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ARTICLE

The Heat Is On: A Game to Envision Thriving Futures in a Climate Changed World

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Abstract

Many young people feel distressed about climate change, and pessimistic about what the future holds. Gaps in education about climate change contribute to limited understanding of opportunities for climate mitigation and adaptation, and to a pervasive "discourse of doom." Here we describe a "game for change" co-designed by climate and education researchers and young people, that aims to shift narratives about climate changed futures toward an active, adaptation-oriented focus.

The Heat Is On is designed to be played by high school classes. Set in 2050, the game takes place on a fictional island called "Adaptania." Teams of students play the role of town councillors in communities facing the same challenges that Australian towns are experiencing as the climate heats up, including flooding, heatwaves, bushfires, inequality, health issues and economic challenges. By focussing on decision-making for adaptation and resilience, *The Heat Is On* enables participants to envision climate-changed futures in which communities can thrive. Students learn how to plan and collaborate to prepare for diverse and cascading impacts of climate hazards. We explore the potential for games in climate education, focussing on *The Heat Is On* as a case study, and share initial learnings from its development and implementation in schools.

Keywords: Adaptation; climate change; education; game; play

Introduction

Surveys across Australia and the world provide evidence of the impact of climate change on the wellbeing of children and young people. Children typically feel worried, powerless and frustrated about climate change (Jones & Lucas, 2023). Children who are concerned about climate change have higher psychological distress and more negative future outlook than other children, and this particularly affects those who are female, gender diverse, Indigenous or live in remote areas (Teo *et al.*, 2024). In a global study by Hickman *et al.*, (2021), almost half of the 10,000 children surveyed said that climate change negatively affects their daily life and functioning. Concern about climate change is rational — under current climate action pledges, those born in the year 2020 can expect to experience up to seven times more extreme events than people born in 1960 will experience in their lifetimes (Thiery *et al.*, 2021). However, some researchers have identified a

"discourse of doom" in which young people imagine apocalyptic, dystopian futures as the likely outcome within their lifetimes (Lucas *et al*., 2024; Tucci *et al*., 2007; Zummo, 2024). Dystopian climate fictions may contribute to this discourse (Schneider-Mayerson, 2018). Yet climate change education is partial at best within school curricula, and climate adaptation rarely touched upon in any detail. Where climate change is taught, many teachers feel unprepared for the strength of emotional response that the subject can evoke (Beasy *et al*., 2023). This can lead to young people leaving school feeling disempowered by their experience of learning about climate change (Jones & Davison, 2020).

Curious Climate Schools is a programme designed by climate communication, education and science researchers at the University of Tasmania (including several of the authors) that aims to help students learn about climate change in ways that empower and inspire them (Kelly *et al*., 2023). Research based on questions submitted by 1500 primary and high school students aged 7–18 from 51 classes across the state of Tasmania, Australia in 2021–22 revealed a concerning level of uncertainty, anxiety and pessimism about their futures in a climate-changed world (Lucas *et al*., 2024). This led us to consider how we might be able to support an educational experience for students that offers some hope and reassurance about young people's futures, while set in a realistic climate scenario. We wanted to focus on how communities might adapt to changing climate impacts to allow them to be more resilient, while reflecting the values of care, equality and justice. We imagined an immersive game-world in which, despite a threatening global scenario, local communities were motivated to work together to make changes that would enable them to thrive. Finally, we wanted to teach students about real, tried and tested actions that can already be applied today to help communities adapt to climate change and build resilience.

Various overlapping terms are used to describe ludic activities designed for more-than-fun. "Serious games," "persuasive games," "games for change" and "deliberative play" describe structured play activities that aim to educate, inform, and potentially to influence behaviour or contribute to the resolution of broader social issues outside of the game itself (Glas *et al*., 2019). Fundamentally, these approaches offer ways to engage young (and older) people in learning and exploring new ideas, as playful, active agents, rather than as passive vessels for information. Games for change and the like are entertaining, interactive, and importantly *real world*, in that they open doors to considering social and environmental justice and affecting social and environmental change (Swain, 2007).

These types of games are increasingly being used in teaching because they appeal to a wide range of learners. Games engage experiential learning, or "learning through doing" (Kolb *et al*., 2001). Experiential learning is based on creating scenarios and tools for problem-solving, offering students feedback on their progress toward goals, and lowering the cost of failure to encourage them to explore, take risks and find their own solutions (Gee, 2013). Games can have rich, story-driven and visually immersive experiences to engage players in imagining and enacting different roles.

