Challenging a Mission Em-Possible: A Study in Gamification of Climate Action at UBC

Team: Mission Em-Possible

Prepared by: Chanreet Bassi, Emma Furland, Elena Mathew, Tia Gschwind, Roshen Basi, and Milana Grozic

Prepared for: UBC Campus and Community Planning

The University of British Columbia

Course: PSYC 421 001

Instructor: Dr. Jiaying Zhao

April 8, 2025

Disclaimer: UBC SEEDS Sustainability Program provides students with the opportunity to share the findings of their studies, as well as their opinions, conclusions and recommendations with the UBC community. The reader should bear in mind that this is a student research project and is not an official document of UBC. Furthermore, readers should bear in mind that these reports may not reflect the current status of activities at UBC. We urge you to contact the research persons mentioned in a report or the SEEDS Sustainability Program representative about the current status of the subject matter of a report.

Executive Summary

Introduction

Despite increased awareness and knowledge of climate change, individuals likely lack motivation to pursue climate action. Gamification may be an effective tool to address this.

Research Question

How does gamifying climate-friendly actions affect the likelihood of engaging in sustainable behaviors and affect support for UBC's Climate Action Plan (CAP)?

Methods

An online Qualtrics survey assessed UBC students' baseline support for CAP. After random assignment, participants in the experimental group played a three-day climate action game, while the control group received a simplified version of CAP. A post-test measured how each method of interaction with climate action influenced participants' likelihood of engaging in sustainable behaviours and supporting CAP.

Results

Our analysis found no significant differences in participants' likelihood of engaging in sustainable behaviours or CAP support between conditions. However, both conditions showed a significant increase in CAP awareness, and an exploratory analysis found a significant positive correlation between game points earned and participants' intention to engage in future sustainable behaviours.

Recommendations

Our intervention had several limitations. A future iteration could incorporate stronger incentives, shorten the duration, and use a different platform to enhance engagement. However, gamification still shows promise for facilitating two-way communication between SEEDS and the UBC community.

Contents

Introduction

Climate change mitigation involves the reduction of anthropogenic emissions to limit rising global temperatures.[1] Individual behavioral changes play a significant role in mitigation strategies[1]. There are indications that households are responsible for 72 percent of global greenhouse gas (GHG) emissions, particularly households in high-income countries such as Canada.[2] Individual action towards climate mitigation remains a challenge despite increased knowledge and awareness about the causes and risks of climate change.[1]

Barriers to Climate Change Action

A psychological barrier to climate change action is the tendency for individuals to think in the short term and have difficulty imagining the benefits of long-term solutions.[3] Even when the individual supports climate change action, short-term personal and social issues are often prioritized over environmental concerns.[3]

Climate-Friendly Behaviors

In this study, climate-friendly behaviors are defined as: simple individual actions contributing to overarching sustainable goals. One example within the current study is "Feng Shui Your Fridge," where individuals organize the products in their fridge in a structure that reduces the likelihood of food waste. This practice is based on research from the *Happy Climate Approach*, which introduces methods for motivating individuals to engage in climate action.[4] See Appendix A for additional examples.

Gamification as a Tool for Sustainable Behavior Change

Gamification integrates game-design elements into non-game contexts to enhance engagement and motivation.[5,6] It promotes behavior change by reinforcing small adjustments in daily routines, making them more likely to become habitual.[7] Elements like point systems, feedback mechanisms, social connectedness, and challenge-based components such as points, levels, and clear goals have been shown to significantly boost motivation to adopt new behaviours.[8-11] Research focused on sustainability has found that gamification is effective at motivating individuals to engage in sustainable actions.[12] Additionally, showing participants the positive environmental outcomes of a given behaviour allows them to feel an increased sense of achievement, which can lead to them engaging in more eco-friendly choices.[12] This is especially effective in game-based contexts and helped inform our hypothesis.[12]

UBC Climate Action Plan

The University of British Columbia's Climate Action Plan 2030 (CAP) aims for the university to reach net–zero emissions for buildings and energy supply by 2030, as well as significantly reduce greenhouse gas (GHG) emissions over the next 15 years.[13] CAP has also set a 2035 target of achieving a 100% reduction in operational GHG emissions.

Current Study

Our study contributes to the growing body of literature on the effectiveness of gamification in promoting sustainable behavior change, through the creation, distribution, and analysis of a novel climate action game. The intervention was targeted toward The University of British Columbia (UBC) community and strived to enact engagement with sustainable

behaviours while also increasing awareness and support of CAP.

Research Question

How does gamifying climate-friendly actions affect the likelihood of engaging in sustainable behaviors and support for UBC's Climate Action Plan?

Hypothesis

We hypothesize that (1) Mission Em-Possible game (MEPG) participants will select more climate-friendly behaviors than non-game (NG) participants, and (2) MEPG participants will show greater support for CAP compared to NG participants.

Methods

Participants

A priori power analysis indicated that, assuming a minimum effect size of 0.2, $\alpha = .05$, and power = .8, a minimum of 310 participants per condition (620 total) were required to achieve sufficient statistical power. Eligibility criteria required participants to be affiliated with UBC and have a valid UBC ID number. We initially recruited a convenience sample of 85 participants (n = 40, control; n = 45, game), but due to a low post-survey response rate, only 50 participants completed all components of our survey. See Appendix B for a detailed breakdown of attrition at various points during our intervention. Of the 50 participants who were included in our analyses (n = 30, control; n = 20, game), all were undergraduate students aged 17-25. 80% of participants were female, 8% male, 10% non-binary, and 2% other. 12% of participants were in their first-year, 16% second-year, 28% third-year, 32% fourth-year, and 12% fifth-year or higher. See Appendix C for complete demographic information.

Conditions

Our independent variable was participants' method of interaction with climate action, which we operationalized using two conditions: MEPG and NG. Participants were randomly assigned to one of two conditions via Qualtrics.

Participants in the experimental condition were enrolled in a 3-day climate action game that was hosted via Canvas. MEPG participants were instructed to complete up to 15 climate-friendly actions (e.g., go on a walk in nature). Participants were provided information on each action's environmental impact. Each task was assigned a subjective point value based on action difficulty and/or time commitment. To earn points, participants were required to submit a verification for each task (e.g., take a photo of your walk in nature). After completion of the task, participants received optional resources and positive reinforcement to encourage continued sustainable behaviours. See Appendix A for complete information on the in-game tasks and associated messaging. For further details on the game layout, refer to Appendix D.

Participants in the control condition were provided with a simplified version of UBC's Climate Action Plan and asked to review it.[13]

Measures

Our first dependent variable, 'Future Action Intent', was operationalized as the number of actions participants intended to take over the next year. To measure Future Action Intent,

participants were presented with a list of the 15 game tasks and asked: “Over the next year, which of the following actions do you see yourself doing at least once? Select all that apply.” The options provided on the survey reflected the tasks participants were requested to perform if they were in the game condition (see Appendix A).

Our second dependent variable, ‘Climate Action Support’, was operationalized as the degree to which students supported CAP. Participants were asked, “Please indicate how strongly you support UBC's Climate Action Plan,” via a Likert scale ranging from 1 = “Strongly Oppose” to 5 = “Strongly Support”. Participants also had the option to select “I have never heard of UBC's Climate Action Plan.”

Additionally, ‘Climate Belief’ was measured using a short, validated scale.[14] See Appendix E for complete survey measures.

Procedure

Participants were recruited from February 25th to March 18th, 2025 through word of mouth, poster advertisements (see Appendix F), and social media outreach. Upon intake, participants were instructed to complete the intake survey, in which Climate Action Support was measured. UBC ID numbers and participants' email addresses were also collected. Following random assignment, NG participants were directed to read UBC’s CAP, while MEPG participants were directed to enroll in the Canvas game. See Appendix E1 for the complete pre-survey.

For three days following game enrolment, MEPG participants received a reminder notification twice a day to complete their tasks (see Appendix D2). Task submissions were verified and graded by members of our research team.

Three days following intake, all participants received an email link to the follow-up survey. Questions measuring Climate Belief, Future Action Intent, and Climate Action Support were included. Demographic information was also collected, including age, gender, UBC affiliation, and undergraduate year of study (if applicable). See Appendix E2 for the complete post-survey.

NG participants who completed both pre- and post-surveys, and MEPG participants who completed both surveys and earned 50+ game points, were eligible to earn one of two 25$ gift cards.

Results

See Appendix G for complete descriptive statistics of each measure.

Main Analysis

Future Action Intent

To examine our hypothesis that MEPG participants would select more future intended climate-friendly actions than NG participants, we conducted an independent-samples t-test. Assumptions of normality and homogeneity of variance were met, with Shapiro-Wilk tests showing no significant deviation from normality for either condition ($W = 0.97$, $p = .30$) and Levene’s test confirming that homogeneity of variance was met ($F(1,48) = 0.41$, $p = .52$). The t-test revealed no significant difference in Future Action Intent scores between participants in the game condition ($M = 10.40$, $SD = 2.76$) when compared to participants in the control condition

(M = 9.60, SD = 3.16), $t(48) = 0.92$, $p = .36$, $d = 0.25$). Our results did not support our first hypothesis. See Appendix H for the graph.

Climate Action Support

To examine our hypothesis that MEPG participants would show greater support for CAP than NG participants, we conducted a mixed design two-way ANOVA. Due to violated assumptions of homogeneity of variance, as indicated by Levene's test in the pre-test $F(1, 21) = 2.34$, $p = .025$, we conducted Welch's ANOVA. NG participants mean CAP support was 3.83 at pre-test (SD = 1.62) and 4.23 at post-test (SD = 0.69). MEPG participants mean CAP support was 4.33 at pre-test (SD = 0.52) and 3.83 at post-test (SD = 0.93). Welch's ANOVA revealed no significant main effect of time, $F(1, 21) = 0.64$, $p = .433$, $\eta^2 = .009$, nor a significant main effect of condition, $F(1, 21) = 0.003$, $p = .959$, $\eta^2 = 8.484 \times 10^{-5}$. Additionally, there was not a significant interaction between time and condition, $F(1, 21) = 2.46$, $p = .132$, $\eta^2 = .033$. Post-hoc comparisons using pairwise comparisons with Holm correction revealed no significant differences between the conditions at different time points. Our results did not support our second hypothesis. See Appendix I for the graph.

Exploratory Analysis

Climate Belief

Due to violated assumptions of equality of variances, as indicated by Brown-Forsythe, $F(1, 48) = 9.84$, $p = .003$, we used Welch's t-test to examine whether there was a significant variation in Climate Belief scores between groups. Welch's t-test revealed no significant difference in Climate Belief scores between participants in the game condition (M = 4.92, SD = 0.70) when compared to participants in the control condition (M = 5.14, SD = 0.40), $t(48) = 1.27$, $p = .22$, $d = 0.38$.

