Climate Challenge – Raising Collective Awareness in the Tradition of Games with a Purpose

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ABSTRACT

The *Climate Challenge* is an online competition in the tradition of games with a purpose that combines practical steps to reduce carbon footprint with predictive tasks to estimate future climate-related conditions. The application is designed to increase environmental literacy and motivate users to adopt more sustainable lifestyles. Its feedback channels include a leaderboard and a visual tool to compare answers of individual players with (i) the average assessments of their direct social network contacts as well as the entire pool of participants, (ii) a selected group of experts, and (iii) real-world observations.

Author Keywords

Collective awareness, games with a purpose, social media, environmental communication, climate change.

ACM Classification Keywords

H.1.2 [User/Machine Systems]: Human Factors; H.5.3 [Group & Organization Interfaces]: Web-based Interaction; I.2.1 [Applications and Expert Systems]: Games.

INTRODUCTION

The *Climate Challenge* provides an engaging way to help people learn more about Earth's climate, assess climate knowledge, and promote the adoption of sustainable lifestyle choices. Measuring the distribution of opinions among citizens in a monthly prediction task as shown in Figure 1, for example, sheds light on collective awareness processes and represents a first step in harnessing the wisdom of the crowd in ways that benefit society – e.g. decision making in the face of a high degree of uncertainty.

Going beyond informing citizens and focusing on triggering environmental action and behavioural change, the *Climate Challenge* as a platform-independent social media application that engages citizens with a competition in the tradition of games with a purpose [1; 2].[1] The application motivates participants through a gamification strategy, in which individuals are immersed in a cultural context that favours play and healthy rivalry within an online community. This competition-based approach is intended to overcome the perceived lack of personal efficacy when addressing environmental problems. It differs from existing studies by (i) engaging a more diverse population, (ii) taking place over a longer period of time – as part of the DecarboNet project (see below),[2] the authors aim to run the *Climate Challenge* for at least 18 months, and (iii) measuring not only changes in energy conservation habits, but also capturing evolution of environmental knowledge and attitudes which are at the foundation of sustainable changes in behaviour.

Advantages of using social networking platforms to engage citizens include a large number of potential participants, intrinsic motivation in an environmental context, and effective mechanisms for games with a purpose to detect and combat attempts of cheating or manipulating results. Viral mechanisms will trigger behavioural change, track the pursuit of common goals and induce competitive behaviour. Using real-time updates whenever possible, the strategy to engage *Climate Challenge* participants and sustain the competition among them includes regular content updates and the unlocking of new task types.

To ensure compatibility with a wide range of platforms, the *Climate Challenge* is based on HTML5 and other Web standards to address desktop and mobile users alike, and provides a flexible authentication framework that supports a separate registration process as well as logins via existing Facebook, Twitter or Google accounts.

MOTIVATION AND GOALS

The DecarboNet project develops a *Collective Awareness Platform* to empower citizens, help translate awareness into behavioral change, and provide analytical and visual methods to understand the processes that underlie this behavioral change. The platform aims to engage environmental stakeholders with a focus on carbon footprint reductions.

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[1] www.ecoresearch.net/climate-challenge

[2] www.decarbonet.eu

Figure 1. Main interface elements of the Climate Challenge (www.ecoresearch.net/climate-challenge)

Climate Challenge is designed to appeal to citizens of various backgrounds, leveraging their interest in the domain as a motivational factor together with the application's entertainment value. Users learn about changes in the Earth climate system, and how to adopt more sustainable lifestyles.

To harness the player's intrinsic motivation, to keep them interested in the game and to encourage them to invite their friends, a variety of tasks is being offered – avoiding repetition and resulting in a richer dataset to analyse. Built-in notification systems and real-time progress statistics help engage users and leverage the wisdom of the crowds for scientific purposes. A differentiating feature of *Climate Challenge* compared to other knowledge acquisition games is its pronounced educational goal, a feature resembling virtual citizen science projects.

APPLICATION DESIGN AND TASK TYPES
The *Climate Challenge* was launched in March 2015 and offers 12 monthly game rounds per year, where players accumulate points by solving various game tasks. Each round combines one prediction question about future climate conditions with a range of additional tasks to earn game points throughout the month. Currently, there are four different tasks built into the game:

- **Awareness** | Test your climate change knowledge
- **Prediction** | Correctly guess the future state of our planet, in terms of both global and regional indicators

- **Change** | Reduce your carbon footprint and adopt a more sustainable lifestyle
- **Sentiment** | Assess keywords in news media coverage about climate change