Few, if any, climate change games emphasising community climate adaptation and resilience have been designed for education in schools. *The Heat Is On* contributes to an urgent need for education to develop adaptive capacity and resilience in high school students. This paper explores the design and development process of *The Heat Is On* as an example of practice-as-research. It describes how the narrative and visual elements of this climate fiction were iteratively co-designed with young people to create a vision for a climate changed future in which communities can adapt and thrive.

The following section briefly describes the theoretical background for game-based learning methods in climate change education, and the benefits of co-design. We then summarise the game world, narrative, physical and digital elements of *The Heat Is On*, before describing the design and development process. In the Discussion, we explore lessons learned, limitations and future research needs. Finally we suggest implications of this project for climate change educators, and further opportunities for game-based learning in climate change education.

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Game-based learning & climate education

Games and play-based activities are increasingly being recognised as effective tools for education, both within schools and in broader society (de Freitas, 2018). The mechanisms for learning through games and play have been examined by a range of disciplines including psychology, neuroscience and sociology. Several theories of play-based learning are of relevance to games that deal with complex and difficult real-world challenges such as climate change. Psychoanalytic theories of play describe the importance of games as activities through which the anxiety of stressful situations can be explored, and a sense of control gained (Freud, 1968). This is in part because games allow players to express and process negative emotions that are frowned upon in "real" social situations (Verenkina *et al.*, 2003). Because games are associated with fun, and are unlike traditional classroom ways of learning, players may also gain skills and knowledge without feeling that they are being explicitly taught (Jackson, 2009). Cognitive theories suggest that play both consolidates prior learning and creates fertile ground for new learning, and learning through doing (Lillard, 2015). Socio-cultural theories of play offer that games can enable children to act out and explore adult roles, and understand rules and systems (Vygotsky, 1977). They may also be effective in helping players understand the limitations of these systems, and the difficulties inherent in adult roles involving decision-making where there is conflict of values and interests. Recent research suggests that games may be useful in developing "futures literacy": a critical awareness of different attitudes toward the future, how it affects the present, how to study and measure it, and how to create pathways for action (Mangnus *et al.*, 2021; Vervoort *et al.*, 2022).

The Heat Is On can be considered a "game for change" in that it is designed to help players engage with current social and environmental issues and address real-world challenges (Op de Beke *et al.*, 2024). It joins a growing number of games designed to address issues relating to climate change (Flood *et al.*, 2018; Galeote *et al.*, 2021). These games come in a variety of formats: video games, board games, card games, mobile games, role playing games, virtual reality and hybrid games. They contain different game elements, including *achievement-oriented elements* such as points, goals and levels; *social elements* such as teams, collaboration, competition, and collective voting; and *immersion-oriented elements* such as visual game-worlds, role play, narrative, and avatars (Galeote *et al.*, 2021).

Many climate change games include simulations of place – creating imaginary worlds in which players are free to make decisions, within a rules-driven framework. The rules that govern choice and change within these worlds are one of the main mechanisms through which game designers influence learning outcomes for players. They may aim for economic realism, for example, or to model a world in which altruism and empathy are given high value. Climate simulation games often tend toward technocratic solutions to climate change, enabling players to "win" through managing resources effectively within existing economic paradigms (Op de Beke *et al.*, 2024). Critiques of such approaches suggest that they could lead to the acceptance of existing systems as part of a natural order and existing crises as inevitable (Hoofd, 2019). In one simulation game trope, players take on the role of grand strategist or master builder, and are given god-like powers – such games are unlikely to offer learnings about how to take climate action within a system that you cannot control and can rarely influence (Kunzelman, 2020). However, simulation games can also position players as resilient citizens who can collaborate to create change, and implement rules which model a politics of care. In this way, games can offer both hope and resilience, opening doors to the understanding of existing systems, and the possibility of change.

Immersion in game worlds is theorised as narrative transportation (Green & Brock, 2000), through which players become absorbed in the story of the game, feeling as though they are having a "real" experience. This, it is argued, creates strong emotions and feelings of connection with characters, and may thus have an enhanced influence on players' beliefs (Green & Brock, 2000; Naul & Lui, 2020). Offering players control of aspects of the narrative may further enhance their feelings of agency and freedom (Mateas & Stern, 2005). Examples of educational games that have

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been used to study the effect of narrative transportation include Crystal Island, a 3D narrative inquiry game learning application designed to teach young high school students about microbiology (Rowe *et al*., 2011), and Minions of Disruptions™, a collaborative tabletop game developed by Dutch non-profit organisation Day of Adaptation, which aims to engage diverse organisations and communities in collective climate adaptation (Sillanpää *et al*., 2024). Rowe *et al*., (2011) found that students who were more engaged with narrative environment experienced greater learning gains and increased problem solving, regardless of prior knowledge. Sillanpaa *et al*., (2024) found that playing collaboratively increased feelings of belonging and social learning among participants, based on their shared participation in developing the narrative.

