Intergenerational tabletop game design for exploring the climate emergency: insights from an undergraduate field course

Merryn Thomas, E. Urbanek & C. J. T. Ladd

Published online: 05 May 2025.

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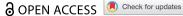Merryn Thomas[a,b], E. Urbanek[c] and C. J. T. Ladd[c]

[a]Centre for Ageing and Dementia Research, School of Public Health, Swansea University, Wales, UK; [b]Department of Geography, University of Exeter, Exeter, UK; [c]Department of Geography, Swansea University, Wales, UK

ABSTRACT

While studies show the value of *playing* games for exploring complex geographical concepts, much less research considers the value of game *construction*. Here we present the rationale, methodology and pedagogical affordances of an "intergenerational climate change game" creation assignment that formed part of a 2nd year undergraduate field course to the Isles of Scilly, Southwest UK. During and after the field trip, students and staff reflected on the process and learnings. First, the assignment was effective in consolidating students' knowledge from various field trip activities and encouraging critical thinking. Students actively engaged in the learning process by playing and appraising their own and each other's games. They enjoyed the creative and novel approach, which was felt to develop teamwork, soft skills and problem solving. The intergenerational element also developed students' ability to simplify complex concepts to be understood by older/younger non-expert audiences. We conclude by considering the role of playful methodologies in geography undergraduate field trips, and further applications of our approach.

Introduction

Field courses are a key component of the learning experience for geography students (Kent et al., 1997) and increasingly focus on training students to understand the climate emergency (Cordero et al., 2020; Williams & Love, 2022). For the past two years, the Department of Geography at Swansea University has offered a five-day residential course to the Isles of Scilly in the Southwest of the UK for 2nd year students as a low-carbon-footprint alternative to international field trips. The course focuses on impacts of and responses to the climate emergency on low-lying islands via case-studies, experiential and inquiry-based learning. Inspired by the call-to-arms to better integrate cooperative learning into higher education (Johnson & Johnson, 2013) we report here teacher and learner reflections on a group-based intergenerational climate change game creation

assignment. We hope our experiences will benefit educators wishing to foster deep learning about the climate emergency.

The pedagogy of game play and design

The game design assignment asked students to develop an intergenerational game about climate change challenges and solutions on the Isles of Scilly. The idea originated from Thomas et al. (2023) and Thomas and Singleton (2024), who used creative and playful methods to promote intergenerational discussions around climate change. Intergenerational engagement is essential to facilitate solidarity, debate and knowledge sharing about climate change between older and younger people (Thomas et al., 2024). Playful approaches such as games can provide a way to facilitate this, by connecting us with others and the world around us (Tsekleves et al., 2020). This is particularly the case with tabletop games, which have been shown to enhance active learning, engagement, and participant motivation (Hayse, 2018).

Games can be thought of as play activities conducted "in the context of a pretended reality" where participant(s) act in accordance with rules to achieve a goal (Adams, 2014, p. 2). There are several reasons why games are valuable for exploring wicked (complex, uncertain, value laden) issues like climate change. Firstly, they allow "a risk-free, active exploration of serious intellectual and social problems" (Abt, 1987, p. 13). The "magic circle" (a concept building on seminal work by Huizinga, 1949) is a space where normal rules/realities are suspended, allowing players to experiment with strategies and role play to explore different perspectives (Illingworth, 2023).

Games can also promote systems thinking, necessary to tackle complex problems such as climate change (Arnab et al., 2019; Wu & Lee, 2015). Gameplay designed to embody "discovery" (where surprises emerge during play, and lessons are learned by making mistakes and adopting new strategies) or "confirmation" (where information about the system is given at the start of the game, and players apply that knowledge to cement understanding) embed learning about the nature of complex systems (Sweeney & Meadows, 2010). Furthermore, games can "create a sense of agency, showing players that their actions can make a difference" (Illingworth, 2023) – some have even been shown to increase pro-sustainability attitudes, knowledge, and feelings of personal responsibility (Douglas & Brauer, 2021). Some climate change board games emphasize teamwork, and can "spark discussion about values, perspective, conflict, emotions and decision-making" (Rosenthal, 2023).

Furthermore, playing games can trigger emotional pathways, which strengthen learning (Wu & Lee, 2015) as well as motivate us to learn (Alexander, 2018). Finally, there is the question of "fun". While fun and its role in both playing and learning is somewhat contested (McManus & Furnham, 2010; Postman, 1987; Sicart, 2014), Koster (2005, p. 90) goes so far as to argue that fun *is* the "act of mastering a problem mentally" and therefore, that games *are teachers*. Pedagogical research already shows there is value in *playing* games for grappling with geographical concepts (Bereitschaft, 2023; Cloke, 1987).

