

The Study Buddy

A friendly sloth to help students' focus

For over two thirds of among the youth, the use of mobile phone takes up to three hours a day. Thus, the mobile phone is a distraction during study sessions. We present the Study Buddy design prototype as a remedy to mobile phone usage distraction. The main idea is that the mobile phone is locked in a box, controlled by a timer. Students choose the desired study time, and get encouragements from a friendly little sloth who slowly climbs a tree, tells when it is time for a break, and when the study session is over. This paper presents the design and formative user experience evaluations of the Study Buddy. The results indicate that users feel it is easier to concentrate on their studies when their mobile phone is locked away, and that the Study Buddy makes them aware, in a relatively playful way, how much time remains of the study session.

CCS CONCEPTS • Hardware~Communication hardware, interfaces and storage~Tactile and hand-based interfaces • Human-centered computing~Interaction design~Empirical studies in interaction design

Additional Keywords and Phrases: Tangible Interaction, Education, Health/Wellness/Assistive Technologies

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1 INTRODUCTION

The mobile phone takes an increasing amount of time from our lives. For over two thirds of among the youth, the use of mobile phone takes up to three hours a day [1]. The presence of the mobile phone is a major distraction during a study session, and, according to David et al. [2], the total time one spends on the mobile phone and studies exceeds the 24 hours of the day, which means that these activities often take place simultaneously. Patil et al. [3] have shown how the efficiency and focus of the studies decreases with the mobile phone's notification, and how students' academic performance deteriorates with increased use of mobile phones. Furthermore, students who spend more time on their mobile phones prolongs the time it takes to finalize an assignment [3]. Excessive mobile phone use can lead to addictive behavior, which can have negative impact on a student's performance and mental health [4]. To minimize the consequences previously mentioned, we believe a solution could be to remove the mobile phone during study sessions. As an indication of peoples' awareness of the negative effects of mobile phone usage, the mobile box became the "Christmas gift of the year" in Sweden 2019 [5].

On the basis of the mobile box we present the design process, formative evaluation and the design itself of the Study Buddy, a tangible design artefact with the aim to help students to focus on their academic studies. The Study Buddy is a mobile box that stores the phone and makes it inaccessible for a specified period of time, hence remedy the distraction from the mobile phone during study sessions. In addition, Study Buddy is intended to increase the motivation to study and we think it could help all students where the mobile phone occurs as a distraction.

2 RELATED WORK

Beside the basic mobile boxes, without either lids or locks, there are several apps that were designed to help students decrease distraction from their mobile phones. For instance, the “Study Bunny: Focus Timer” [6] involves taking care of a rabbit by studying together with it. Another example is the application “Forest: Stay focused” [7] where the user plant trees / builds a forest. Instead of, somewhat paradoxically, using apps on the mobile phone to reduce the distraction from it, Caballa et al. [8] made a tangible design. They approached the problem for students to keep focus during nightly study sessions by the design of a social robot called Flumzis. The robot tells the students when it is time for a break, and it provides tips on healthy snacks, hence it optimizes the students focus. Another work that tackles the concentration issue is the Kip3 robot [9]. Zuckerman et al. designed the robot to help students suffering from ADHD to maintain their focus during their studies. When the robot detects a student’s focus loss, the Kip3 makes gestures to alert the student. The results from their study showed that most of the participants felt that Kip3 could be a helpful solution to gain attention. In our design we sought the positive effect of the presence of a tangible entity shown in the Flumzis and Kip3 projects.

3 METHODOLOGICAL REMARK

We have had a research through design approach utilizing a combination of introspective reasoning, analytical-critical work, Wizard of Oz evaluation [10], and formative user experience evaluation of a working prototype. Using introspective reasoning as a research method implies that the researcher, or the user or practitioner, is aware of and reasons about the mental objects and the internal reasoning processes involved when using an artefact [11], such as the Study Buddy. This reasoning is based on related work in the problem space, but also allows us to incorporate our own lived experience of mobile phone distraction. With an analytical-critical approach, salient concepts are identified by presenting illustrative examples and then reasoning around these. The practice of criticism has been proposed to be beneficial in the field of interaction design [12], and a way to produce intermediate-level knowledge about experiential qualities [13]. Experiential qualities are particularly characteristic qualities of the users' experience for a specific type of use situation. As part of this process, we also rely on the construction itself as part of the process of understanding the design and its qualities - “making yields artifactual knowledge” [14].