Co-design in educational games

Co-design is a critical approach in educational game development that integrates the creativity and expertise of diverse stakeholders, particularly young people, throughout the design process (Sanders & Stappers, 2008). Co-design aligns with participatory design principles, ensuring that games reflect the needs and perspectives of their intended audience. This is particularly significant in climate adaptation education, where engaging young people in game design can foster agency and deeper understanding of complex environmental issues. Many approaches to co-design exist, and in Australia, it is often framed as a key strategy for innovation and inclusivity in educational settings (Shay & Sarra, 2023). Understanding popular approaches to co-design is useful for informing educational game development.

Informant design provides a structured approach for involving young people at key moments to maximise the value of their contributions (Scaife *et al*., 1997). This framework has been successfully used in serious game design to enhance advertising literacy among adolescents (De Jans *et al*., 2017). Authors note the primary advantage of this framework is that stakeholders, including young people, contribute based on their expertise at different stages of the design process. As a result, young people were able to assume dynamic roles, influencing narrative structures, game mechanics, and learning outcomes in ways that reflected their lived experiences.

Alternative approaches, such as narrative co-design, position young people as central storytellers rather than passive recipients of pre-existing narratives. Uğraş *et al*. (2022) describe a process in which children generate the themes and narratives of educational games from the ground up, rather than being constrained by predefined content. This method enhances engagement by ensuring the game aligns with the ways young people conceptualise and relate to key issues.

Cooperative Inquiry further extends participatory design by positioning young people as co-researchers (Druin, 1999). Cooperative Inquiry brings together intergenerational teams — including young people, educators, and developers — who collaboratively shape the design process. This approach acknowledges that young people hold unique expertise in their own experiences and provides structured opportunities for them to contribute as users, testers, informants, and full design partners (Druin, 2002). In this application of co-design, power dynamics between adults and young people need to be managed to ensure equal contribution and respect. Measures such as informal language, shared physical spaces, and casual dress help to create a more equitable environment (Fails *et al*., 2013).

An example of successful co-design in climate education is Climania: The Climate Action Game, which was developed as a participatory tool to engage young people in discussions about the built environment and climate action (Shtebunaev & Carter, 2022). This game was co-created with 14- to 18-year-olds in response to COP26, using a series of nine workshops where participants shaped the game's rules, mechanics, and objectives. The young co-researchers worked alongside university lecturers, artists, and industry professionals, developing skills in teamwork, academic research, and arts-led methods. Direct engagement in game creation enabled young

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Figure 1. Map of Adaptania by Rosie Murrell. Note that while teams' towns are initially referred to by number, this changes when they choose a name by picking two parts of a town name sign.

people to contribute meaningfully to climate discussions and develop a sense of ownership over the final product.

Co-design methodologies provide valuable frameworks for engaging young people in educational game development. Working with established co-design methodologies supports the development of climate adaptation games that are both pedagogically sound and relevant to the lived experiences of young players, ultimately enhancing their impact as educational tools.

The Heat Is On game world & narrative

The Heat Is On is a hybrid game that is facilitated by a trained Narrator in a classroom environment, and is played by 5 teams. It involves physical elements (cards, maps, counters, and a spin wheel) and a digital dashboard managed through a web app, through which the Narrator inputs game decisions and events, and players can see their scores. Narration is supported by a script with prompts and text to read at specific moments in the game.

We start with a Time Machine. When the Narrator presses the button, players are transported fast forward in time to 2050. "How old will you be in 2050?" they ask. "What kind of job might you be doing? Are you ready? Let's go!" In the Global Scenario of the game, they explain that "because of human activity, the world has heated up a lot. It's 2050, and global average temperature has risen by more than two degrees Celsius (2°C) above that of 1900. This makes extreme weather events more frequent and severe."

The Heat Is On is set in Adaptania — a fictional island grounded in real-world climate challenges (Figure 1). Adaptania is in a temperate zone, so it's generally not too hot or too cold. It has mountains, bushland, rivers and farm land. Adaptania has a long indigenous history, but its current population includes people from all over the world. Their fairly small population is spread across six towns. Because of its location, landscape, and relatively wealthy population, Adaptania has been less affected by some of the climate impacts that have occurred across the world. However, it still faces significant risks from hazards including bushfire, flood, storm surge,

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Figure 2. Game pieces for Town 3, including adaptation cards, map, and effort point tokens. Design by Rosie Murrell.

