Yummy Tricks: A serious game for learning healthy eating habits

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Abstract - Cure4Kids organized the first Global eHealth Challenge in 2010. This contest encouraged creating innovative multimedia applications that help educate children or parents about cancer and healthy living. Here, it is described one of the applications submitted to this contest. The presented application is a serious-game containing several mini-games designed to teach healthy eating habits. Each mini-game involves learning a “trick” or a lesson. Two mini-games have been developed so far, but the application may be extended with more. Several design decisions were taken to make games enjoyable and appealing to children. This application was awarded with the gold award of the Challenge.

I. OBJECTIVE

The Cure4Kids group, an initiative of the St. Jude Children’s Research Hospital, created the Global eHealth Challenge 2010. This is a worldwide open contest for developing a web page, an application or a game that improves kids’ health or knowledge, in one of these three topics: cells, cancer or healthy habits. This paper describes one serious game that participated in this contest. It exploits the healthy habits topic, which has a very important impact in reducing the risk of cancer.

Serious Games [3] deliver intense usable moments with the support of different platforms and social networks. Higher degrees of motivation ensure efficiency and performance. These allow creating powerful and truthful experiences on the basis of providing the user with goals, challenges, problem-solving and rules, besides a clear internal value and an interactive experience. Our software and hardware-based tools should have the power to teach and change us, while making us better problem-solvers and professionals.

The name of our serious game is “Yummy Tricks” because it presents a set of tricks that help achieving an adequate healthy diet. The application contains two mini-games, each one having a trick. The objective of the games is to teach children healthy eating habits while having a good time playing.

The intended audience for the game is children aged between 7 and 10 years old. At this age, children are capable of distinguishing between healthy and unhealthy food habits. It is observed that there are children within this age who spend time alone at home [1]. During this time they take some important eating decisions, such as what to eat, when to eat it and how much food. It is believed that educating children in healthy food habits will help them to take appropriate decisions when they do not have adult supervision. Moreover this may help them in the future, when as adults must take these decisions always by their own. The geographic audience is limited to Spain, because food habits are different depending on the country.

The game play involves dragging virtual objects on a 2D space. It is tested, that performing this task is easy enough for children of this age [2]. The application has been designed to be played in a touch device, because this makes the task of dragging very intuitive. However, it can also be played using a mouse at the cost of little more difficulty.

The main goal of our development is to improve children’s eating habits. This is achieved by developing a serious game as we have presented already. The game teaches children with some important nutrition concepts, and tries to increase their conscience about the importance of food. For this reason the game’s objectives are helping children to:

- Distinguish groups of foods and what food belongs to each of them.
- Learn that a healthy diet requires eating foods from different groups in a balanced manner.
- Emphasize the importance of distributing food intakes into five meals per day.
- Be aware of the amount of food that has to be eaten at different meals.
II. IMPLEMENTATION

A. Game Mechanics

The application is a container for mini-games. It currently contains two games but may be extended with more. For each game there is a preparation screen. This screen contains a “trick”, which describes the lesson that must be learned on that game, and instruction for playing the game.

A.1. First Mini Game

The learning objective for the first game is to distinguish between the groups of foods in the food pyramid. The trick screen shows a food pyramid, so the player can identify the groups of foods before playing. The game shows a basket at the bottom of the screen. This basket can be dragged left and right to collect the food elements that fall from the top of the screen. Children must show their ability on collecting food elements from only a single group. The following figure shows a schema of the game mechanics.

![Figure 1. Game mechanics for the first game.](image1)

At any time, only one food group should be collected. The current group changes several times during the game. There are two visual feedbacks to indicate a change of food group: a label with the name of the food group that appears at the center of the screen and a change in the color of the basket. This color matches the color of the food group label.

The challenge for the user/learner is to get as many points as possible within a limited time. Two points are obtained every time that a food element belonging to the current food group is collected. One point is subtracted for collecting a food element of a different food group.

The game ends after fixed time duration. At this time an end game screen is shown. This screen contains the score of the current game, and one of these two messages: invitation to try again if the score is low, or "excellent!" when score is high.

A.2. Second Mini Game

The second game has two learning objectives: the convenience to eat five times a day, and which foods are more appropriate for each meal. This is explained in the trick screen. The game consists in dragging full meals through a “tunnel”. The end of the tunnel contains a label with the name of the meal. The game's challenge is in moving the food without touching the walls of the tunnel. An example of a map design is shown in the following figure. There are several map designs. Every time a gamer plays the game, one of the maps is selected randomly, thus avoiding repetitiveness. The meal icon has to be dragged downwards. If during this process, a wall is touched, the meal returns to its initial position (the top position).

![Figure 2. Example of map design for the second game.](image2)

The game ends when all five meals have reached their destination. At this time an end game screen is shown. This screen contains a congratulation message for the gamer.

B. Technological Flexibility

The application has been developed in such a way that is very easy to add new games. Each game is developed as an individual application. The only think that must be done to add it to the main application, is to add a button in the main menu. That has to be done by modifying the source code of the menu.

All coding of the game has been done in the Java programming language [4]. This language has been chosen for several reasons: it is open source, which allows developing and distributing it freely; it has multiplatform support; and the language is extended with...
many features that facilitate high-level graphics application programming.

C. Adaptability

As mentioned before, the application is developed in Java [4], which facilitates multiplatform support. That means that it can run on different operating systems such as MS Windows, Mac OS and Linux. The current game version consists of two releases: an executable file (.exe), which facilitates its installation in a Windows environment; and Java bytecode, which lets to run it in any of the above-mentioned platforms [5].