Climate Action Awareness

Due to a small number of participants reporting CAP awareness at baseline, a chi-square test of independence was conducted to examine the changes in CAP awareness from pre- to post-test in both the control and game conditions. In the control group, the chi-square test indicated a significant association between pre- and post-test awareness, $\chi^2(1, N = 30) = 5.46$, $p = .02$, with a small to moderate effect size (Cramer's $V = .30$). Similarly, the game condition also revealed a statistically significant association between pre- and post-test awareness, $\chi^2(1, N = 20) = 16.94$, $p < .001$, with a strong effect size, (Cramer's $V = .65$). The result suggests that both conditions resulted in an increased awareness of CAP. See Appendix J1 for the graph.

A logistic regression was further conducted to explore whether there was a significant interaction between condition and time in predicting CAP awareness. The analysis revealed significant main effects of condition (β = -1.25, SE = 0.61, z = -2.04, p = .04) and time (β = 1.47, SE = 0.65, z = 2.24, p = .03). However, the interaction between condition and time was not statistically significant (β = .77, SE = 0.99, z = 0.78, p = .44). These findings suggest that MEPG participants did not show a greater increase in CAP awareness compared to NG participants. See Appendix J2 for the graph.

Correlation of Game Points and Future Intended Action

To investigate whether game participation was related to future action intent, a Pearson correlation was computed. For participants in the game condition, the analysis revealed a

significant positive correlation between game points and number of future intended actions, $r(48) = 0.535$, $p = .015$. See Appendix K for the graph.

Discussion

Our findings did not support either hypothesis. MEPG participants did not select significantly more climate-friendly behaviors than NG participants, contrary to our first hypothesis. However, both groups expected to engage in an average of 10 climate-friendly behaviors in the coming year, indicating a general willingness to adopt sustainable behaviors. This lack of difference may be influenced by the convenience sampling method, which likely attracted individuals already interested in climate action. Additionally, a positive correlation was found between the number of points earned in the game and participants' intended climate actions, though the directionality remains unclear. Regarding support for the Climate Action Plan (CAP), MEPG participants did not show greater support than NG participants, contrary to our second hypothesis. However, both conditions demonstrated increased awareness of CAP, suggesting that both methods were effective in raising awareness. These findings suggest that gamification was not more effective than simply providing information in increasing the intent to adopt sustainable behaviors or support for CAP.

Implications

Our results are not consistent with previous literature that suggests gamification increases motivation for sustainable behavior adoption.[12] The lack of gamification elements like social connectedness and motivational rewards, which have been shown to drive behavior change,[8] may have limited the game's effectiveness. Additionally, the large number of tasks available to participants could have contributed to choice overload, further hindering behavior change.[15] This study highlights the limitations of gamification methods that lack a reward system, social interaction, and manageable task load. It further reinforces the notion that certain game elements alone do not result in behaviour change. Refining the game by incorporating additional gamification elements could improve its effectiveness.[7-10,12,16,17] Furthermore, incorporating competitive elements and social components, such as leaderboards or collective point totals, may enhance intrinsic motivation.[12,18] Nonetheless, our findings highlight the potential of game-based methods as real-time measures of student engagement in sustainable behaviours.

Limitations and Future Research

Despite prior research showing gamification's potential, our study found no significant results. A small sample size was a key limitation (see Appendix B for attrition details). The use of convenience sampling likely skewed our sample, as participants were recruited through social media and word of mouth, which likely does not accurately reflect the broader UBC student population. Future studies may benefit from a larger sample size, a more focused intervention period, and fewer tasks in the game condition to improve effectiveness. Although this study yielded null results, gamification may still hold potential for promoting climate action. A more engaging and refined game could lead to better outcomes, motivating sustainable behaviors and increasing climate action within the UBC community.

Recommendations

We do believe that there may be potential for gamification at UBC. However, students likely associate Canvas with schoolwork and perhaps consider it to be less game-like than other applications. A canvas course that results in a guaranteed reward could be a positive way to incentivise the community to engage in more climate friendly behaviours. The inclusion of a 'sustainability' or 'climate-friendly' badge or certification may further increase engagement, especially when it could enhance participants' employability. Overall, Canvas worked moderately well for our study due to ease of access, but it is not a game-based software and therefore could not be as effective as other applications. We suggest looking into other platforms or apps made for gamification, for example, the "Cool Choices" game.[19]

One promising aspect of this design was its potential for two-way communication. Not only could we provide information about CAP, but we could also garner feedback about what climate actions participants were taking. A game-like design promoting direct feedback may be a good method for measuring what climate-friendly actions students are undertaking, without relying on surveys.

References

[1]Masciangelo, L., Lopez Lumbi, S., Rinderhagen, M., Hornberg, C., Liebig-Gonglach, M., & Mc Call, T. (2024). Promising behavior change techniques for climate-friendly behavior change – a systematic review. *Frontiers in Public Health*, 12. https://doi.org/10.3389/fpubh.2024.1396958

[2]Hertwich, E. G., & Peters, G. P. (2009). Carbon Footprint of Nations: A global, trade-linked analysis. *Environmental Science & Technology, 43*(16), 6414–6420. https://doi.org/10.1021/es803496a

[3]Van Lange, P. A. M., & Huckelba, A. L. (2021). Psychological distance: How to make climate change less abstract and closer to the self. *Current Opinion in Psychology*, 42, 49–53. https://doi.org/10.1016/j.copsyc.2021.03.011

[4]Dr. Jiaying Zhao combats climate change with happiness. UBC Department of Psychology. (2023). https://psych.ubc.ca/news/dr-jiaying-zhao-combats-climate-change-with-happiness/

[5]Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification: using game-design elements in non-gaming contexts. CHI '11 *Extended Abstracts on Human Factors in Computing Systems*, 2425–2428. https://doi.org/10.1145/1979742.1979575

[6]Aguiar-Castillo, L., Clavijo-Rodriguez, A., Hernández-López, L., De Saa-Pérez, P., & Pérez-Jiménez, R. (2021). Gamification and deep learning approaches in higher education. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 29, 100290. https://doi.org/10.1016/j.jhlste.2020.100290

[7]AlMarshedi, A., Wanick, V., Wills, G. B., & Ranchhod, A. (2016). Gamification and behaviour. *Progress in IS*, 19–29. https://doi.org/10.1007/978-3-319-45557-0_2

[8]Xi, N., Hamari, J. (2020). Does gamification affect brand engagement and equity? A study in online brand communities, *Journal of Business Research*, 109, 449-460, ISSN 0148-2963, https://doi.org/10.1016/j.jbusres.2019.11.058.

[9]Alahäivälä, T., & Oinas-Kukkonen, H. (2016). Understanding persuasion contexts in health gamification: A systematic analysis of Gamified Health Behavior Change Support Systems Literature. *International Journal of Medical Informatics*, 96, 62–70. https://doi.org/10.1016/j.ijmedinf.2016.02.006

[10]Hamari, J. (2017). Do badges increase user activity? A field experiment on the effects of Gamification. *Computers in Human Behavior*, 71, 469–478. https://doi.org/10.1016/j.chb.2015.03.036

[11]Legaki, N.-Z., Xi, N., Hamari, J., Karpouzis, K., & Assimakopoulos, V. (2020). The effect of challenge-based gamification on Learning: An experiment in the context of statistics education. *International Journal of Human-Computer Studies*, 144, 102496. https://doi.org/10.1016/j.ijhcs.2020.102496

[12]Cornelissen, G., Pandelaere, M., Warlop, L., & Dewitte, S. (2006). Positive cueing: Promoting sustainable consumer behavior by cueing common environmental behaviors as environmental. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.944391

[13]Climate action plan 2030. Climate Action Plan 2030 | UBC Campus & Community Planning. (n.d.). https://planning.ubc.ca/cap2030

[14]Fairbrother, M., Johansson Sevä, I., & Kulin, J. (2019). Political Trust and the relationship between climate change beliefs and support for fossil fuel taxes: Evidence from a survey of 23 European countries. *Global Environmental Change*, 59, 102003. https://doi.org/10.1016/j.gloenvcha.2019.102003

[15]Adriatico, J. M., Cruz, A., Tiong, R. C., & Racho-Sabugo, C. R. (2022). An analysis on the impact of choice overload to consumer decision paralysis. *Journal of Economics, Finance and Accounting Studies, 4*(1), 55–75. https://doi.org/10.32996/jefas.2022.4.1.4

[16]Looyestyn, J., Kernot, J., Boshoff, K., & Maher, C. (2018). A web-based, social networking beginners' running intervention for adults aged 18 to 50 years delivered via a Facebook group: Randomized Controlled Trial. *Journal of Medical Internet Research, 20*(2). https://doi.org/10.2196/jmir.7862

[17]Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of Game-Based Learning. *Educational Psychologist, 50*(4), 258–283. https://doi.org/10.1080/00461520.2015.1122533

[18]Wang, K., Tekler, Z. D., Cheah, L., Herremans, D., & Blessing, L. (2021). Evaluating the effectiveness of an augmented reality game promoting environmental action. *Sustainability, 13*(24), 13912. https://doi.org/10.3390/su132413912

[19]Ro, M., Brauer, M., Kuntz, K., Shukla, R., & Bensch, I. (2017). Making cool choices for sustainability: Testing the effectiveness of a game-based approach to promoting pro-environmental behaviors. *Journal of Environmental Psychology*, 53, 20–30. https://doi.org/10.1016/j.jenvp.2017.06.007

Appendices

Appendix A
List of Climate Friendly Actions and Associated, Educational Information