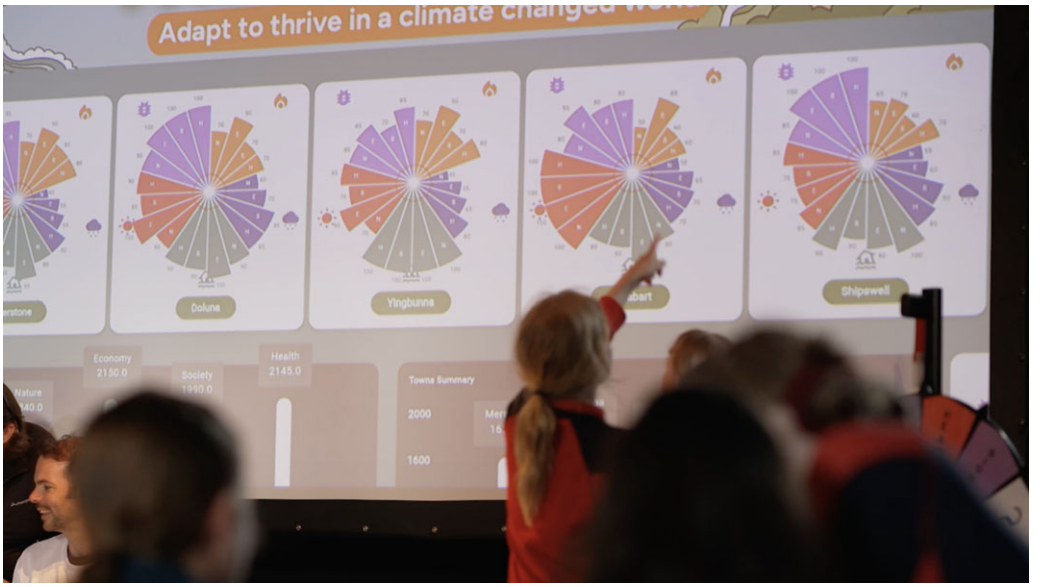

Figure 3. A young player pointing to their town's Nature, Economy, Society and/or Health resilience for flood on the digital dashboard. Players are encouraged to interact with the dashboard to help them make informed choices for adaptation. Photo: Brad Harris.

heatwaves and biohazards in the form of pests and disease. All the towns are at risk from all of these climate hazards, but because of the island's geography, each town has different vulnerabilities.

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Figure 4. A young player spinning the Climate Hazard Wheel. Photo: Brad Harris.

As Adaptanians, players work together in teams that represent five of Adaptania's six towns, to take adaptive actions to respond to climate hazards, and to make Adaptania a fair and sustainable society. They play the role of town councillors, and are encouraged to develop and share their own stories about their town's population, residents' interests, jobs and values. Creativity is encouraged, and anecdotes about each town dreamed up by players at the start of the game are revisited by the Narrator when they reflect on the towns' decisions and resilience at later stages of the game. Each game round is a year, and the game runs over three or four years (the number of rounds depending on the length of time available). Each year, teams can choose to spend their budget of "effort points" on a range of different adaptive actions, represented in the game as "Adaptation Cards" (Figure 2). These are real solutions to climate change problems, that are relevant and applicable to current climate impacts. Each Adaptation Card lasts for one, two or three years, and protects the town from one or more climate hazard by building the resilience of its Nature, Economy, Society and/or Health (NESH).

A digital dashboard of each town's changing NESH resilience is displayed as a radar plot (via a web app) on a screen so that players can see how their choices affect their resilience in each round (Figure 3). The Narrator inputs these choices as they are made, using the app. The NESH resilience radar plot is made up of segments that show the current level of resilience of each town's Nature, Economy, Society and Health as they relate to different climate vulnerabilities. Each year (or round), a physical "Climate hazards wheel" is spun by a student, to randomly determine what extreme events might befall Adaptania (Figure 4). There are six options: bushfire, flood, storm surge, heatwave, biohazard, and ? – the last being a wildcard option that (at the Narrator's discretion) could be a policy change, a windfall, a back-to-back disaster, or a gift from each town to another town in Adaptania. Once the event has occurred, the Narrator reads out a description of what happened, and the impact of the event on towns' resilience is revealed on the digital dashboard, and discussed.

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Example of a narrated bushfire event

> During a day of Catastrophic fire danger, Joe, an Adaptanian gardener, not realising the risk, decided to do some whipper-snippering in his yard, and accidentally started a bushfire. Smoke spread rapidly across the island, and emergency services struggled to get the growing fire under control. All towns were affected, particularly Town 1, because it is so close to the forest. Towns that put effort into bushfire adaptation were more resilient. For example, in towns that had reduced fuel using fire breaks and controlled burns earlier in the year, the fire did not reach the tree canopy, and was brought under control earlier.

