Using Availability Heuristics in Game Design to Introduce Children to Energy Sufficient Behaviours at Home

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Abstract. Parents looking to foster more energy sufficient behaviours in their children struggle to have their child maintain these behaviours unsupervised. Our research indicates that in order for the child to maintain these behaviours, s/he must perceive him/herself as an eco conscious individual. We propose that increasing a child's ability to firstly recognise eco-friendly behaviours and secondly, recollect them, is likely to yield a greater affinity for habitual energy sufficient behaviours. This paper describes a first prototype game, whose interface employs availability heuristics and other persuasive design elements to achieve this goal.

1 Introduction

The negative impact of increasing global energy consumption on our environment is becoming alarmingly apparent [1], [2]. It is recognized that the problem has to be tackled and from multiple angles, for example recycling schemes for plastics and glass and energy efficiency labels for electrical appliances [3]. We describe the user-centred design of a dedicated system aimed to foster energy sufficient behaviours at home in children aged between 8 and 10 years. Our user group is inspired by the idea that knowledge and skills practiced in childhood, will lead to eco-friendly decision making in adulthood.

To gauge the desirability of such a system, we conducted an online survey involving 25 parents. The survey outcomes indicated that parents would indeed welcome more energy sufficient behaviors in their children. In addition, it revealed that the challenge lies in getting the children to adopt these behaviors unsupervised. This is thus the focus of the system explained within this paper.

2 Design: approach and concept

Once established, human behaviors generally take a long time to change. Literature research into this area indicates that there is a feed-forward loop between attitude and

self perception [5]. According to Cornelissen et al. [5], self perception is dependent on the availability heuristic of specific behavior-related information.

In order to gauge the connection between children's attitude and their knowledge of energy sufficient behaviors five children of ages between 8 and 10 were interviewed. The interviews were conducted at 2 different international primary schools in the Netherlands. During the interviews, a quiet location at the child's primary school was chosen and he or she was asked a set of pre-made questions in a conversational manner. The questions were designed to gather information regarding the relation of the following four key areas: knowledge, activities, communication and attitude, and energy sufficiency.

Our findings showed that the children were aware of direct actions such as switching off electrical appliances such as lamps, televisions and computers. Upon probing, the children were able to identify further energy saving actions such as closing doors or dressing warmly in the winter. We observed the need for probing, and the outcomes as an indication that there were likely to be further actions which children carry out at home but which, due to their indirect relationship with energy, were not readily associated with eco-friendliness. This observation inspired the primary function of the proposed system: to increase the children's ease of retrieving pro-ecological actions.

The envisioned design is an intelligent system that facilitates a game employing role play to challenge children to independently execute character-specific energy sufficient actions during their normal daily routine. These actions are monitored by the system and feedback that is both stimulating and educational is provided in a manner that reinforces the child's ability to associate the action with eco-friendliness. It is our expectation that long term play of this game, will strengthen the child's long term perception of him/herself as an eco-conscious individual.

3 Concept: implementation and evaluation

The system described in Fig 1. implements 3 preliminary components identified as being the foundation of the conceptual model of the envisioned game. These components are 'Character Cards', an 'Activity Tree' and a list of 'Alternative Energy Sufficient Behavior' (AESBs). For ease of evaluation, it has been developed as an interactive web based interface. Our objective is not to test the 'real time' properties of the game but rather, if the enforced relationship between the 3 key components is suitable for increasing children's knowledge of AESBs. The relationships between the components are described below:

- AESBs describe different energy sufficient behaviors that children aged between 8 and10 might carry out a specific activity during their daily (weekday) routine. They are presented in text format, in a list of 5. These five comprise of 1 energy-neutral behavior, and 4 energy-impactful behaviors. Of these 4, only 2 are fitting to the persona of a 'Character Card'.
- A 'Character Card' is an item depicting a child aged between 8 and10 who, due to his or her personality, is inclined towards specific AESBs. Of the five AESBs listed, only two correctly match both the activity presented by the 'Activity Tree',

as well as the profile of a child on a specific 'Character Card'. The objective of the game is to identify the 2 correct AESBs.

