpose, we created gamified activity prompts. Those prompts encourage students toward seeing, seizing, and even creating opportunities for themselves—they "nudge" students to change their behavior in a desirable way without forcing them or punishing non-compliance (Thaler and Sunstein, 2008). In the following, we describe our design process and our students' experiences with our "fieldwork bingo" activity.

CREATING A FIELDWORK BINGO ACTIVITY

We use the layout of a bingo card to present a wide range of learning activities that we want to encourage students to engage in during the fieldwork. Filling out a bingo card is more appealing than working through a checklist, and most students intuitively know how to play bingo and feel drawn to checking boxes to complete a full row, column, or diagonal. In addition, strategic placement of activity prompts lets us subtly guide students toward certain activities. For example, some squares are replicated on the card more than others, providing additional opportunities to engage in those activities to get to bingo. Figure 1 shows an example of a fieldwork bingo card for a four-day student cruise on a research ship.

IDENTIFYING INTENDED LEARNING OUTCOMES AND CHOOSING ACTIVITIES

To create a bingo card, we first collect and discuss intended learning outcomes with all teachers and teaching assistants involved in the course. It is fairly easy to identify learning outcomes and activities relevant to the curriculum that we want to encourage students to engage in during their time on board. Such activities might not be explicitly mentioned in the curriculum, for example, handling specific equipment, taking distinct measurements, and documenting the experience for future reports, but they are typically the reason why we go into the field in the first place. Many students will readily engage in them, but some need the extra prompt. This is especially true on cruises with large numbers of students, where only a few students at a time can perform a specific task. Ensuring that everyone participates in a variety of activities can become challenging because of the difficulty of tracking individual contributions. Fieldwork bingo can increase the probability that every student engages

	• Ask a technician how you can help • Learn to use a ratchet strap • Move cargo with a forklift
	• Identify and discuss 3 different cloud types. Estimate their height and look up typical heights • Read ship's weather data and compare with observations • Document radiation/light phenomena
	• Document and discuss wave phenomena (refraction, defraction, turbulence, capillary, wind waves, swell) • Use the Beaufort sea state description to estimate wind speed and compare to measurements
	• Visit the bridge and study the radar screen at night • Observe a ship and identify it in the ship's navigation system • Compare your surroundings with a satellite image
	• Write a story for the department's newsletter • Post a 3-slide story from the fieldwork on Instagram • Post a fieldwork report on a student organization account
	• Have a conversation with a crew member • Visit the bridge and have a conversation with the captain • Thank the chef for the nice food
	• Plot vertical profiles of temperature, salinity, and density and identify the thermocline/pycnocline • Plot temperature versus salinity and identify water masses
	• Take a break outside • Visit the gym/sauna
	• Take care of someone who is not feeling well (e.g., seasick, lonely) • Include someone you haven't talked to in a conversation or activity
	• Explain/walk a peer student through a measurement procedure • Ask a peer student for help/support when performing a new task
For all topics: We welcome your suggestions for activities!	

FIGURE 1. (left panel) An example of a fieldwork bingo card for a student cruise. The goal is to complete one or more bingo patterns (i.e., check all fields along a row, column, or diagonal). The white fields cover specific learning activities, while the colored fields indicate umbrella categories of activities designed to encourage student exploration during fieldwork. (right panel) The table shows examples of activities students might choose from in the different categories.

in a basic set of tasks, facilitating a comprehensive experience for all.

Good indicators of the less obvious activities that might be useful to include in a bingo card are recollections of situations where we noticed some students (or sometimes even instructors) eagerly creating interesting and beneficial learning opportunities for themselves (or ourselves) that did not appear to interest other students. Some ideas come from conversations with other people involved in the fieldwork, for example, the crew on a research ship. We reflect on what useful learning students may miss out on if we do not encourage them explicitly (e.g., related to the "etiquette" on a research ship; Glessmer, 2019), and create corresponding activity prompts.

PLACING ACTIVITIES ON THE BINGO CARDS

We then categorize and prioritize activities. Some activities we deem so important that we want to include them explicitly in their own fields, for example, "collect a water sample for oxygen measurements." We also offer the opportunity for each student to choose activities that have personal relevance for them by including umbrella categories. There, students choose from a list or suggest their own activities that are relevant in that category. For umbrella categories, it is more important that students think about the category in general than what they actually do. Such categories include practical work, social interactions with peers and crew members, and connecting theoretical disciplinary knowledge to observations of the real world.