At the end of the game, the Narrator wraps up by pointing to the overall resilience teams have achieved, in contrast to the control town, that did not implement any adaptations. Collaboration and approaches that balanced care for Nature, Economy, Society and Health are applauded as ways to help build resilience. As students return to the present day, they are asked "What did you learn that you can bring back to how we live now?"

Design & development of *The Heat Is On*

Co-design process

We used a three-stage approach to design the game, building in student feedback and iteration. Stage One involved a series of six workshops conducted by a diverse intergenerational team to develop an initial prototype game. Our Stage One project team was drawn from a diversity of disciplinary backgrounds, including science communicators, climate and spatial scientists, and social scientists. We also represent a diversity of generations, with ages from 19–49, and career stages including undergraduate, postgraduate, early and mid-career researchers. The design scope was for a game that could actively engage up to 30 players in a classroom setting, could be quickly learnt and easily understandable to children from 11 years old and up, could offer experiential learning about how to collectively adapt to climate impacts, and would move beyond dystopian future narratives.

Stage Two used informant co-design to test and develop the prototype with students and teachers at two STEM events for high school students in 2023, using this feedback to develop a more polished and user-friendly version of the game with the assistance of young creatives. We engaged a young illustrator, Rosie Murrell, to update the design from an initial prototype based on photographs and text put together by the design team. She created a warm and colourful palette, and a cheerful design style that aimed to help students envision a bright and regenerative future. She also introduced design elements to help players visualise the NESH resilience scores, time period and effort cost of each adaptive action. Web app developer Jieming Hu created a digital dashboard to enable easier game scoring.

Stage Three involved rolling out the updated game to 14 school and youth groups across Hobart, Tasmania in 2024, and gathering further informant feedback and suggestions from players. Altogether 286 players including around 200 school students aged 11–18 were involved in this process. Their verbal and written feedback, together with observation of gameplay, has enabled us to make a number of changes and improvements to the game.

Game design decisions, mechanics & learning objectives

The Heat Is On is a hybrid game in that it involves elements of tabletop role play and has a digital interface through which teams' progress can be monitored. It is also interdisciplinary, in that it includes scientific, technological, social, political and geographical concepts and actions in a creative storytelling process. The climate and environmental hazards of Adaptania reflect real-

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world projections for Tasmania under all climate change scenarios discussed by the IPCC (2023). Rising temperatures and declining rainfall are increasing bushfire risks (Dowdy *et al.*, 2019). More intense rainfall is raising the likelihood of both flash and riverine flooding, while rising sea levels and stronger storms worsen coastal erosion and storm surges (Grose *et al.*, 2020). Heatwaves are becoming more frequent, impacting agriculture and public health and climate change also shifts species distributions and spreads invasive pathogens, affecting ecosystem resilience (McLaughlin *et al.*, 2017). This makes the challenges faced by Adaptanians in 2050 highly plausible.

We debated how hot to make our 2050 world in some depth. We were aiming for realism, because we want to help prepare students for the kind of reality they are likely to be facing in their adult lives. But climate projections for 2050 range from 1.1–2.9°C above pre-industrial levels based on IPCC low or high emissions scenarios (KNMI, 2020). We initially (in 2023) decided on 1.5°C of warming, the IPCC's threshold for dangerous climate change, reasoning that we should avoid scaring students by describing a dangerous scenario that might not take place. But the following year (2024), global average temperatures rose to 1.6°C above pre-industrial levels (World Meteorological Organization, 2025), and we decided that our initial scenario was too optimistic.

Adaptania is, of course, modelled on places we know and love, and it is not entirely by chance that it somewhat resembles the island of Tasmania. This decision was made to help young Tasmanian players connect the imagined world to their own lived experience, while learning about climate impacts facing temperate regions, and the diversity of vulnerabilities dependent on both the geography and socio-ecology of their settlements. The NESH resilience was designed to integrate four key domains significantly affected by climate hazards: Nature, Economy, Society and Health. These domains reflect critical areas of vulnerability and resilience for communities and provide students with insights into the multifaceted effects of different hazard events. We chose radar plots to visualise the NESH index. Radar plots are a space-efficient method to effectively visualise multivariate data, allowing NESH values for each hazard to be represented simultaneously. By highlighting key changes, radar plots enable students to quickly intuit areas of low resilience, and identify how adaptation strategies implemented within each town are able to improve their resilience, supporting informed decision-making within the game.

