Cultural Probes for the Gamification of Energy Awareness

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ABSTRACT
This paper presents an experimental research proposal for the development of a gamified energy awareness application. Our goal is to get a valuable insight into families’ life and motivations. Specifically, we propose a cultural probes package containing artifacts and tasks that children perform during one week in order to provide us designers with inspirational data not only about them but also about their family and their relation to energy use and energy consciousness.

CCS Concepts
• Human-centered computing—Field studies • Human-centered computing—HCI theory, concepts and models

Keywords
Interaction; Cultural probes; Gamification; Energy awareness.

1. INTRODUCTION
Energy awareness is a societal challenge that aims to encourage people to use energy efficiently and therefore save costs, avoid energy peaks and have good impact on the environment. Undoubtedly, the development of energy awareness applications can help, and here we present our modest contribution to this challenge. In our HCI course, we are developing a web application to provide family’s members with detailed information about their use of electricity and give them useful recommendations to change appliances and/or habits. Firstly, as interaction designers, we need to know the users and their context. To do so, we conducted a contextual inquiry with users through interviews and questionnaires. After drawing conclusions, we realized that people tend to be uninformed and disinterested in the topic of energy. Additionally, the interviews and questionnaires gave us limited data about families’ habits and feelings about energy, and their willingness to change behavior. To address these issues, we have decided i) to include gamification in the design of the application, and ii) to perform further experimental research on families to know them better. Specifically, we propose to gain a deeper insight into the emotional side of families and their activities using the so-named cultural probes method [1]. This method consists in giving the participant a package with artifacts (diary, map, postcard) and tasks to allow her to record specific events, feelings or interactions, then getting relevant and useful data for designers. The designed cultural probe package includes some activities that put a child of the family in the role of an artist, electrician, detective and a journalist, to collect information about family’s relation to energy.

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2. RELATED WORK
In the past years, the number of projects related to smart energy has increased [2] [3]. In this context, and in order to raise users’ awareness, other projects have used gamification to influence and shape their behavior [4]. However, the implementation of gamification in a deep level (not only using PBL - Points, Badges and Leaderboards) is not easy because the designers need to know the users well. Cultural probes is a well-known technique to learn about and gain insight into users [1]. The classical approach of cultural probes is to give one package to each participant in the study, get tasks done in return after some time, and in consequence obtain valuable data about the participant [5], i.e. it is the same subject the one in charge of performing tasks and the one that designers want to collect data about.

We can find in the literature several proposals of cultural probes where participants were children [6] [7]. Our approach slightly differs from these proposals, and in general from classical cultural probes, in the fact of “for who is the package” (children) and the “from whom get data” (families). We propose to give the cultural probe to children, who are in charge of performing some activities not only related to them but also to the rest of the family. We decided to get information of the whole family through children is because cultural probes require time and interest from the user and children tend to have more free time and can be more interested in this kind of dynamic activities than adults.

3. GAMIFICATION
Gamification is the use of game elements in non-game contexts to motivate and influence user behavior [8]. It has been used in different contexts, such as business, marketing and education to engage users in fun and motivating experiences. The success of gamification greatly depends on the context where the gamification is applied, on the final users, and mainly on the design of the gamification, being necessary to define clear objectives and follow well defined steps [9]. In the following we synthesize the common steps that different gamification frameworks focus on [10] [11] [12] [13] [14] [15]:

Stage 1. Define objectives and target behaviors.
At this stage, designers state why they want to gamify, the behaviors they aim to influence, and what are the benefits that the gamification provides to the system. They also propose metrics to gauge the success of the gamification process.

Stage 2. Describe the players. The goal here is to know and understand the potential players' thinking: who are the players? What are their needs and goals? What social actions do they find enjoyable? Do they enjoy games? If so, what characteristics of games do they find most appealing? Why are they playing? Understanding common characteristics among the different types of players can help designers to tailor game mechanics to change users' behaviors [14].

Stage 3. Devise fun activity loops. Designers define the game elements and the game mechanics that will be used to create
player’s engagement. These game elements are not only external rewards (like coupons, badges or points), but also those related to intrinsic motivation (self-realization, self-confidence, feel connected to others). Gamified activities have to balance the difficulty of a task so that players become neither anxious nor bored, maintaining a flow state during the experience. This is the hardest point for a gamification designer due to it is a creative process where no specific rules or guidelines exist.

Stage 4. Deploy, play-test. This step implies the testing and deployment of the gamification with users in a real environment. The test will be useful to enhance some design aspects and refine details of gamification mechanics.