We anticipated that *constructing games* could be an even more valuable learning tool (see Papert, 1993, for a conceptualisation of constructionist pedagogy). Kafai (2006) asserts that while game *playing* assists in acquiring knowledge, game *design* requires learners to construct new relationships with that knowledge. In creating a game, learning

and reflection are involved in each design decision. Students must retrieve knowledge, prioritise what to include, and determine how elements interact with each other. Furthermore, in creating their own game to be played by others, students are designing "'networked' cultural artefacts that have use value, and that matter to their makers" (Thumlert et al., 2018, p. 704).

While research indicates that game construction can improve engagement, in-depth thinking, and support learning in cognitive and social domains (Kafai & Burke, 2015; Sandoz et al., 2016), this research has tended to focus on computer games, and none to our knowledge has addressed game construction in the context of higher education in geography. In sharing our experience, we hope to fill this gap and inspire others to build on our approach.

Materials and methods

Study context

The group-based tabletop game assignment was completed during the Isles of Scilly field course, based on local climate change issues observed during the trip. The Isles of Scilly are a small archipelago home to around 2,100 people, located 28 miles from Land's End, UK. The greatest risk from climate change here is coastal flooding due to sea-level rise and increased storminess, with associated freshwater contamination and habitat loss (Barnett et al., 2020; Council of the Isles of Scilly, 2022). Storms also threaten critical infrastructure and ecosystems, while changing rainfall patterns are expected to impact farming and land management. At the same time, temperature change may increase pests, diseases, and invasive species (Council of the Isles of Scilly, 2022).

Whilst island communities can be particularly vulnerable to climate change, they can also possess remarkable resilience because of strong social capital (Petzold, 2016). Indeed, Scillonians are responding to climate change in several ways, from communities planting marram grass to maintain sea defences, to the Council developing their *Climate Change Action Plan*, which aims to achieve net zero by 2030 (Council of the Isles of Scilly, 2022).

This year, the trip included guided tours of coastal defences, waste/recycling facilities, organic and conventional farms, and Tresco Abbey Gardens. We (12 students and 3 staff) walked the Islands' natural and built environments and throughout the field trip students were encouraged to take extensive field notes including observations, sketches, and reflections.

Tabletop game

Drawing on their fieldnotes, three groups of four students were asked to submit a prototype of a functional Isles of Scilly climate change game for 8–108-year-olds. The aim of the assignment was to facilitate learning and/or discussion about climate change across generations. Before the field trip, students were introduced to intergenerational research, the concepts of playfulness and gamification, and the benefits and drawbacks of using games to engage people with climate change. We provided a "GAME ACE" framework for students to consider when designing their game, and which was used to grade their assignments (Table 1).

Table 1. GAME ACE framework for developing and marking the game-creation assignment.

GAME ACE: Game creation assignment
G   **Gameplay**: Is it a game? Does it have game elements like goals, rewards, agency, strategy? Is it entertaining?
A   **Aesthetics**: Is it visually appealing?
M   **Mechanics**: Is the game intuitive and usable?
E   **Engagement**: How engaging is it? Does it encourage collaboration, learning, discussion between generations?
A   **Accessibility**: Is the game accessible for players of different ages, abilities, backgrounds? Are instructions clear? Consider text size, imagery, colour.
C   **Content**: Is climate change and Scilly content appropriate and accurate?
E   **Effectiveness**: Does the game stimulate understanding, discussion, exploration of different values or solutions?

On the first evening of the field course, students had opportunity to play commercial climate change games. These included the collaborative strategy board game "Carbon City Zero" (Illingworth et al., 2023) and climate versions of "Bingo", "Snakes and Ladders" and "Top Trumps" (Eco Action Games, 2012). They also tried "The Isles of Scilly Board Game" (Tabron, 2024) and a climate change dice game (Thomas et al., 2023). Each group was provided with a choice of a blank box of cards, blank dice, or a board game template consisting of a blank game board and cards, game pieces, spinner, blank instruction board and dice [Apostrophe Games]. We also provided printed maps of the Isles of Scilly and St. Mary's (the largest island), Sharpie pens, pencils, scissors, glue, and a copy of "Make Your Own Board Game" (Daniels, 2022) for reference and ideas. Students had four evenings to create their prototype game.