We incorporated a limited budget of "effort points" as the means to obtain adaptations to promote strategic deliberation and collaborative discussion among players. That these are not directly equated to money, but effort, reflects the value of many different forms of support for adaptation, including financial, political, and physical support. Each adaptation strategy available within the game is assigned an effort cost of either 10, 15, 20 or 30 points, representative of real-life implications. Each adaptation has different benefits across different aspects of the NESH index, compelling teams to critically evaluate which strategies might yield the greatest benefits given their town's specific vulnerabilities. This design encourages students to thoughtfully allocate limited resources, focusing on both the longevity of each adaptation and targeted action, simulating realistic constraints faced by policymakers in hazard management scenarios. Students must weigh short-term, lower-cost adaptations against more costly, long-term adaptation strategies. For example, to adapt to storm surge, they can implement a one-year strategy of building seafront defences including walls, jetties and groins, or a two-year strategy of regenerating mangroves or saltmarshes to act as natural barriers, or a three-year strategy of changing planning laws and incentivising residents to build houses on stilts and reduce erosion through tree planting. Effort points thus serve as an educational tool to foster communication, collaboration and critical evaluation among students, particularly in engaging with peers regarding the most effective climate adaptation actions for their scenario.

The web-based platform for *The Heat Is On* was developed in Stage Two to replace an initial Excel prototype that used pie charts, bar charts, and VBA scripts for data manipulation. The web-based platform significantly enhances this foundation, with better scalability, user experience, and visual design. Now built on Google Cloud storage infrastructure, the platform enables potential advanced data analytics capabilities that weren't feasible in the spreadsheet version. The digital

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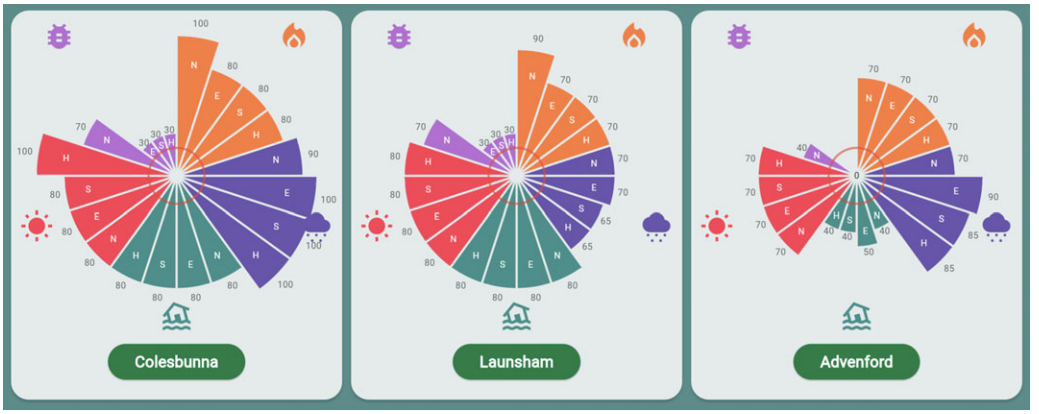

Figure 5. Nature, Economy, Society and/or Health (NESH) resilience scores for three towns as displayed on the dashboard, just after two back-to-back biohazard events (biohazard is the pale purple sector with a bug icon). You can see that Colesbunna has a broad NESH resilience circle, meaning that they have adapted well to climate hazards, while Advenford remains very vulnerable to both storm surge and biohazards, and is in the "danger-zone" represented by the red circle, where any future events will have cascading impacts on their economy, society and health across all hazard-types.

dashboard has four components. The first component consists of a graphic header and footer. The second component showcases the towns' radar charts (Figure 5), including a control town called "Bludgeton." Different colours and icons are used to denote the NESH resilience of different hazards. Coloured sets matching the Adaptation card colours are referred to as "hazard categories," and Nature, Economy, Society and Health (NESH) as "aspects" of resilience. Each individual N, E, S or H of any hazard category as a "segment." Resilience is measured as a percentage. A red circle at 20% resilience marks a "danger zone" of critical vulnerability that requires immediate action to avoid cascading impacts. If any segment falls within this danger zone, then all other segments for that aspect of resilience will receive a 10% penalty next time a climate hazard occurs. The third component consist of two bar charts. The left panel displays cumulative resilience scores for Nature, Economy, Society and Health across all five towns. This helps the Narrator to explain how well Adaptania is faring as a whole. The adjacent panel shows a comparative analysis of each individual town, represented through coloured segments standing for each of the NESH factors. The fourth component is a log that shows what has happened in each round of the game. The Admin side of the portal allows game facilitators to quickly input teams' decisions using dropdown buttons, and to apply climate events as they are decided by the Climate Hazards wheel. Future iterations of the web portal will include animations and video elements to create a more immersive simulation experience. This will help to make the role of the Narrator simpler, and potentially to enable teachers to take on this role themselves.