Climate Friendly Action	Point Value	Environmental Information	Verification	Additional Messaging
Turn off your tap when brushing your teeth and/or washing dishes	1	It is common to leave the tap on when engaging in mundane activities such as brushing your teeth. However, those few minutes of brushing can waste up to 8 gallons of water a day! In a month that adds up to 240 gallons, enough to fill a large home aquarium, and that's just from brushing your teeth. Turn Off the tap | WaterSense Kids | US EPA. (n.d.). https://19january2017snapshot.epa.gov/www3/watersense/kids/tap-off.html#:~:text=Just%20by%20%20turning%20%20off%20the,Turn%20off%20the%20tap	I certify that I turned off the tap while brushing my teeth and/or washing dishes. (True or False)	Great efforts in conserving water! Challenge yourself by checking this article out to learn more ways to use water mindfully. https://davidsuzuki.org/living-green/make-every-drop-count-water-conservation-tips/Links to an external site.
Do not use GenAI (e.g., ChatGPT) for one day	3	According to Earth.org, just a simple conversation with Chat GPT (roughly 20-50 questions asked) can be as wasteful as pouring out a 500ml bottle of water. If the entire student population at UBC Vancouver, which is roughly 50,000 people, used Chat GPT for just one day, UBC would waste the equivalent of 25000 liters of water! McLean, S. (2024, May 31). The environmental impact of ChaTGPT | Earth.Org. Earth.Org. https://earth.org/environmental-impact-chatgpt/	I did not use Chat GPT or any other genAI software today. (True or False)	We are so proud you did not use Chat CPT today! Take a closer look at the environmental impacts of AI here: https://earth.org/the-green-dilemma-can-ai-fulfil-its-potential-without-harming-the-environment/Links to an external site.
Bring a reusable water bottle, cup, or bag instead of using non-reusable alternatives	3	Save money by avoiding the extra fees on disposable bags and cups while also saving the planet! By using reusable items such as bags and cups, we can reduce plastic waste which limits the microplastics and pollution in our water supply, air, and habitats. Reusable water bottles – Understanding the reasons why to use them. (2023, July 10). Clean Water Action. https://cleanwater.org/2023/07/10/reusable-water-bottles-understanding-reasons-why-use-them	Please upload a photo of your reusable water bottle, cup, or bag.	Good job bringing a reusable item! Check out this article to look for more ways to reduce single use items: https://www.greenmountainenergy.com/en/blog/green-living-and-more/how-to-avoid-single-use-plasticLinks to an external site.
Read the UBC Climate Action Plan	4	Ever heard of the UBC Climate Action Plan 2030 or CAP 2030? Well, familiarize yourself with the goals, plans, and actions for sustainability through this link: https://storymaps.arcgis.com/stories/aa4e4379f4d04ef38a5e3ea52cb26b42	Please report a piece of information you learned from the UBC Climate Action Plan 2030. This could also be something you found especially valuable or	Nicely done! To go above and beyond, continue to check out the full UBC Climate Action Plan here: https://planning.ubc.ca/cap2030

			important. (Long Answer)	
Climate Friendly Action	Point Value	Environmental Information	Verification	Additional Messaging
Take a walk in nature	4	According to the International Union for Conservation of Nature, there is growing evidence that when an individual connects with nature, they are more pro-beneficial climate actions. Not only do you get peaceful time and exercise outdoors, but you foster a relationship with nature that helps climate-friendly actions feel natural and instinctive. Charles, C., Keenleyside, K., Chapple, R., Kilburn, B., Van Der Leest, P. S., Allen, D., Richardson, M., Giusti, M., Franklin, L., Harbrow, M., Wilson, R., Moss, A., Metcalf, L., Camargo, L., & Children & Nature Network. (2018). Home to Us All: How Connecting with Nature Helps Us Care for Ourselves and the Earth. https://iucn.org/sites/default/files/2022-06/hometousall.pdf	Please upload a photo from your walk.	We hope you enjoyed your nature walk. Try to keep it up and continue exploring beautiful British Columbia.
Go digital for a day and avoid using paper	5	Did you know that using an iPad for a third of the day still does not make as much greenhouse gas as just one single piece of paper does? In theory, going digital for a day can save around 0.06 kg of CO_2 per individual by limiting paper waste. In turn, we reduce deforestation and water waste. Richard. (2024, November 22). Sustainable Note-Taking - Make the Switch - PLAY IT GREEN. Play It Green. https://playitgreen.com/sustainable-note-taking-make-the-switch/#:~:text=This%20means%20that%20it%20would,for%20each%20sheet%20of%20paper!	What is your favorite digital tool for staying organized or getting work done (e.g., GoodNotes, Google Drive, Notion, etc.)? (Long Answer)	Amazing work at going digital! We urge you to check out this article to further promote reducing paper waste: https://www.floridamuseum.ufl.edu/earth-systems/blog/action-of-the-week-use-your-local-libraries/#:~:text=Borrowing%20a%20book%20from%20the,of%20paper%20waste%20in%20circulationLinks to an external site..
Read an educational article on an environmental issue and/or solution	5	Did you know that about 61% of Americans do not understand the magnitude of climate change, especially when it comes to personal health? The George Mason University's Center for Climate Change Communication found that the more knowledge we have about climate change, the more likely we are to help. Check out some of the readings in the additional content resources or conduct your own research to better your understanding of climate change. Campbell, E., Uppalapati, S. S., Kotcher, J., & Maibach, E. (2023). Communication research to improve engagement with climate change and human health: A review. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.1086858	Discuss one or more things you learnt from your reading on climate change. Be sure to include a link to the article you read. (Long Answer)	Fantastic job! We hope you continue to learn and communicate to others about your findings, these open climate change discussions are key. Feel free to check out any of the other articles under the additional resources module to learn even more!

Climate Friendly Action	Point Value	Environmental Information	Verification	Additional Messaging
Find a sustainability focused business/organization at UBC	6	Check out some UBC or Vancouver businesses that emphasize sustainability. From local produce and handmade items, to ethically sourced materials and packaging, UBC has it all! https://www.cohocommissary.com/post/your-guide-to-sustainable-businesses-in-vancouver	Please provide a link for the sustainable business/organization you found.	Thank you for finding a sustainable group to support! Consider sharing it with your friends or supporting the businesses/organizations sustainable initiatives.
Properly sort your recycling, garbage, and compost	7	Sorting your waste is key to the environment. Did you know that the incorrect sorting of plastic can leave it stuck in landfills for up to 450 years? However, with proper sorting of materials, these plastic items can be recycled and have a new life, which helps us build a more sustainable future. https://www2.gov.bc.ca/gov/content/environment/waste-management	Waste sorting game, where participants had to categorize certain items by which bin they would go in to.	Stellar! Try to nudge others to practice proper sorting as well, a little action goes a long way.
Educate yourself on your local community's environmental policies	8	As reported by Elections Canada, it is estimated that university-aged students are the least likely of any age group to vote. We highly encourage you to research what is going on in your local community, and advocate for greener policies and the future. Canada, E. (n.d.). First-Time electors – youth. Elections Canada. https://www.elections.ca/content.aspx?section=res&dir=rec/part/yth&document=index&lang=e	Describe one local environmental policy that shocked you and why. (Long Answer)	Outstanding work! We highly encourage you to register to vote (wherever you are eligible to do so) if you haven't done so yet.
Upcycle something you were planning to throw away	8	Since about 2,700 liters of water is needed to make just one cotton shirt, upcycle to avoid the unnecessary use of finite natural resources. Repurpose an old shirt to and give it a new life or take old jars and turn them into vases. Create a unique item for free and help the environment flourish, all while having fun! FutureLearn. (2022, October 25). Updates, Insights, and News from FutureLearn | Online Learning for You. FutureLearn. https://www.futurelearn.com/info/courses/upcycling-for-change-from-green-ideas-to-startup-businesses/0/steps/67684	Upload a photo of your newly upcycled item!	Excellent job at up-cycling! Take a look at this website for some great inspiration on how to reuse more and waste less: https://oceanconservancy.org/blog/2020/10/19/12-creative-upcycling-ideas-reduce-waste/Links to an external site.

Climate Friendly Action	Point Value	Environmental Information	Verification	Additional Messaging
Opt for rideshare or sustainable transportation options (e.g, public transit or Uber Share)	10	Want to reduce your carbon footprint and have more fun? Consider carpooling or sustainable transportation such as taking the bus. The International Transport Forum found that carpooling can reduce global emissions by 11%. On top of that, use the time with others during the transport to connect and enjoy some social interaction. DGB Group. (2023, March 14). Green commuting: the environmental benefits of carpooling and alternative modes of transportation. DGB Group. https://www.green.earth/blog/green-commuting-the-environmental-benefits-of-carpooling-and-alternative-modes-of-transportation#:~:text=Carpooling%20is%20a%20simple%20and,emissions%20released%20into%20the%20atmosphere	What rideshare of sustainable transportation option did you use?	Enjoyed carpooling? If so check out this link that directs you to ride sharing services to find a match: https://www.cnv.org/Streets-Transportation/Traffic/Ride-Sharing#:~:text=Ride%2Dsharing%20can%20be%20a,with%20similar%20destinations%20and%20schedules. Links to an external site.
Look for sustainable items when shopping (hint: go to a thrift store!)	12	Did you know the second leading industry in wasting water is fast fashion? They also contribute to 10% of the world's carbon emissions just for 85% of these garments to end up in landfills shortly. Instead, earth.org advocates for sustainable consumer habits such as thrifting. Check out UBC's very own store Get Thrifty to find some nice and sustainable clothes: https://sustain.ubc.ca/get-thrifty. Maiti, R. (2025, January 20). Fast Fashion and its environmental impact in 2025 | Earth.Org. Earth.Org. https://earth.org/fast-fashions-detrimental-effect-on-the-environment/	Upload a photo of a sustainable item you have purchased or of the sustainability focused store you visited.	Well done at picking a sustainable option while shopping. To learn more about how to make sustainable choices in all of your shopping, check out this article: https://earth5r.org/how-to-make-more-sustainable-choices-when-shopping/Links to an external site.
Cook or purchase a plant-based meal	12	Want a happier wallet, body, and planet? Well limit meats and embrace a plant-based meal! With the growing meat consumption rates, this causes a rise in deforestation rates to allow more space for farms. Plus our air and water quality worsens solely for the sake of a mediocre cheeseburger. Plant-based meals still can offer the same nutritional benefits at a fraction of the cost, while also helping keep our planet healthy. Millstein, S. (2024, November 6). Why eating meat is bad for the environment and climate change, explained. Sentient. https://sentientmedia.org/why-is-eating-meat-bad-for-the-environment/	Upload a photo of your delicious plant-based meal!	Excellent job at making a plant based meal, we hope you enjoyed it. Feel free to check out more delicious, plant-based meals here: https://www.loveandlemons.com/Links to an external site.

Climate Friendly Action	Point Value	Environmental Information	Verification	Additional Messaging
Feng Shui your fridge	12	Did you know that eating more plants can reduce carbon emissions by up to 80% all while making you feel happier? Most of us often forget about our fresh produce due to the typical fridge layout. Behavioral scientist, Dr. Zaho, uses a feng shui strategy to organize their fridge, opting for perishables in the front so we can't forget them. In turn, this makes plant-based meals increasingly accessible and is a great happy climate hack. Check out Dr. Zhao's TED talk here: https://www.youtube.com/watch?v=lO2A4g9tMJU Zaho, J. (2023, April 22). How to feng shui your fridge — and other happy climate hacks | Jiaying Zhao | TED [Video]. YouTube. https://www.youtube.com/watch?v=lO2A4g9tMJU	Upload a photo of your newly organized fridge.	Wonderful work! We hope this helps you choose more healthy options.

Appendix B
Attrition at Various Points During the Intervention

Of the 134 individuals who began the pre-survey and were initially assigned to a condition (control: $n = 65$; game: $n = 69$), only 85 participants provided their UBC ID, which was necessary to link their data. As a result, only these 85 participants were officially assigned to either the control ($n = 40$) or game ($n = 45$) condition.