The bar chart visualization shown in Figure 2 is available via the "Progress" menu – increasing transparency by presenting an overview of the overall game structure. It also lets users track their progress for each task type, and informs them about the total number of available questions.
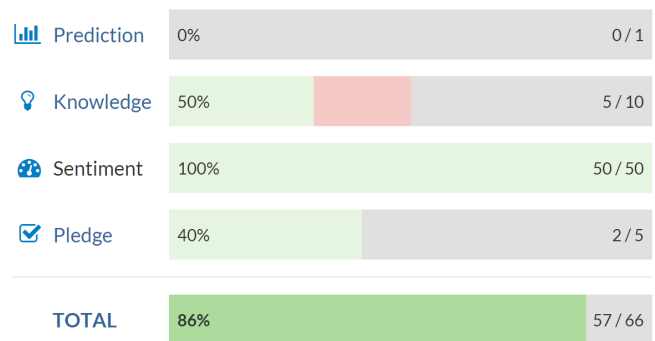
Figure 2. Progress bar to track task completion by task type

A flexible task management and prioritization system, together with the ability to directly link to specific task types, enables the system to personalise content.

Testing Climate and Energy Knowledge. In the early phase of the game, the Climate Challenge provides trivia questions to find out about the users' climate change knowledge. The difficulty of the questions gradually increases over time. The questions cover a variety of topics, from climate and energy facts and private consumption patterns to climate science and policy issues. Quiz questions apply a multiple choice format with a predefined correct answer. Easy, intermediate and hard quiz questions are included to ensure good differentiation between respondents. Wherever feasible, item wordings are identical or closely similar to other international surveys to gain the opportunity for later comparisons with these data sets – e.g., *Eurobarometer*, *International Social Survey Programme* or the *Six Americas Project* [3]. Players gain points for answering correctly, and lose points for wrong responses. The total score from the multiple choice questions serves as an overall assessment of the user's climate change knowledge.

Predicting Future Climate Conditions. This task compares individual guesses about future events to the average estimates provided by a user's friends, the entire pool of game participants ("the crowd"), and a selected group of experts. In a later phase of the game, the actual real-world observations are being revealed to determine whether the wisdom of crowds is a reliable indicator when it comes to predicting future climate conditions. For this purpose, the Climate.gov team of the *National Oceanic and Atmospheric Administration* (NOAA) identifies an authoritative source at the time a question is first published. The measurement published by the source will be considered the final real-world answer. Game points are then distributed depending on how close a user's guess matched the real-world answer.

Users can just guess at answers, or take time to gather more information from a set of recommended links. They can only enter one guess per question, and it must be entered before the stated deadline. To track results after having provided an answer, the system renders the diagram shown in Figure 3. It shows how the user's estimate compares to (i) the average of their own circle of friends, (ii) the crowd – i.e., all *Climate Challenge* participants, (iii) the experts' predictions, and (iv) the highest and lowest guesses. Once measurements are available, the diagram also shows how well the user did compared to (v) the actual real-world numbers, and lists the names of the top three users who had submitted the closest estimates.

Pledging System. Inspired by the WWF *Environmental Recommendations Database* (www.wwf.ch/tipps), the pledging task of the *Climate Challenge* asks for user feedback on practical recommendations to reduce the personal energy consumption and make more sustainable lifestyle choices. The task presents citizen-centred information and allows sharing specific recommendations via e-mail or social networking platforms.

Polarity Assesment. This task aims to determine whether users perceive specific keywords from climate-related media coverage as positive, neutral or negative. They receive points based on how closely their rating matches the average rating by other players, which are added to the total score once per week. To compile the list of climate change-related keywords from Anglo-American news media coverage between January and December 2014, we used an aggregated representation of document keywords from the *Media Watch on Climate Change* [5].
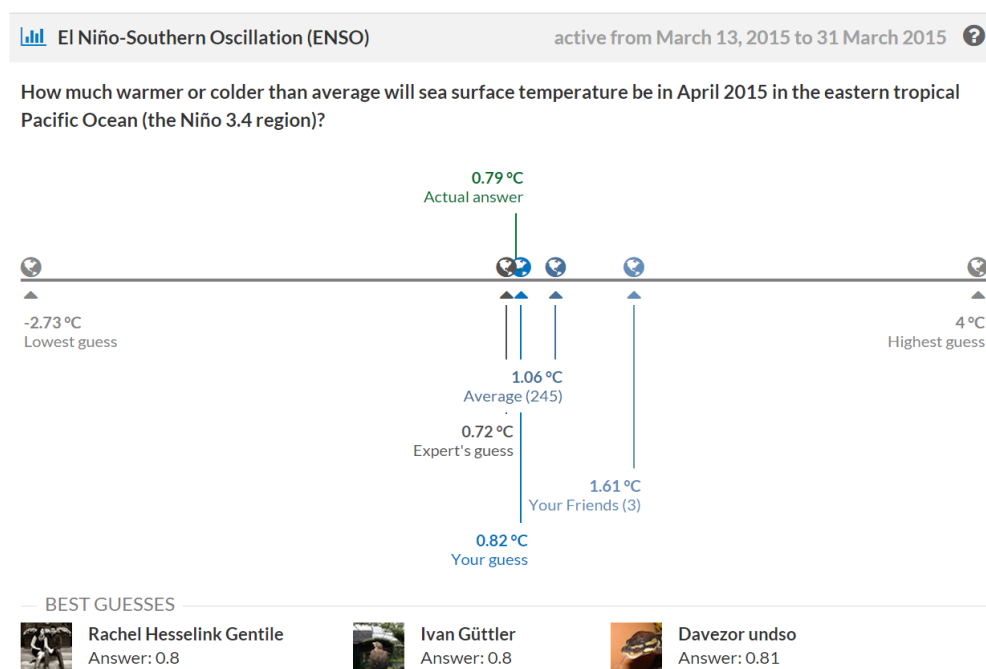
Figure 3. Comparative results of a prediction task, including a list of top-ranked players