Iterative changes based on student ideas

Student feedback led to many improvements to the game. Two common requests were to have more years to play and to have more effort points to spend. This is a positive indication of the levels of enjoyment and engagement that we saw in the classroom, with students becoming very invested in building the NESH resilience of their town. While the number of rounds we can include is limited by the time available, we have enabled flexibility so that the number of rounds can be increased if we have more time. It is also interesting to note that students wanted more effort tokens rather than fewer extreme events, pointing to the shift in mindset towards focusing on active adaptation decision-making that is encouraged through the game design. In response to these requests, the game was adjusted so that if a town achieves a resilience score of 100% for any NESH segment, that town receives 5 effort points back. This was incorporated into the game

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narrative by explaining how strong resilience in one area has flow on effects to other areas, effectively mirroring the "cascading impacts" of having critically low resilience.

Informal feedback from watching how students responded to various elements was also used to improve the game design. During one game with not enough players for each town, a town was left out of the game. This effectively provided a control for everyone to see the impact of the adaptations they were applying, and groups were excited to see how much better their NESH resilience was after each event compared to this town. This led to the permanent inclusion of "Bludgeton" in the game, which enabled a new narrative about a town with an ineffective council and no community engagement.

While every experience of the game is unique due to the role-playing and random aspects of the game design, we consistently find that the positive energy in the classroom (smiles, laughter) grows throughout the game. Some students get very interested in the role-playing elements of the game, sharing creative ideas about their town. Examples include towns made up entirely of retired people, or one particularly interesting town that the students decided was famous for its pet frogs. These creative narrative decisions often led students to choose particular adaptations for their town to fit their narrative (such as a network of protected wetlands for the frogs), with some groups of students connecting much more strongly to the story than to the numbers shown on the cards. The town identity is also built through picking a town name, which is an easy and fun element that helps groups become comfortable with role playing. A thriving future must include creativity and fun, and this comes out in the stories that are encouraged by the Narrator through careful listening to initial creative ideas and referral to these elements as the game goes on, enabling students to own and develop their own town identities and stories of place.

Discussion

A key strength of *The Heat Is On* is its ability to move beyond the typical "doom and gloom" narratives that often dominate climate change discussions, instead emphasising how communities can mitigate and adapt in a changing climate. *The Heat Is On* responds to global recognition of the psychological impact of climate change on children and young people (Hickman *et al.*, 2021; Jones & Lucas, 2023; Teo *et al.*, 2024) by disrupting a "discourse of doom" (Lucas *et al.*, 2024; Tucci *et al.*, 2007; Zummo, 2024) and immersing young people as players in collaborative decision-making to support community resilience. The game fosters adaptive thinking, demonstrating to young people how it is possible to influence change, rather than being passive recipients of distressing information (see Figure 6). This strengths-based approach is particularly important in the context of climate change education, where many teachers feel underprepared to manage the strong emotional responses the topic can evoke (Beasy *et al.*, 2023).

Despite the fact that effective adaptation requires collaboration to manage shared problems and negotiate trade-offs, most climate games are designed to be played by individuals, and few explore community-level adaptation (Sillanpää *et al.*, 2024). *The Heat Is On* is unusual in being a collaborative tabletop/digital hybrid game played by a whole class. This point of difference has proved very effective in enabling students to role-play the kind of group decision-making processes that are increasingly important to promote resilience to climate hazards.

The decision to make Adaptania resemble Tasmania, where our engagement takes place, was made in order to help players draw parallels between their world and the game world. However, the differences to Tasmania are as important as the similarities, in that they give license to invent and play with new and creative ways of imagining familiar settings. Ideas to transform aspects of the environment, population and political system are encouraged through the game narrative. For example, whether Adaptania conforms to existing governmental and economic systems, or represents a transformation of these, is not defined within the basic game narrative.

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Figure 6. *The Heat Is On* introductory video. Filmed by Brad Harris, with illustrations by Rosie Murrell. Produced by Chloe Lucas https://youtu.be/28WHq4apeLE?feature=shared.