However, within the game condition, 12 participants did not use the provided link to join the game, leaving only 33 participants who actively enrolled. The post-survey was distributed to all participants, but only 50 individuals fully completed it (control: $n = 30$; game: $n = 20$), meaning 10 control participants and 13 game participants did not respond. Those who failed to complete the post-survey were excluded from the final analysis.

Ultimately, only 58.8% of the initial participants fully completed all parts of the study, with a higher completion rate in the control group (75%) compared to the game group (44.4%).

Appendix C
Detailed Demographic Characteristics of Included Participants

Demographic Characteristics	Control		Game		Total	
	n	%	*n*	%	*n*	%
Gender						
Female	24	80	16	80	40	80
Male	2	7	2	10	4	8
Non-Binary	3	10	2	10	5	10
Other	1	3	0	0	1	2
Prefer not to say	0	0	0	0	0	0
Age						
17-25	30	100	20	100	50	100
26-33	0	0	0	0	0	0
34-42	0	0	0	0	0	0
43-51	0	0	0	0	0	0
52-59	0	0	0	0	0	0
60+	0	0	0	0	0	0
Prefer not to say	0	0	0	0	0	0
UBC Affiliation						
Undergraduate Student	30	100	20	100	50	100
Graduate Student	0	0	0	0	0	0
Faculty	0	0	0	0	0	0
Staff	0	0	0	0	0	0
Other	0	0	0	0	0	0
Prefer not to say	0	0	0	0	0	0
Undergraduate Year of Study						
1st year	4	13	2	10	6	12
2nd year	5	17	3	15	8	16
3rd year	7	23	7	35	14	28
4th year	10	33	6	30	16	32
5th+ year	4	13	2	10	6	12
Prefer not to say	0	0	0	0	0	0

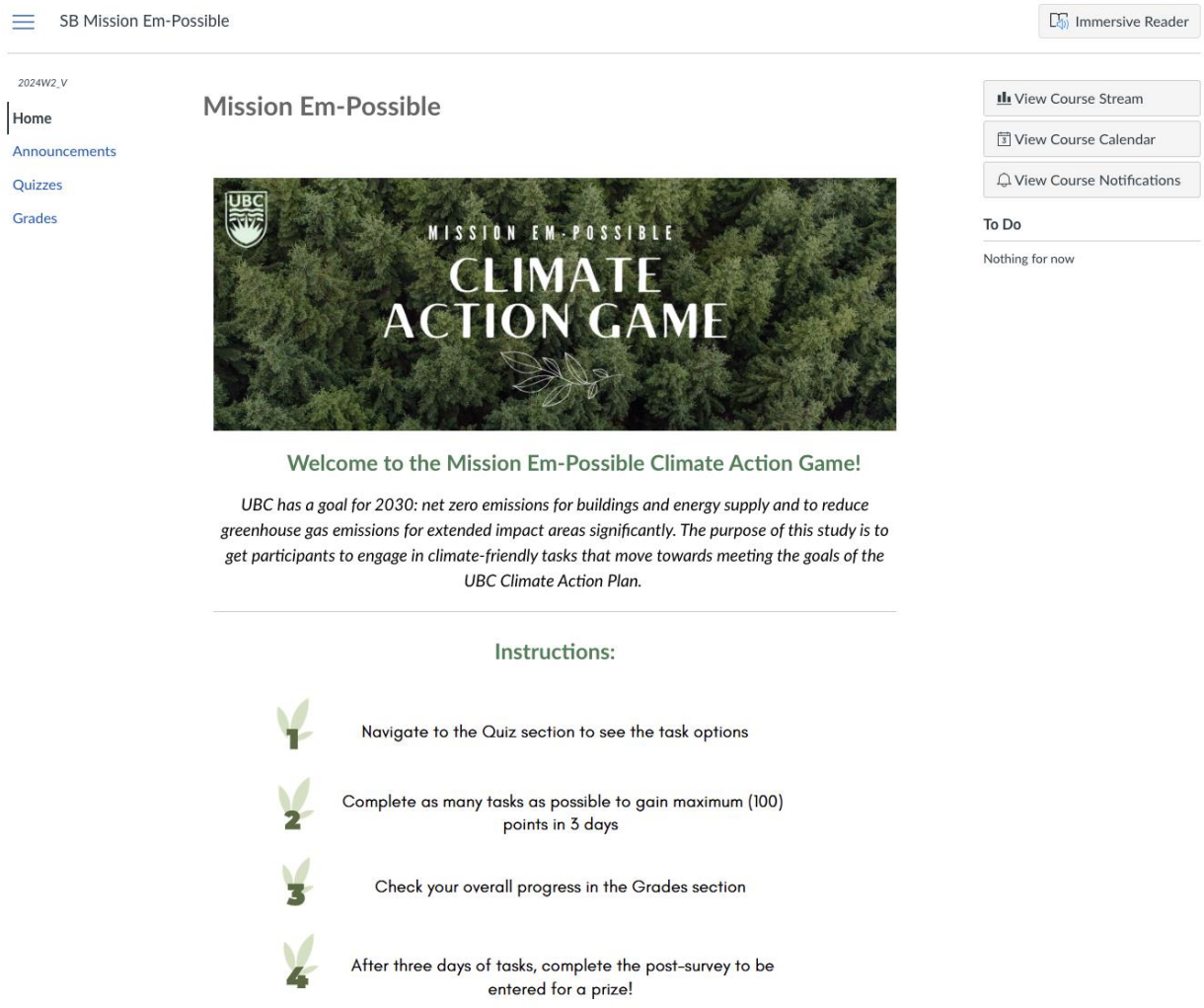
Note. $n = 30$ for control and $n = 20$ for game

Appendix D
Mission Em-Possible Climate Action Game Configuration

The following figures (Figures D1-D7) demonstrate the configuration of the game-based intervention.

Figure D1

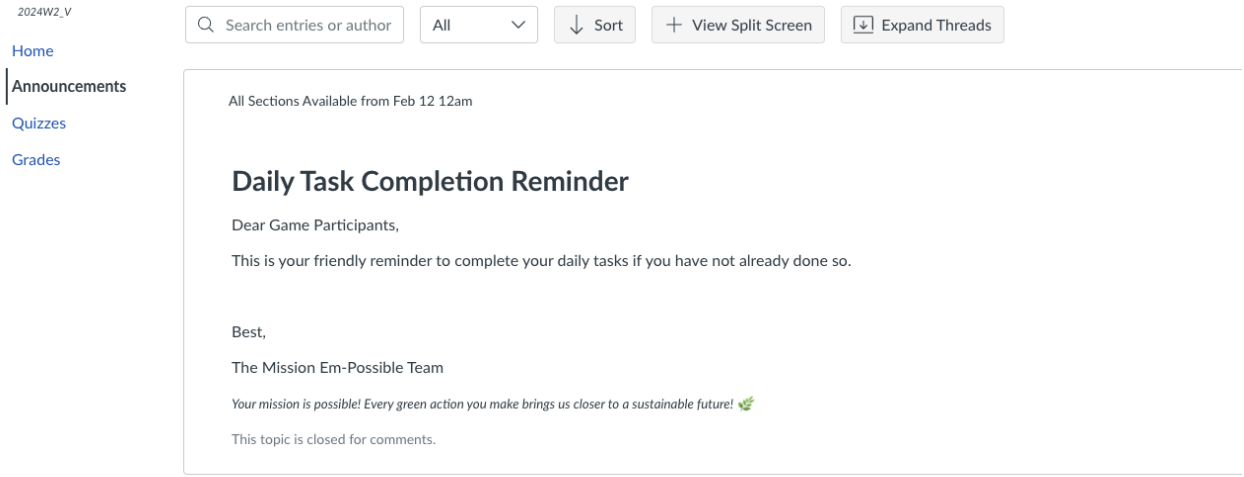
Climate Action Game Landing Page



Note. Page was visible immediately when participants entered the game.

Figure D2

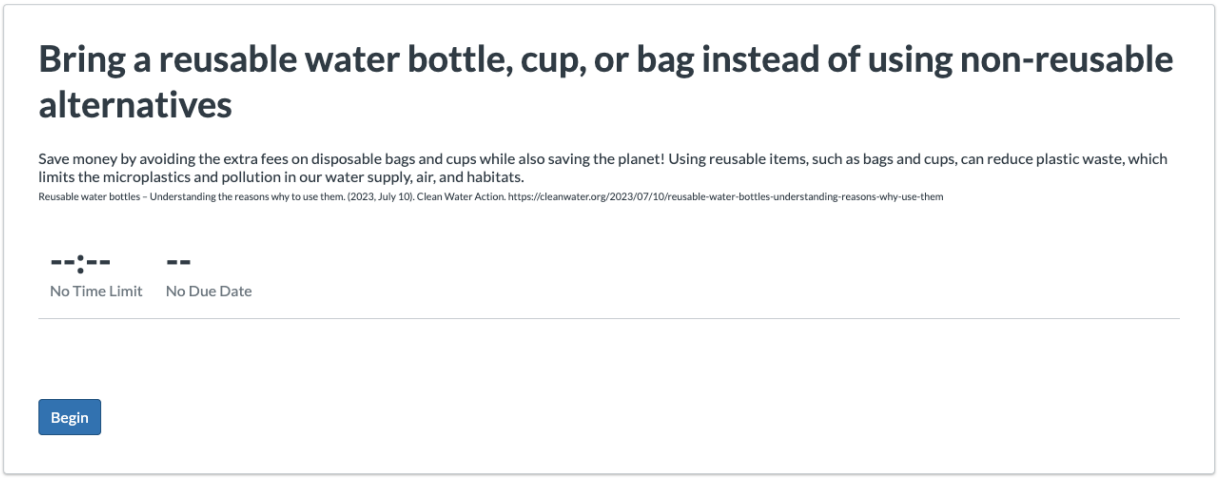
Canvas Daily Announcement Example in Climate Action Game



Note. Participants received two daily announcements, one in the morning and one in the evening, reminding them to engage in sustainable behaviours.