On the final evening of the field course, each group introduced their game and explained how it addressed the GAME ACE framework, then played each other's games and provided constructive feedback. Students commented on the clarity of instructions and playability of each other's games, but did not assign marks. During this session, the three staff members (authors) took notes about students' perspectives and experiences of the assignment. Staff formally assessed the games using GAME ACE as marking criteria. Six weeks after the field course, four students provided feedback during an optional one-hour debrief, to which all students were invited. Anonymous student comments from the field course and debrief session are included in quotations.

Results

All three groups designed board games "because they were more fun and better for conversation", and "required more thought" than card or dice games (Figure 1). Each was playable, educational, and fostered discussions about climate change. Two games focused on imparting information and generating conversation, whilst one involved strategy. The most successful games included simple, easy-to-understand instructions with multiple-choice questions suitable for both younger and older players.

In *Impacts and Mitigations* players progress along their own route, collecting information cards that help jointly answer trivia. *Project Scilly* requires players to travel around a map collecting grants for sea-defences, farms, and restoration projects. *Guardians of Scilly* requires players to progress around a concentric board to experience events, collect defence cards, and answer trivia questions to build sea defences. The benefits of the assignment were as follows.
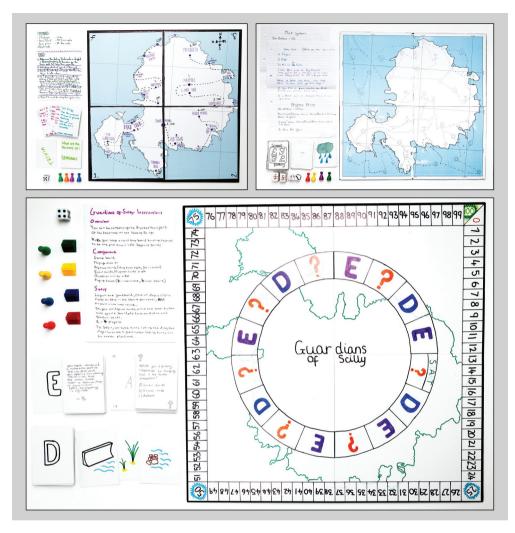
Figure 1. Games created by students during the Isles of Scilly climate emergency field course, clockwise from top left: *Impacts and Mitigations; Project Scilly; Guardians of Scilly*.

Knowledge consolidation

The assignment was effective for consolidating knowledge gained from listening to islanders and making observations, with some students supplementing this with online research. They felt they benefited from "special information from guest [speakers] that we couldn't get online", which they "integrated between work in the day and evenings", "putting the field notebook to good use".

Games included topics ranging from the pressures of tourism, practicalities of building coastal defences in isolated places, local conflicts, climate change, historical sea-level rise, and changing farming practices. Students also incorporated humorous and anecdotal information they heard from islanders, such as "How are cows transported from the mainland onto the Isles of Scilly? a) Snorkelling, b) Airlifted, c) Ferry", which made the games more enjoyable to play. Albeit culturally specific, humour is more likely to result

in information being retained and to improve engagement in learning (Sambrani et al., 2014). The answer is C, by the way.

Active engagement in the learning process

Reflecting on the assignment, students noted that the games task "definitely made the field trip more engaging", and that, "because it was new and different, I had to pay more attention and figure out how we wanted to do it". Another suggested that it "established a competitive vibe, added a bit more fun, and kept us out of the pub".

Playing and commenting on each other's games encouraged reflection, or learning about learning (Kafai & Burke, 2015). In this way, the game creators benefitted from teaching others, while the players benefitted from learning how their peers understood the topic and tackled the task. Reflecting afterwards on how to improve their games, students suggested they would make their games more visually appealing, "polished", and improve the consistency of game card content.

Creativity and innovation

Students enjoyed the creative and novel approach. Contrary to other games creation tasks (Kafai, 2006; Thumlert et al., 2018) this assignment did not require technology, but instead the gathering together around a table to manually make something – a practice that can reduce inhibition and boost creativity (Harrison & Ogden, 2021). One student noted that working together in this way rather than online "allows for more creativity because if it's an idea off the top of my head, I can workshop it immediately [with my colleagues]".

Another noted that, unlike other assignments, the game task did not require information to be referenced, which was "liberating" and contributed to creative flow. The same student also commented that the process provided valuable experience and "improved [their] soft skills", likening the task to a workplace project. Students acknowledged that in this way, the experience would be useful for cover letters and CVs. The game design task can therefore be considered an "authentic assessment", that provided novel learning, freedom to demonstrate competencies, and opportunities for cooperative learning (Fook & Sidu, 2010).

Collaboration and communication

Students commented that playing games on the first evening was a good way to meet each other and socialise, when they would have otherwise "gone to our rooms and watched films". Throughout the task, the hostel's communal space was filled with hubbub, discussion and laughter as students spent evenings working on their games. Some expressed that while they did not usually enjoy group work, they were "surprised by how fun [this assignment] was".