Several interactive devices may be used to play the game. These are a PC using the mouse, a PC with a pen tablet, or a tablet PC. Touch screen interaction makes game play more intuitive. The following image shows a tabletPC and a pen tablet.

Figure 3. Examples of a tablet PC (left) and a pen tablet (right). Courtesy of shop.ebl.com and ldtstudio.coe.uga.edu.

D. Healthy habits research

The application development required research on healthy habits. Several sources of information have been consulted. For the types of food, quantities and menus it has been consulted two sources of information: M.D. Graciela Ribas, which has an expertise in nutrition, and Cure4kids documentation found in [6]. The food pyramid, as shown in figure 4, is based on the one proposed by the Health and Agriculture Departments of the United States [7].

E. Graphic Design

The graphic identity of the application, such as the logo and all the graphical interface elements of the game, are designed following the ideas behind “Yummy Tricks”. These are happiness, vitality, energy, confidence, variety and intellectuality.

Several logos using these ideas were created. Results are shown in figure 5. We showed these logos to potentially users of the application to help deciding the one that is more appealing for them.

The logo that got more acceptances among children was chosen as definitive. It is shown in the figure 6. This logo uses a mixture of types of typography: “sans serif” with rounded edges for the word “yummy”, which recalls to children’s handwriting, and “serif” for the word “tricks” to represent formality, reality and credibility. The tricks are the lessons to teach.

As for the colors, we used some warm and saturated colors in the first word to represent happiness. For the word “trick” we used the blue color. Blue is “intellectual” and represents veracity. The representations of colors are based on the study in [8].

Regarding the graphical interface and other graphical items, let us mention that they were created under a level of figurative representation rather than abstractive. Figurative representations resemble reality but with a touch of abstraction on its traces. That helps children to identify real objects without the need of using photographs. The “cartoon” style makes it more
appealing to children, transmitting happiness and fun. Designs for food are shown in figure 7.

Figure 7. Design of the meal icons.

Colors used in many graphic elements of the game are highly saturated. These represent joy, vitality, playing, learning, and the energy produced when eating healthy. Colors from the whole spectrum are used, which reinforces the idea of diversity, as it should be in a balanced diet.

III. OBSERVATIONS AND RESULTS

Preliminary studies included three children having tested the application during different stages of the game. Their opinions affected design decisions since early stages of the project. All testers found that the game was fun and they liked its colorful design.

The main screen of the application is shown in figure 8. The layout is simple but very colorful. It contains buttons to access games 1 and 2. These are labeled as Trick 1 and Trick 2. Moreover, there is an exit button and an information button.

Figure 8. Application main screen.

Each game starts with a trick screen. This screen shows a recommendation about healthy eating habits related to the current game plus a set of playing instructions. Figures 9 and 12 present the trick screens for both games.

The first trick involves “knowing the groups of the food pyramid for a healthy diet” The concept is accompanied by a drawing of the pyramid. The game starts after clicking the arrow button.

Figure 9. Screen with the trick for the first game.

Figure 10 shows a snapshot of the first game. The basket is being slid left and right by the gamer to collect only the food elements that correspond to the current group. Food elements are falling from the top following vertical paths at random velocity, and from random horizontal positions to increase challenge. In Figure 10, the current group is “Fruits”, as it is written in the violet label on the top of the screen. The color of the ribbon on the basket matches the color of the label and changes with different groups. In this example, capturing the strawberries will add 2 points to the score, grabbing the bacon will subtract 1 point, and not grabbing the orange will not subtract any point but it will not add anything either. Current score is always shown in the top of the screen.

Figure 10. A screenshot of the first game.

The game will change the group that must be collected several times and will end after a certain number of changes. At that time, the game screen will change to the score screen. This screen shows the final score and one of these two messages: “keep trying” if the score is low; and “well played” if the score is high. Figure 11 shows an example with a high score.

The trick for the second game is “A balanced diet should include 5 meals distributed along the day”, and includes a graph with recommendations about what time to eat them. These times may change depending on the country. This screen shows typical hours for our country which is Spain.
The objective of the second game is to drag meals from the top of the screen to its destination area, situated at the bottom. Figure 13 shows a snapshot of this. Two meals: “desayuno” (breakfast) and “media mañana” (noon) are already situated at its destination area. The meal “comida” (lunch) is being dragged at this moment. If a meal icon overlaps the walls of the tunnel, shown in green, the icon returns to its original position. When dragging a meal its icon gets shrunk. This balancing key moderates game difficulty to appropriate levels. The meal will return to its original size once reached its destination area. Finally, the two other meals are still at their original positions.

There is always the option to exit a game by clicking the exit icon at the top of the screen. The exit action returns to the main menu screen.

IV. CONCLUSIONS

Preliminary results show that the proposed application successfully engages children on playing while learning healthy food habits. Being at a game helps motivation for playing it over and over. Moreover, being extendable with other mini-games helps improving the game with additional learning lessons.

Initial observations show that children understand and remember the lessons for each game. However, future research, such as the one performed in [9], is needed to verify the effectiveness on changing food habits on them.

The application was awarded with the first prize (Golden Award) of the eHealth Challenge 2010. We thank Cure4Kids and Sant Jude Children’s Research Hospital staff for organizing this contest and promoting kids’ heath around the World.

V. REFERENCES