Figure D3

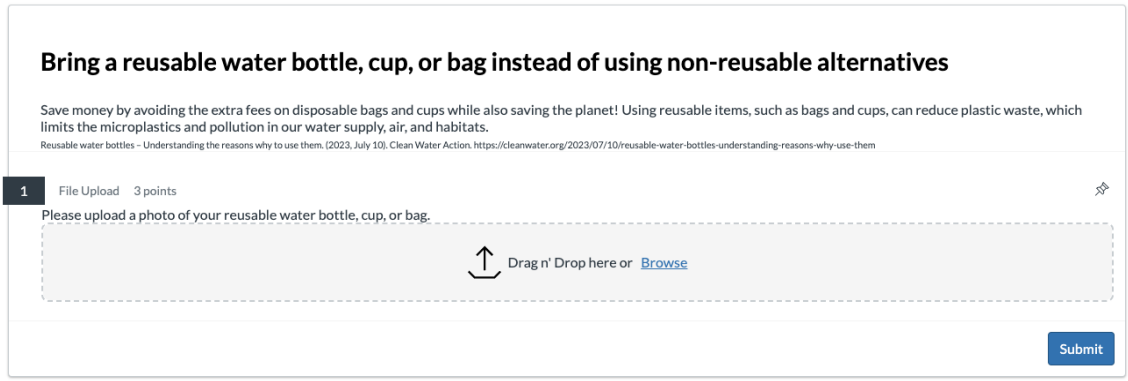
Example of the Task Configuration in the Climate Action Game



Note. Each task was configured as a quiz on Canvas. Each task was accompanied by an interesting fact about the task. For a detailed list of all in-game tasks, see Appendix A.

Figure D4

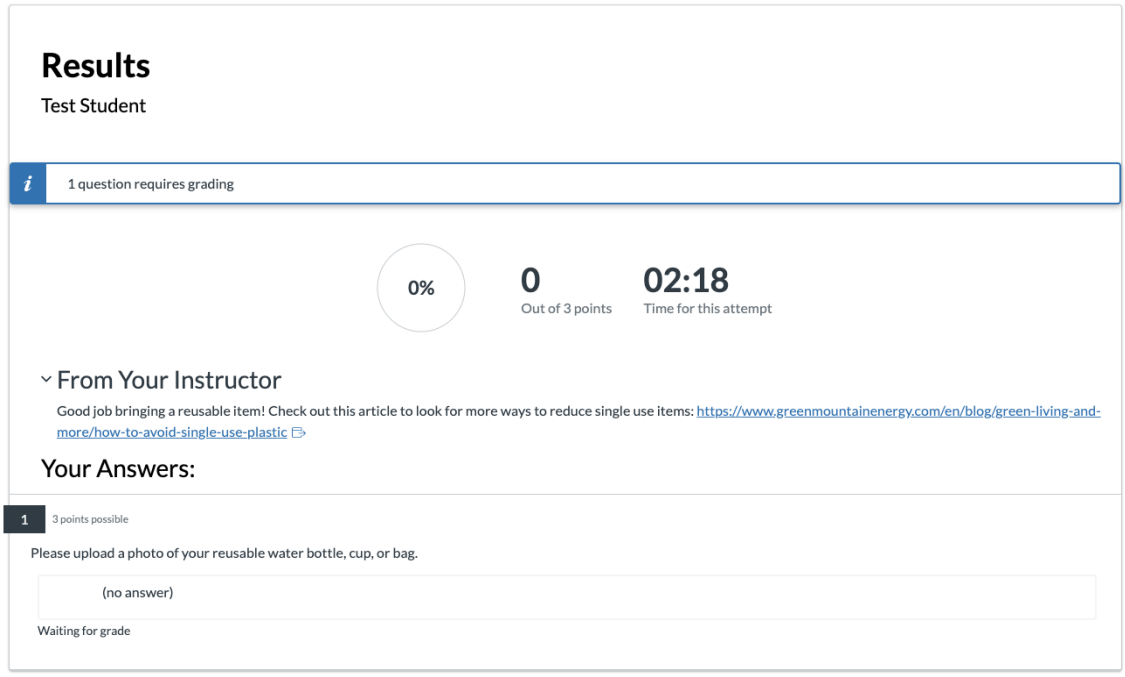
Example Task Verification in Climate Action Game



Note. Example shown in which participants were asked to upload a photo of their reusable item. For a detailed list of all task verifications, see Appendix A.

Figure D5

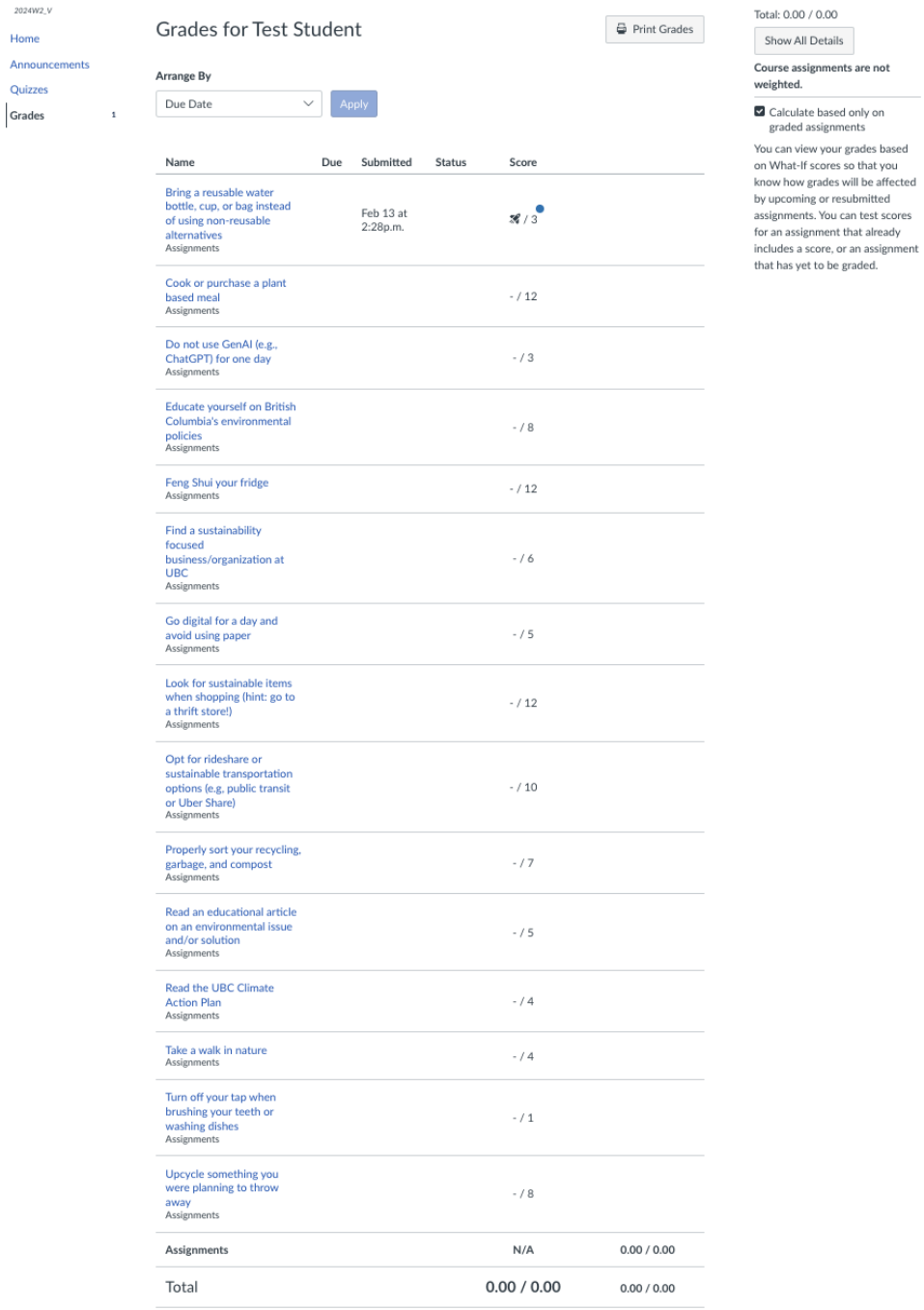
Example of Additional Messaging in Climate Action Game



Note. Participants were rewarded points if they correctly completed the verification. Participants were also provided positive reinforcement and additional information regarding the sustainable behaviour they engaged in. For a detailed list of all additional messaging, see Appendix A.

Figure D6

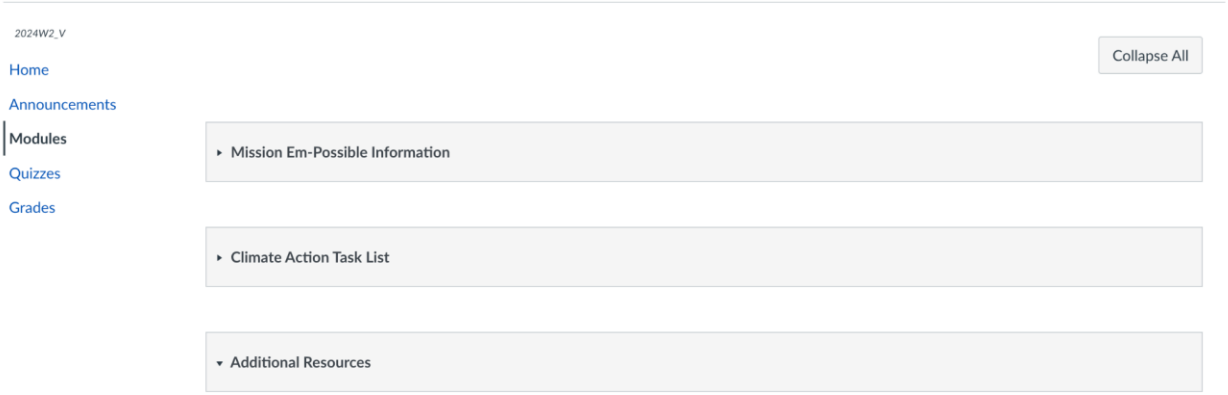
Example of Participant Point Tracking in Climate Action Game



Note. As participants completed tasks, they accumulated points. Participants were able to check in on their progress at any time throughout the study by clicking the “grades” tab on Canvas.