- Activities are mapped to the branches of an 'Activity Tree' visualization. This mapping has the purpose of communicating the impact that different behaviors can have on the tree during a specific routine activity such as breakfasting. The tree communicates its health through its number of leaves and the brightness of its leaves.

To play the game, the child selects either to try an evening or a morning activity. Upon doing so, the timer starts and s/he is presented with the elements in stage 2 of Fig 1. The child then selects and deselects the AESB as s/he sees fit, pressing the 'Check Guess' button when ready to test the guess. If the guess is correct, the timer stops, all the targeted leaves from dark green to bright green and a congratulatory message appears on the screen. If the guess is incorrect a message appears for a short period, informing the child of this, the child should then try again.

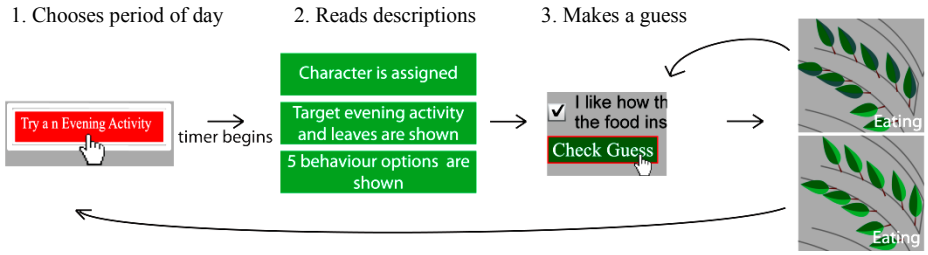

Fig. 1. Example outline of the game sequence supported by the interactive web-based prototype

By varying the combinations between 'Character Card', targeted activity and number of targeted leaves, the game can offer varying levels of difficulty.

3.1 Scenario Evaluation

For the test scenario, 4 children aged between 9 and 11 were provided with a URL link to the game so that they could play it individually in their own homes. The children were instructed to play the game twice: once for the morning routine and once for the evening routine. Prior to playing the game, they were asked to read through a pre-test form presenting two lists of the same 13 energy impacting behaviors. Amongst these 13 were the AESBs presented in the game scenario. For one list, they were asked to select the behaviors which they thought best completed the following sentence: *"When I want to save energy around breakfast time I can…"*and for the second list, the following sentence was used: *"When I want to save energy around relaxing time in the evening I can…"* After playing the game once per period of day, they were required to fill in a post test form involving the same list and activity as the pre test form. Finally, the forms were sent via email.

Each behavior had a weighted value of 0, 1 or 2, depending on its suitability to the headline sentence. This weight was used to calculate the scores achieved by the children. The results showed a lack of improvement by 18 of the behaviors. Of this

18, 9 were negative results- i.e. the child selected the behavior in the pre test form but not in the post test form. The other 9 showed no change. Six out of the 26 available behaviors showed positive improvement. Four out of this 6 belonged to the morning activity. Child 1,2 and 4 showed an increase in their scores of percentages 12, 3 and 3 respectively. Child 3 showed a decrease of 3%.

The results showed that there was a marginal increase in the children's familiarity with AESB: with 3 out of the 4 children being able to identify AESBs more correctly than before. The children's remarks regarding the textual feedback in particular indicated that they understood the mapping between successful guesses and unsuccessful guesses. This indicated that the game had been successful in introducing the participants to AESB.

4 Discussion and Conclusions

We found that with a short test, we were able to increase the children's ability to identify more energy efficient behaviors than before. This is a promising finding, as it gives confidence in the potential impacts such a game could have.

This paper has made one major contribution towards the design of educational interactive systems for initiating behavior changes in children. We have shown with a first prototype game designed to present alternatives to habitual behaviors to positively influence a child's affinity to energy sufficient behaviors.

Further work could focus on extending the list of eco-friendly behaviors children could perform, and even have lists tailored to certain ages. In addition, more thought could be put in the 'Character Card's to appeal to children of various ages. Finally, a more robust and extended set-up would allow us to conduct a more thorough test regarding the potential of the game to add knowledge, and ultimately change behavior.

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