Previous crowdsourcing projects [4] showed that the inclusion of named entities yields unsatisfactory results, since their perception is highly context-dependent. Therefore the *CrowdFlower.com* platform was used to classify all candidate terms and exclude references to people, organizations and location. The more than 1,900 remaining terms were integrated into the game.

Participants earn points for matching answers, but can also lose points if their opinion differs from the majority opinion. To obtain the final result for each term, we use five-fold cross validation. This crowdsourcing task yields insights not only in terms of sentiment analysis (e.g., extracting n-grams that indicate positive or negative polarity), but also in terms of better understanding stakeholder perceptions (e.g., how the assessments differ by region).

ENGAGEMENT STRATEGY

In the fast-growing market of casual Web and social media games, it is generally difficult for applications with a sustainability focus to become widely accepted. To attract a large number of players, we use a combination of general and task-specific promotional activities. Built-in incentive mechanisms include a levelling system with the opportunity to unlock additional games features, the comparison of players' performance vis-à-vis their network of online friends, progress statistics for each task, and the leaderboard with aggregate monthly scores shown in Figure 4. The game statistics of a user's online friends who also play *Climate Challenge* are available via the status display.

The prototype of the *Climate Challenge* has been completed as of September 2014. After several rounds of beta testing and evaluation between October 2014 and February 2015, the application was released in March 2015 – in conjunction with the Earth Hour 2015 event.[3] Ongoing evaluation and targeted promotion per task type leverages the existing communities of the DecarboNet core and associate partners – e.g., social media activities around the presented carbon reduction strategies by employees of *WWF Switzerland* or monthly promotion of the prediction tasks by the *Climate Program Office* of the *National Oceanic and Atmospheric Administration* (NOAA).

SUMMARY AND OUTLOOK

Climate Challenge is a social media application in the tradition of games with a purpose that provides an engaging way to help people learn about Earth's climate, test their climate knowledge against others', and promote the adoption of sustainable lifestyle choices. In conjunction with data streams from the *Media Watch on Climate Change*,[4] a news aggregation and visual analytics platform, the *Climate Challenge* will provide the data for longitudinal engagement monitoring.

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[3] www.earthhour.org
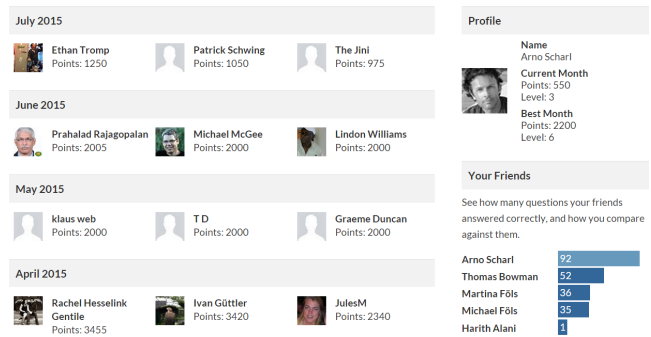[4] www.ecoresearch.net/climate

Figure 4. Climate Challenge Leaderboard; April-July 2015

Future work will introduce specific energy consumption tasks among users of energy monitoring devices, and provide language-specific tasks to assess keywords via the user community of the *General Architecture for Text Engineering* (GATE). The combination of general and task-specific dissemination activities will help to ensure an active user base, connecting and mobilizing different online communities around energy and climate issues.

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