Figure D7

Climate Action Game 'Modules' Tab Organization

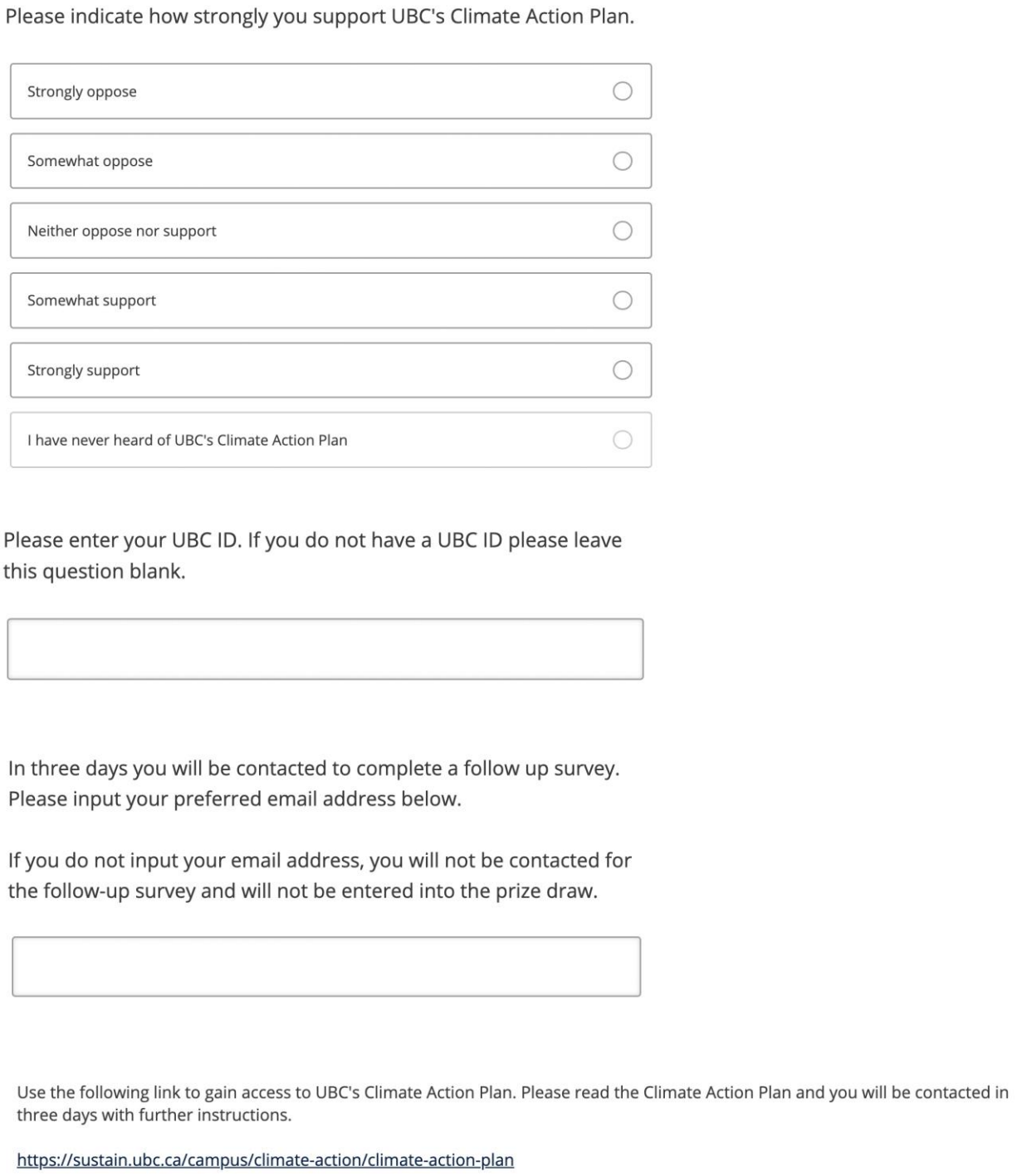


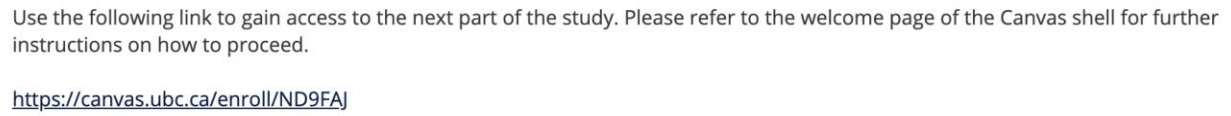
Note. The climate action game 'modules' tab was organized specifically to ensure easy access to all tasks and associated information.

Appendix E
Pre and Post Survey Measures

Figure E1

Pre-Survey Measure

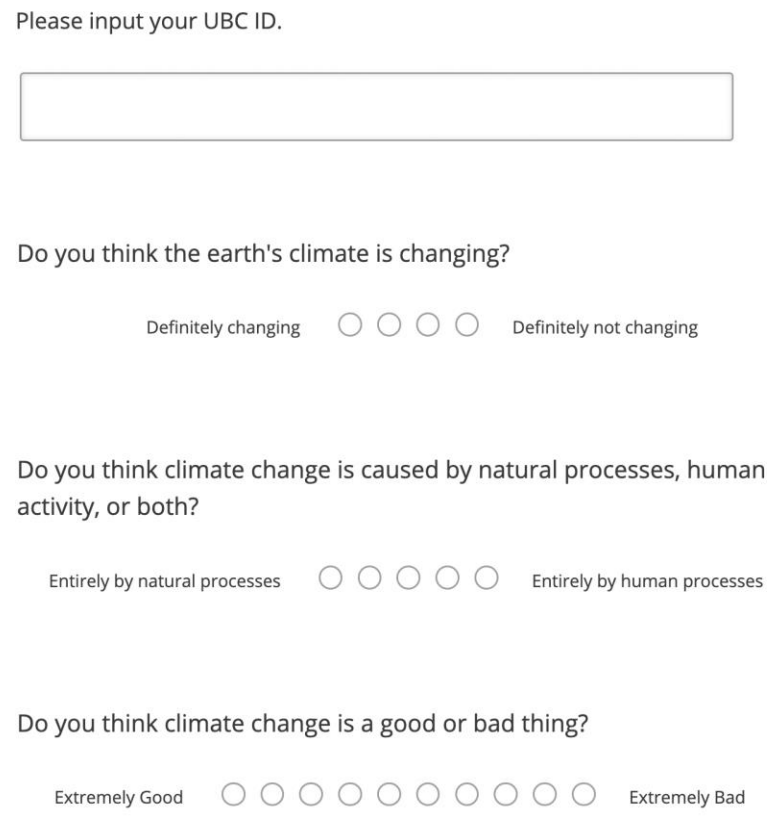




Note. Participants were randomized into either the experimental (MEPG) or control (NG) condition and received the associated end of survey message.

Figure E2

Post-Survey Measure



Over the next year, which of the following actions do you see yourself doing at least once? Please select all that apply.

- [ ] Using a reusable water bottle, cup, or bag instead of non-reusable alternatives
- [ ] Cooking or purchasing a plant-based meal
- [ ] Not using GenAI (e.g. ChatGPT) for one day
- [ ] Educating myself on my local community's environmental policies
- [ ] Feng Shui-ing (reorganizing) my fridge
- [ ] Finding a sustainability-focused business or organization at UBC
- [ ] Going digital for a day to avoid using paper
- [ ] Looking for sustainable options while shopping (e.g. thrift stores)
- [ ] Using sustainable transportation (e.g. public transport, biking, rideshare)
- [ ] Properly sorting my garbage, recycling, and compost
- [ ] Reading an educational article on an environmental issue and/or solution
- [ ] Taking a walk in nature
- [ ] Turning off the tap when I brush my teeth or when washing dishes
- [ ] Upcycling something I was planning to throw away
- [ ] Reading the UBC Climate Action Plan

Please indicate how strongly you support UBC's Climate action plan.

- Strongly oppose
- Somewhat oppose
- Neither oppose nor support
- Somewhat support
- Strongly support
- I have never heard of UBC's Climate Action Plan

What is your age?

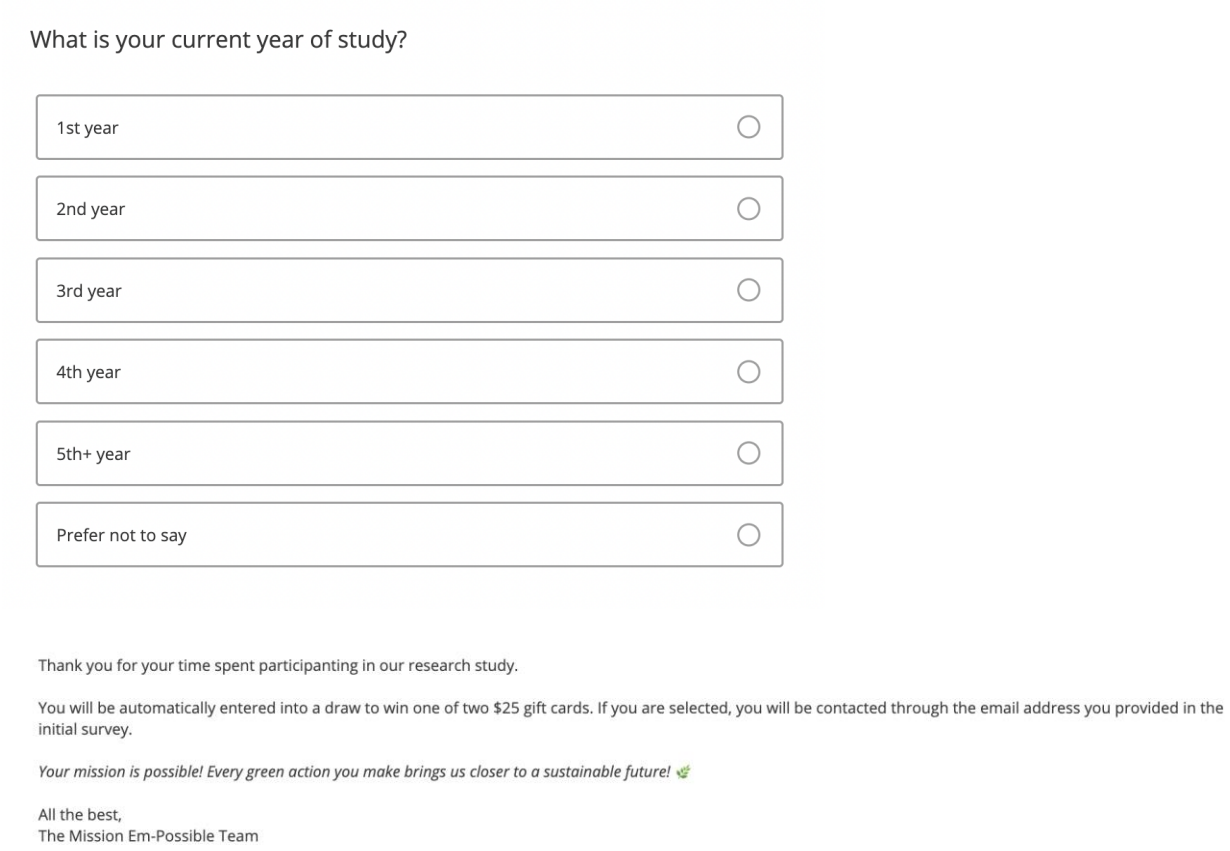
- 17-25
- 26-33
- 34-42
- 43-51
- 52-59
- 60+
- Prefer not to say

What is your gender identity?

- Male
- Female
- Non-binary
- Other:
- Prefer not to say

What is your current affiliation with UBC?