We leave the center square empty to allow students to freely suggest their own activities. These "choice" fields encourage students to actively think about what other activities or experiences they might benefit from and want to seek out, to better connect different tasks with disciplinary content, to expand their horizons, and to take ownership of their learning. The students did take the "free choice" option seriously and chose tasks that were meaningful to them and deserved highlighting, both for themselves and for the teacher. The "free choice" tasks roughly fell into three categories: taking responsibility for "household chores" (e.g., "tidying up the mess in the water samples"), learning useful skills (e.g., soldering), or science communication (e.g., documenting the work for the institute's newsletter). Finally, we also include some low-threshold activities on the bingo card (e.g., participation in the security briefing, which is mandatory for all students anyway) to get students started.

To construct the bingo card, we created a table in PowerPoint and coded both the table and list of suggested activities for accessibility with a color-blind friendly palette (Tol, 2021) as well as with icons. An editable PowerPoint document of the bingo card shown in Figure 1 can be downloaded at https://cocreatinggfi.w.uib.no/bingo.

BOX 1. STUDENT PERCEPTIONS OF THE FIELDWORK BINGO

Here we present free-text student feedback to illustrate student perceptions of the fieldwork bingo in the students' own words.

We ran the fieldwork bingo activity on two student cruises on board Norwegian research ships with four continuous days at sea each. The cruises were embedded in physical oceanography and meteorology study programs at the Geophysical Institute, University of Bergen, Norway. During their time at sea, all students completed at least one bingo. Despite the limited time and the bingo activity being introduced as completely voluntary, some students finished up to eight bingos. But what aspects of the bingo made the experience motivating and valuable for students?

In response to open questions about their experience with the bingo, one student states: "*[The bingo] positively influenced the [fieldwork] experience, since [the bingo] challenged us to do various things we would not necessarily try out.*" Several students commented similarly that the bingo gave them "*motivation to explore and build on existing skills*," "*increased motivation to try out non-disciplinary activities*," or "*helped me to be even more curious and active than I usually am, since it added a 'game' feature and a bit of healthy competition to the different objectives*."

In the following, we structure student feedback according to the three components of self-determination theory that support intrinsic motivation: relatedness, competence, and autonomy (Deci and Ryan, 2000), which are clearly identifiable in the student responses we received.

I Feel Connected!

We created opportunities to experience positive relationships and relatedness with peers, teachers, and the crew. Students noticed this and expressed that the bingo "*encouraged students to interact with each other*" and served as a "*teamwork opportunity*: *For instance, some students shared good tips on identifying cloud types, whereas others knew how to find vessels from the global vessel positioning data. By helping each other, we got to spend more time together outside of the class activities, and it has helped our teamworking skills and encouraged communication.*" Especially on the student cruise where the students did not know each other well, students appreciated the "*ice breaker*" that made "*socializing with peers, whom I didn't know so well from before, easier.*" Even though not explicitly mentioned by the students, the bingo is also an opportunity for students and teachers to have informal conversations about disciplinary content and beyond, thus building relationships and lowering the threshold for future interactions.

The students also understood that the staff and the crew members welcome interaction. An experienced student writes: "*The thing that I enjoyed the most, and that surprised me because I never noticed it on all my previous cruises, was to see how open to a chat or to answer questions the crew is. They always seem very serious and preoccupied with all their different tasks, and I never really thought of interacting with them for anything more than what was needed for our sampling purposes. I enjoyed spending some time practicing knots with [another student] and a crew member on deck, and that served not only to tick off another task, but also to break the ice and provide conversations with the same crew member and others during the following days. The bingo also motivated me to go up to the bridge to follow some sampling operations or study the radar, and I had interesting conversations with the captain and other crew members. It is sometimes hard for scientists to remember that we can learn a lot from people with different types of experiences, and in my next cruises I will definitely keep this in mind.*"

I Feel Capable!

We also included tasks that the learner can do with guidance or figure out together with their peers (Vygotsky, 1978), especially regarding developing practical skills that help students solve challenges in fieldwork. One student writes: "*I liked how the game was designed, with different activities ranging from the easy and fun (say 'thank you for the food' to the chef) to the more scientific ones. Having some low-bar activities helped to get some tasks ticked off already as we got the bingo sheet, which made all of us more eager to do the rest.*"

The bingo helped students feel engaged with the fieldwork because it "*gave us something to do during quiet periods of the shift*," for example, during night watches, by encouraging them to "*spend the time on something we learn from and that is useful*." It also encouraged them to connect relevant disciplinary knowledge with their experience, which gave them a feeling of mastery: "*When walking on the outer decks to take photos of the fjords I enjoyed noticing that a part of my mind was focused on detecting the different phenomena which could be observable in the water or in the atmosphere*," as one of the bingo activities suggested.