Adaptanians do not live in an explicitly capitalist system, as is evidenced in our scoring system based on "effort" rather than money. However, we recognise that the assumptions that come of living in a capitalist society are hard to shake, and students often interpret this as an economic framework. Whether councils are making top-down decisions is also unspecified, and given all the actual residents of the game are represented on councils, this could equally be bottom-up. There is an opportunity to critique existing systems through the narrative developed between players and Narrator in the telling of the game, and a skilled narrator can draw on aspects of narrative introduced by players to coalesce many different game worlds. In a recent example, residents of the capital city decided to implement a communal urban farming initiative, while seeing off the biohazard threat of Godzilla. The opportunity to reflect on, and question existing systems is something we aim to develop further in the future.

Lessons learned from the co-design process

The co-design of *The Heat Is On* integrated multiple models to align with the game's intended purpose. The initial design was undertaken by a diverse intergenerational team, who collaboratively shaped the game's foundational mechanics, narrative, and learning goals, ensuring that the design was both scientifically robust and engaging. Later, children were involved in an informant co-design process, where they contributed to iterative refinements, such as game balance adjustments and visual enhancements. This approach highlights how co-design can operate at different levels within a single project, with expert-led development establishing core mechanics and student-led contributions refining usability and engagement. Further, the game itself enacts a form of narrative co-design, as students work together to create their town's own unique narrative, with their creative roleplay influencing decisions that directly shape their gameplay experience. In this way, *The Heat Is On* seeks to provide a psychologically safe space for students to engage with climate adaptation while developing their decision-making capacities in scaffolded, student-led ways (Brown *et al.*, 2023).

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The involvement of children in the design of *The Heat Is On* aligns with existing research that emphasises the importance of participatory approaches in educational game development. Approaches such as informant design (Scaife *et al.*, 1997), narrative co-design (Uğraş *et al.*, 2022), and cooperative inquiry (Druin, 1999) highlight different ways young people can contribute to game-based learning. In this case, elements of informant design were intentionally used, with children contributing at key stages of development to maximise the relevance and impact of the game. This approach provided several benefits. First, it ensured that the game reflected children's lived and place-based experiences, making it more relatable and engaging. Prior studies have shown that when young people contribute to game narratives and mechanics, they are more likely to see themselves reflected in the content, which enhances motivation and learning outcomes (De Jans *et al.*, 2017). Second, participation in the design process strengthened children's sense of agency, aligning with research that highlights co-design as a means of fostering empowerment in climate education. Finally, interdisciplinary collaboration between children, educators, and researchers enriched the learning experience, reinforcing findings that intergenerational and cross-disciplinary teams lead to more innovative and impactful educational tools (Fails *et al.*, 2013).

Limitations & future directions

Despite these benefits, the co-design process in this study also revealed limitations. While young people played an important role in shaping aspects of the game, their involvement was primarily structured around an informant design model rather than the more immersive approaches seen in cooperative inquiry or narrative co-design. Research has shown that deeper engagement — such as positioning young people as co-researchers or primary storytellers — can lead to more transformative learning experiences (Druin, 2002; Uğraş *et al.*, 2022). However, constraints related to time, resources, and institutional structures meant that young participants were involved at key moments rather than throughout the entire design process.

We also recognise that creative processes are key to thriving, now and into the future. Our game design team did not include any academics from the Arts, and future iterations might look to further explore creativity as an element of adaptation.

Current work is underway to evaluate the game's effectiveness in supporting young people's adaptive capacity, addressing climate anxiety, and identifying where climate change may be negatively impacting mental health. While initial findings suggest promising outcomes, research to understand the short, medium and long-term impact are necessary to determine the games potential as an educational tool that supports developing adaptive capacity for a climate changed future.

Conclusion

The value of co-designed games in shifting climate discourse cannot be overstated. They provide an opportunity to transform passive learning into interactive experiences where students are not merely recipients of information but also contributors to shaping the narrative. By framing climate change not as an insurmountable problem, but as a challenge to which communities can consciously adapt, while retaining their values and protecting what is important to them, the game equips students to better manage their anxieties and develop a sense of control and empowerment. This shift in climate discourse is crucial, as research highlights the negative impacts on well-being of "doom and gloom" narratives (Jones & Lucas, 2023; Teo *et al.*, 2024).

For educators and policymakers, integrating interactive games like *The Heat Is On* into climate education can empower students with the skills to make informed decisions and adopt an action-focused mindset. *The Heat Is On* also highlights how school-community partnerships can support

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teachers in delivering engaging and impactful learning experiences. The involvement of the *Curious Climate Schools* team demonstrates how external expertise can complement classroom teaching, reducing the burden on educators while enriching student learning. As the education landscape continues to change and the need for innovative approaches grows, fostering stronger collaborations like this will be essential. Expanding these partnerships will ensure that young people — the ultimate beneficiaries of *The Heat Is On* — gain the knowledge and agency to navigate a changing world.

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