- Undergraduate student
- Graduate student
- Faculty
- Staff
- Other:
- Prefer not to say

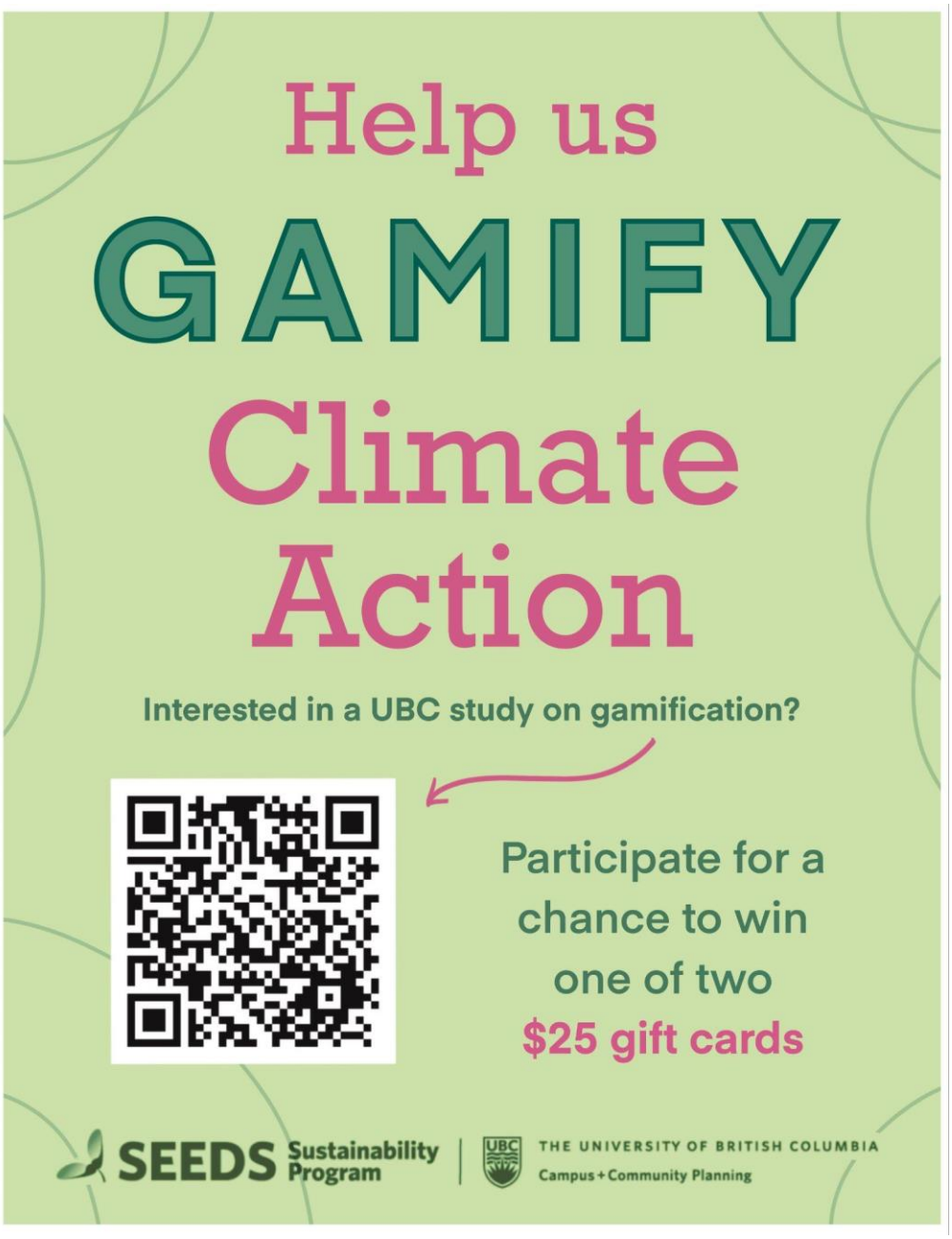


Note. Only participants who indicated being an undergraduate student were asked their current year of study.

Appendix F
Recruitment Poster

Figure F1

Mission-Em Possible Recruitment Poster



Note. The recruitment poster was placed at various locations across UBC campus, as well as shared through social media.

Appendix G
Descriptive Statistics

Table G1

Participants Awareness of UBC's Climate Action Plan 2030 (CAP) (N = 50)

Time	Control				Game			
	Heard of CAP		Never Heard of CAP		Heard of CAP		Never Heard of CAP	
	n	%	*n*	%	*n*	%	*n*	%
Pre	18	60	12	40	3	15	17	85
Post	26	87	4	12	16	80	4	20

Table G2

Participants Support of UBC's Climate Action Plan 2030 (CAP)

Time	Control				Game			
	n	*M*	*Mdn*	*SD*	*n*	*M*	*Mdn*	*SD*
Pre	18	3.83	4.50	1.62	3	4.33	4.00	0.52
Post	26	4.23	4.00	0.59	16	4.06	4.00	0.93

Note. CAP support was only calculated for participants who selected a Likert scale response (1–5) and excludes those who selected the "I have never heard of CAP" option.

Table G3

Participants Support of UBC's Climate Action Plan 2030 (CAP)

Time	Control				Game			
	n	*M*	*Mdn*	*SD*	*n*	*M*	*Mdn*	*SD*
Pre	17	3.82	4.50	1.67	6	4.33	4.00	0.52
Post	17	4.29	4.00	0.69	6	3.83	4.00	1.17

Note. CAP support was only calculated for participants who selected a Likert scale response (1-5) in both the pre and the post survey. It excludes those who selected the "I have never heard of CAP" option.

Table G4

Average Number of Climate-Friendly Actions Participants Intend to Engage in in the Next Year, out of 15 (N=50)

Condition	*n*	*M*	*Mdn*	*SD*
Control	30	9.60	9.50	3.16
Game	20	10.40	10.50	2.76

Table G5

Specific Climate-Friendly Actions Participants Intend to Engage in in the Next Year (N=50)

Climate-Friendly Actions	Control		Game		Total	
	n	*%*	*n*	*%*	*n*	*%*
Use reusable items (e.g., water bottle)	29	97	20	100	49	98
Cook/purchase a plant-based meal	20	67	14	70	34	68
Restrict use of GenAI for one day	23	77	17	85	40	80
Learn about local environmental policies	11	37	12	60	23	46
Feng-Shui my fridge	10	33	9	45	19	38
Find a sustainable organization at UBC	10	33	7	35	17	34
Go digital for a day	23	77	18	90	41	82
Shop sustainably	19	63	16	80	35	70
Use sustainable transportation	25	83	18	90	43	86
Properly sort my waste	23	77	19	95	42	84
Read an educational article	14	47	9	45	23	46
Take a walk in nature	28	93	19	95	47	94
Conserve water	24	80	15	75	39	78
Upcycle something	17	57	12	60	29	58
Read UBC's Climate Action Plan	13	43	3	15	16	32

Note. $n = 30$ for control and $n = 20$ for game. For a detailed list of the climate-friendly actions presented to participants, please see Appendix (...).

Table G6

Average Game Points Game Condition Participants Received, out of 100 (N=50)

Condition	*n*	*M*	*Mdn*	*SD*
Game	20	16.27	3.00	20.00

Note. Total Game Points was only calculated for game condition participants who completed the post survey. Please see Appendix (...) for a detailed list of climate-friendly tasks participants could complete to earn game points.

Table G7

Descriptive Statistics for Climate Belief Measures (N = 50)

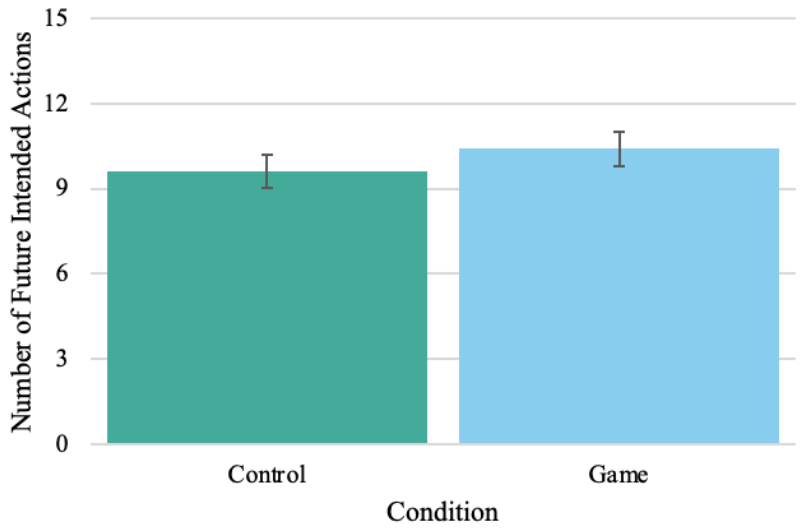
Condition	*n*	*M*	*Mdn*	*SD*
Control	30	5.14	5.04	0.40
Game	20	4.92	4.98	0.70

Note. Climate belief was calculated as the geometric mean of trend, attribution, and impact scepticism measures (see Appendix __ for complete measures). Higher scores indicate stronger beliefs in climate change.

Appendix H
Future Action Intent Independent Samples t-test

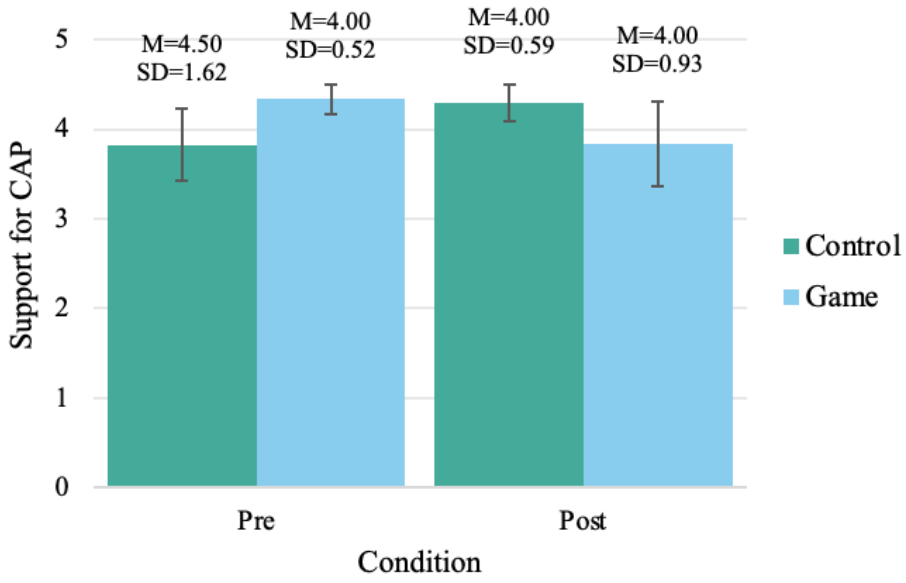
Figure H1

Number of Future Intended Actions by Condition



Note. Error bars represent ±1 SEM. An independent sample t-test did not reveal a significant difference between groups, t(48) = .92, p = .36. The effect size, measured by Cohen's d, was d = 0.25, indicating a small effect.