Students noted that the game assessment required a higher level of teamwork than other activities. Comparing it to their other group assignment, whereby students tended to delegate tasks to be worked on individually, students felt that the games task required close collaboration throughout to solve complex problems. They felt that more skills were

needed to make a game (e.g., mechanics, systems, creativity, artistic skills) and therefore a range of people needed to work on the task together.

Finally, students commented that having to create a game for older and younger people added "another layer to communicate to different groups", developing students' ability to simplify complex concepts to be understood by older/younger non-expert audiences.

Discussion

The game creation assignment encouraged climate change knowledge consolidation, critical thinking, and active engagement in the learning process, while fostering creativity, collaboration, and communication. It also offered a welcome respite for students from an ever-increasingly technology-enhanced degree. Digital technologies undoubtedly offer opportunities to boost learning, widen participation, and develop graduates equipped for the modern world (e.g., Barnett, 2014), but they "are not always optimised for effective learning" (Laurillard et al., 2013). Overreliance on digital learning can cause a decline in dialogue skills, refocus efforts on learning how to use the technology, and bring about the "pedagogic solitude" of learners (Demetriadis & Pombortsis, 2007). Tabletop games still offer significant educational impacts, delivered at a lower cost (no licensing fees) and with the use of few resources (Masters, 2024).

There are of course limitations to our approach. A primary consideration is the space and time required for students to effectively collaborate to create a working game within the constraints of a field trip setting. Ours was carried out before holiday season on Scilly, so we could hire the whole hostel with plenty of space for lively collaboration. The cost of materials is also a consideration, which for a group of 12 was around £250 (including example games, game templates, and stationery).

We would caution that field course schedules and content (including example games and kits) inevitably shape game design, and that the first field sessions likely become the focus of the games (in our case, sea defences). On reflection, we would also recommend that teachers more strongly emphasise that students should a) carefully consider the target audience of the game, b) be clear on game goals, c) keep games simple and readable, and d) allow time to iteratively test and adapt the game (Salen & Zimmerman, 2004).

There is also a call for improving literacy on complex systems, necessary to tackle global crises such as climate change (UNESCO, 2017). Game co-design and co-creation can be powerful tools to facilitate this (Morini, 2013). Whilst students reported their need to tackle the complexities of game design and rule mechanics, systems thinking *per se* was not embedded in gameplay. This may be a limitation of trivia-based games (especially as gameplay simplicity was encouraged here), making it harder to incorporate elements such as feedback loops and conflict resolution – hallmarks of climate change processes and governance (Schneider, 2004). Guiding learners to incorporate systems thinking into game design may be necessary to facilitate understanding of complex systems (Morini et al., 2022; Sweeney & Meadows, 2010).

Furthermore, as with any rubric, the GAME ACE framework may provide inspiration but should not restrict the creativity of student nor teacher (Kohn, 2006). And of course, different people find different modes of play more or less

fulfilling (Cutting, 2011; Koster, 2005). "It is not possible to design an ideal game that pleases everyone, because everyone does not enjoy the same thing" (Adams, 2014, p. 16), so developing and evaluating games will be a subjective and thus reflective experience.

At this juncture, we must recognise that learning with games is not for everyone: some people find games patronising or take issue with the idea that learning must be "fun" (Postman, 1987). Indeed, badly designed games can do more harm than good if players are preoccupied with complicated game mechanics rather than subject matter (Clark, 2021). Even good games have their limitations. They are (i) simulations of real life, (ii) shaped by the biases and agendas of the developer, and (iii) simplified to present specific theories or points-of-view (Pedercini, 2017). Player agency is restricted and cannot generally change underlying game mechanics (Bogost, 2010). Thus, while our games were effective in promoting discussion and reflection (arguably first steps towards climate change action) their potential for providing *answers or ideas for action* is more limited (Khaled, 2018). This is not necessarily an issue if the purposes of the assessment are clear.

Importantly, playful methodologies for serious (particularly place-based) issues are not unproblematic. As with social equity contexts reported by Carreiro and Kapitulik (2010, p. 232), participants in such games can be positioned as "looking down" on those less fortunate. As visitors to the islands, we must remember that climate change is not a game to those who live here, nor indeed to communities worldwide where climate change is having devastating impacts. It is essential to handle such assignments sensitively and critically. If done so, we suggest that game design can be a valuable way to learn about and reflect on complex environmental problems. In this way, the approach has potential for other field-based learning activities within geography, environmental and physical sciences.

Acknowledgements

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

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