Stage 5. Evaluate the effectiveness of the gamification. Using defined metrics, designers can collect and analyze data to track user activity and measure the degree of achievement of the goals defined in the first step. Generally, designers also use this information to refine and improve future designs.

As a conclusion, the gamification design process heavily relies on knowing the users (players) and its context. Our intuition is that cultural probes can be adequate to gain empathy and gather relevant data regarding electricity use in families, which could be more difficult to achieve with other methods as questionnaires and interviews. Additionally, cultural probes are less intrusive than field observations.

4. CULTURAL PROBE PROPOSAL
Participants are children between 8 and 12 years old. The cultural probe duration is one week. Each child receives a package with the following activities:

- “Become an artist and draw your own family (including yourself) using electrical appliances, indicate their mood and explain your drawing.” The package will contain paper and pencils. Figures 1 and 2 show two examples of the expected result performed by children in a pilot test.

Through this task, we will be able to determine what electrical appliance(s) children relate to each member of the family. Moreover, we’ll get the users’ mood information through the children, who are the ones that know better how their family members are feeling at that moment. This mood data can inspire the gamification designers to develop an application that engages and motivates users. For instance, if they are sad while they are using electrical appliances, the application can motivate them to do the tasks quickly or less frequently. The extra explanation that children give can also be helpful to understand the drawing and maybe get a bigger insight.

- “Become an electrician and use stickers to mark the electrical appliances you have in each room and who uses them each day for a week. Make your own reflection answering the questions you’ll find in the last page.”

For this task, the package will contain a notebook with the following contents: the instructions specified above in the cover, seven templates of house plans (one for each day of the week), the needed stickers (electrical appliances and family members icons), and a final page with questions for the last reflection. The questions will be: “Do you think that there is a wasteful person in your family? Who? Why?”, “Do you think that there is a saver in your family? Who? Why?”, “What electrical appliances do you think are the most important for each member of the family?”. Figure 3 shows a sample of the inside of the designed notebook.

![Figure 3. Stickers and template of house plan for one day.](image)

This is a useful task to learn about what are the electrical appliances owned by families, their distribution in the house and who are the main users of each one. The result can also reflect the frequency of use of each electrical appliance. Moreover, the answers of the final questions can determine useful and important facts to implement the gamified application. For instance, if we can determine the most important electrical devices for the members of the family, bigger rewards can be given if the habits related to that device are modified in a positive way.

- “Become Sherlock Holmes for a while and discover. Ask your parents what green behavior is and write their answer. Do your parents think they have a green behavior? Why?”

For this activity, the package will have a decorated paper (pipe, magnifying glass, poly-cotton hat) containing the questions and spaces to fill in. Figure 4 shows the material designed for this task.
This activity is specifically designed to know how informed are the adult members of the family about green behavior and how much do they care about it. The obtained information can be used to determine how the application can present information about this topic. If people are not conscious, gamification could be a good idea to motivate them to learn about green behavior and also to make them aware of how important it is and the repercussion it has in energy saving and their lives.

- “Become a journalist and interview each member of your family”. For this task, the package contains questionnaires (proposed by Marczewski [14]) to determine the player type of each family member (including one for the child in charge of the cultural probe). The gathered information sets the general trend of player types within a family that can be used by the gamification design team.

5. CONCLUSIONS AND FUTURE WORK

This paper proposes a cultural probe for gathering data related to families in the context of energy use and saving. Although tasks in the package are designed to obtain relevant data about all members of the family, only one member (child) will be on charge of performing them. We have proposed 4 tasks. In the first task children draw the members of their family, including their mood, and involvement in sustainable behavior. In the last one, children ask questions to all the members of the family in order to collect information that we will use to determine their player types. The information obtained with these tasks will be used to design the gamified application according to families motivations, habits and values.

As on-going and short-term future work we want to perform the culture probe experimental research. We also plan to develop a mobile application (its QR-Code inside the package) to make it easier for the children to perform cultural probe tasks and also enhance their experience. It would contain instructions, remind users the completion of activities, and also facilitate the gathering of pictures. Some additional tasks that could be proposed for the application are to play the role of: a smart-meter and specify the electrical appliances that are in current use and by whom in a certain moment of the day, and a paparazzi to take photos of the members of the family using electricity.

The cultural probe itself could also be gamified (meta-gamification) to ensure its completion by including enjoyable activities to motivate the children through some challenges (either competing with the other members of the family, or even other children also participating in the cultural probe). The application mentioned above could be a helpful tool to add gamified tasks in the cultural probe.

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6. REFERENCES