Appendix I
Change in UBC's Climate Action Plan 2030 (CAP) Support from Pre- to Post-Test by Condition

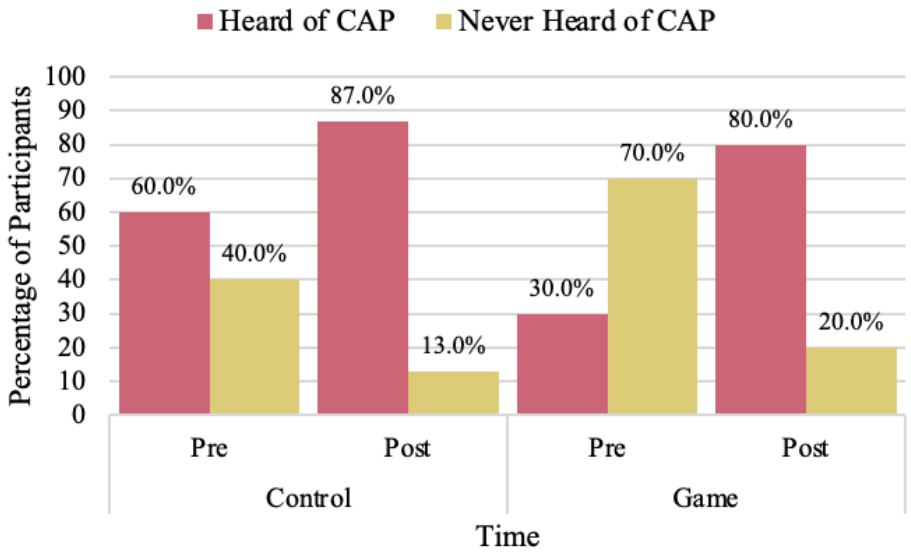


Note. A Welch's ANOVA was conducted to examine the effects of time and condition on the scores. There was no significant main effect of time, $F(1, 21) = 0.64$, $p = .433$, $\eta^2 = .009$, nor a significant interaction between time and condition, $F(1, 21) = 2.46$, $p = .132$, $\eta^2 = .033$. There was also no significant main effect of condition, $F(1, 21) = 0.003$, $p = .959$, $\eta^2 = 8.484 \times 10^{-5}$. All post-hoc comparisons yielded non-significant results, with p-values greater than 0.05.

Appendix J
Climate Action Awareness Chi-Square Test and Logistic Regression

Figure J1

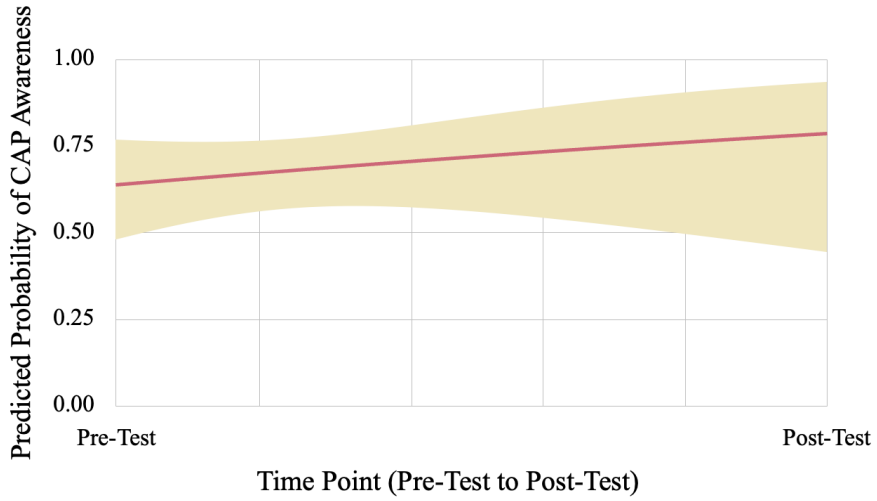
Change in UBC's Climate Action Plan 2030 (CAP) Awareness from Pre- to Post-Test by Condition



Note: Chi-squares were conducted to examine the change in CAP awareness from pre- to post-test by condition. The chi-square for the control group was $\chi^2(1, N = 30) = 5.46$, $p = .020$, with a small to moderate effect size ($V = .30$). For the game condition, the chi-square was $\chi^2(1, N = 20) = 16.94$, $p < .001$, with a strong effect size ($V = .65$).

Figure J2

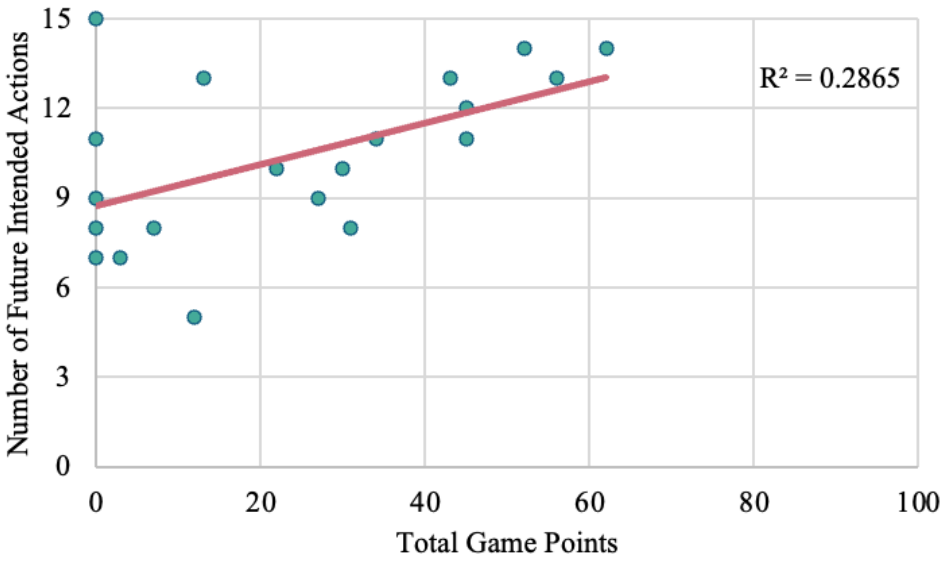
Logistic Regression Analysis of the Interaction Between Predicted Probability of UBC's Climate Action Plan 2030 (CAP) Awareness and Time (Pre/Post)



Note. A logistic regression analysis revealed significant main effects of condition (B = -1.2528, z = -2.040, $p < 0.05$) and time (B = 1.4663, z = 2.243, $p < 0.05$) on CAP awareness. However, the interaction between condition and time was not statistically significant (B = 0.7673, z = 0.776, p = 0.4378).

Appendix K

Pearsons Correlation Between Total Game Points and Number of Future Intended Actions



Note. A Pearson correlation revealed a moderate, statistically significant, positive relationship between total game points and the number of future intended actions ($r = 0.535$, $p = 0.015$).

Appendix L
Contribution of Each Team Member on the Entire Project

Our group had equally distributed responsibilities throughout our research project. All group members' individual responsibilities are shown in Table L1.

Table L1
Outline of Each Group Member's Responsibilities

Project Element	Group Member	Notes
Project Proposal		
Title	All	
Background Literature	All, Elena, Tia*	*All found papers,
Research Question and Hypothesis	Ro, Elena	Elena and Tia
Participants	Chanreet	summarized
Conditions	Emma	
Measures	Milana	
Statical Analyses	Emma, Milana	
References and Appendix	Elena, Tia	
Formatting and Editing	All	
Submission	Elena	
Meeting Scheduling + Information		
Project discussion meeting		
Booking	Elena	
Questions	All	
Submission	Elena	
Project approval meeting		
Booking	Elena	
Questions	All	
Progress check-in + stats meeting		
Booking	Elena	
Updating Team Charter	All	
Write-up	Milana, Emma, Chanreet	
Submission	Elena	
Game and Survey Development		
Pre-Survey Creation	Emma, Milana*	*Milana only
Post-Survey Creation	Emma, Tia, Ro	responsible for
Demographics	Emma	uploading consent
Formatting Survey	Emma, Milana	form, Emma did the
Participant Tracker Dev	Elena, Milana	rest
Task List	Ro	
Background Research for Tasks	Ro	
Canvas Shell Aesthetics	Elena	
Canvas Shell Functionality + Quizzes	Milana	

Canvas Shell Additional Information	Ro, Milana	
Data Collection, Recruitment, and Analysis		
Social Media + Email Outreach	Elena, Emma, Milana, Ro	
Poster Creation + Placing	Tia	
Pre-survey Checking	Chanreet, Ro	
Recording Pre-Survey Responses	Chanreet, Ro	
Daily Announcements	Emma, Tia	
Verification Confirmation	Emma, Tia	
Post-Survey Email	Milana, Elena	
Point Count	Milana, Elena	
Statistical Analysis	Emma, Milana	
Presentation		
Title	Chanreet, Ro	
Research Question and Hypothesis	Ro	
Participants	Chanreet	
Conditions	Milana	
Measures	Tia	
Results	Emma, Milana	
Implications	Elena	
Recommendations	Tia	
Design	Elena, Chanreet	
Submission	Elena, Milana	
Final Report		
Executive Summary	All	
Introduction	Elena	
Research Question and Hypothesis	Ro	
Participants	Chanreet	
Conditions	Milana	
Measures	Emma	
Procedures	Tia	
Results	Elena, Milana	
Discussion	Ro, Elena	
Recommendations	Tia	
References	Elena, Tia	
Appendix	Milana, Chanreet*	*Chanreet
Formatting	Milana, Ro	responsible for
Editing	All	challenges section
Submission	Milana	(See Appendix M)
Other		
Client Communication	Tia	
Time Management + Scheduling	Elena	

Appendix M
Problems, Delays, or Difficulties Throughout the Project

One of the key challenges we encountered during data collection was participant error and negligence. Specifically, several participants were excluded from the study due to incomplete survey responses (i.e. missing emails/student numbers), resulting in our inability to contact them and track their progress. This results in us only having usable data from 50 participants, which was well below what we needed to reach statistical significance according to our power analysis.

Another key challenge we encountered was being unable to fully verify that participants were completing the climate friendly behaviours. We had a few instances of individuals submitting fake verification photos, and for other tasks that did not require a verification, we are unable to know whether they actually completed the task or not. This is a large limitation to our method of data collection as we are relying on self-report data that may not be accurate. This may potentially be a larger problem in future interactions if larger rewards are available, as participants may lie about completing tasks solely to earn points and receive the reward.