The feeling of competence was not limited to the time students were at sea but also manifested in the usefulness of the real-life skills later: The "*cruise bingo has facilitated learning new skills which became helpful outside of that particular cruise/course. For example, one of the cruise bingo activities was to learn how to tie a knot. It was not my first cruise, yet I have never asked the crew to teach me this fundamental skill. This time, the cruise bingo motivated such interaction, and I learned one of the knots from an engineer on board. Shortly after the cruise, I was on fieldwork, where we needed to secure some equipment with a rope, and it came in handy to have learned this skill through the cruise bingo.*"

I Have Choice!

Lastly, we wanted students to choose what to do, when, and with whom to do it to co-create their learning (Glessmer and Daae, 2022). One student stated: "*It was fun to be creative and make up my own suggestions for the bingo,*" and another student stressed: "*To start with, everything is more fun when there is a game and competition. The bingo made us constantly look out for work tasks that were not directly linked to our [individual] projects.*" The bingo activity also changed how students perceived their surroundings: "*I was constantly on the lookout for atmospheric/oceanographic phenomena.*"

Providing choice is also important for accessibility (Behling and Tobin, 2018). A student elaborates: "*Having room for choice in some of the bingo squares was a good idea. It allowed each student to participate in the bingo activities within their comfort zones while trying new experiences and engaging with a new environment. Such freedom motivates students to explore and build upon their existing skills and does not enforce activities they might not want to engage in, which are not academically compulsory. For example, someone who might have social anxiety about interacting with the crew members could still participate in the bingo without being excluded or pushed beyond their comfort.*"

SUPPORTING STUDENT MOTIVATION

Playing fieldwork bingo is a voluntary activity for our students. Including competition and prizes might seem fitting with the playful approach of bingo, but rewards should be used with caution, as they can also undermine intrinsic motivation (Kohn, 1994). In our case, all those who completed their first bingo patterns were given an inexpensive neckwarmer. We did observe students trying to finish their first bingo row in order to get a neckwarmer, which is of practical use on a cruise (to wear under a helmet). However, none of the students mentioned them as the reason they were motivated to engage with the activity. So even though the small reward seemed to be appreciated, it did not appear to have a big influence on the students' perception of the bingo.

Rather than relying on incentives to encourage engagement, we designed our bingo card to address the three components of self-determination theory that support intrinsic motivation: relatedness, competence, and autonomy (Deci and Ryan, 2000). This means we designed the activities in such a way that students were likely to experience connection and meaningful interaction with peers, teachers, and others; that they felt capable of mastering new challenges; and that they felt they had choice in what to do, when to do it, and with whom to do it. In free-text feedback after the cruise, students highlighted aspects of all three components as especially positive, and reported that the bingo did indeed contribute to their motivation and engagement with the unique learning opportunities of the research cruise (see Box 1).

CONSIDERATIONS FOR FUTURE BINGO ACTIVITIES

Complementing what the students reported after the cruise, we observed a lot of positive interactions between students and staff, students' active engagement and success in carrying out unfamiliar tasks, and their use of the time on board to explore many different aspects of this unique opportunity. In particular, interactions with the research ship's crew were highlighted as positive experiences that were both unexpected and educational. Students were unaware that the crew typically welcomes conversations with students, but student-crew interactions resulted in the students being taught practical skills that turned out to be directly useful both on the cruise and in later fieldwork. We conclude that the bingo activity served its purpose, and we are thinking about how to use and improve it going forward.

We adapt the bingo cards specifically for each instance we use them, not just in terms of the intended learning outcomes of a course, but also depending on the context of the course. For example, if students do not know each other well before the fieldwork, they benefit especially from activities that provide them with opportunities to socialize and get to know each other. Similarly, if the student group is very diverse in terms of prior experience, including competition might discourage less experienced students from engaging.

Before, during, and after this experience, we have had many interesting discussions with other teachers and students who see the potential of using a bingo approach in their teaching and learning contexts. For example, one of the experienced students participating in our cruise will be teaching a field course later this year and writes: "The bingo helped me in understanding a bit better what motivates students to get engaged in more activities, and how to make learning feel more 'voluntary' and entertaining. I am currently thinking of making a different version for the students of our cruise in September."

Now that you have seen what we do and how we and our students think about it, we are curious to hear your thoughts! How would you use such a bingo activity in your context? What suggestions do you have for improving our bingo activity? Please reach out!

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