4 CONCEPT PHASE

In the beginning of our design process we used an analytical-critical approach for how our Study Buddy would work. We brainstormed various suggestions for functionality and all ideas were documented in a mind map. Finally, we agreed upon four different functions, visualize time, motivate the student, encourage breaks, and provide an option for study time.

Based on the functionality, we discussed three conceptual directions:

1. Application. A Tamagotchi-like application that blocks access to other applications for a certain period of time and motivates the user to feed or otherwise support the life of a living virtual being.
2. Box. The phone is locked in a box. The box has options for setting time and is visualized with a physical character.
3. Application + Box. An application with minimal functionality that makes it possible to set the time. The phone is placed in a box that receives time information from the device and physically blocks access to the phone.

As previously described, today there are various apps solutions to help reducing mobile phone usage or to optimize focus when studying. The disadvantage of these solutions is that the mobile phone needs to be used to start the applications, which does not prevent the actual use of mobile phone during studies. There are also studies that shows benefits when interact with a physical robot over a character displayed on a screen [15]. Further there are no combined solution that reduces the mobile phone distraction factor and at the same time increases the student's focus and motivation. Even though both Flumzis and Kip3 are meant to improve students focus the issue with distracting factors, like a mobile phone, is still unsolved. Based on these factors, we have chosen to develop a Study Buddy in the form of a mobile box that locks the phone mechanically.

To visualize time, we wanted to use a symbolic activity associated with achievement such as walking up the stairs, climbing to the top of a mountain, climbing a tree or running a marathon. We considered the image of a mountain climber, however, a human shaped robot can create high functionality expectations. When the robot cannot live up to those expectations it can result in a negative interactions experience [16]. Fink's study showed that people interacted more physically with animal shaped robots which can contribute to an improved interaction experience [16]. We therefore chose to portray our Study Buddy as a sloth. Sloths are slow-moving animals, on the ground they are not safe, they need to climb trees to avoid predators. Furthermore, sloths have a relaxed and friendly appearance that we believe motivate the users to help the animal climb the tree and thus also achieve its goal.

To give students an opportunity to select and display desired studying time, we chose between a digital display, light emitting diodes (LED) and a mechanical setting (students put their sloth in the tree at a certain distance from the top and the sloth begins its climb from that position). We decided to use the LEDs since the aesthetics of a display would be too "digital" for our design. Compared to the mechanical setting, LEDs give more accurate feedback.

At the final stage of the concept phase, we came to a conclusive decision: Study Buddy is a mobile box that locks the mobile phone in such a way that it is not possible to take it out before the time runs out. All interaction takes place via the box where we have imagined the following interaction order: open the box, put in mobile phone, close the box, set time and press start, which can be compared to a microwave oven. Visualization of time consumption is implemented with a sloth that continuously climbs up a tree. Moreover, the sloth tells when it is time to take breaks and provides encouragements to the student. On the basis of these design decisions we explored the design space before we made a paper prototype to evaluate the design.

5 PAPER PROTOTYP

Based on the sketches from the concept phase, a paper prototype was created (Figure 1, 2) to model design choices and evaluate the usability of these.



Figure 1: Overview of paper prototype, mobile phone compartment on the left side of the box.



Figure 2: Close up of diods and controls on the paper prototype. Text and pictograms are placed on the box to clarify what the controls do.

To evaluate our design choices, we invited three computer science students to test the paper prototype individually. Prior to the evaluation, the students were informed that participation is completely voluntary and that it is possible to cancel at any time if desired. Because the evaluation was performed through observations, it was not possible to keep the participation anonymous for us in the project group. In addition, due to the prevailing corona situation, there was no opportunity for more participants.

At the beginning of the observation, each participant received the following information about the project:

"It is a Study Buddy that will help you study, by eliminating mobile phone distraction. The time during the evaluation is much faster than in reality."

The information did not include any further instructions. The reason for this was to analyze how the participants choose to interact with the prototype. Participants were given a book to read during the test, to simulate a study session. After the test, we enquired them to share their thoughts.

Before the test, all participants stated that they need help to maintain concentration. During the test, all participants encountered two problems. It was unclear where the mobile phone should be placed, it took time before the compartment was discovered. Also, what happens if the user needs to access the mobile phone before the study period is over? To solve the first problem that arose during this evaluation, we changed the original design. We placed the mobile phone compartment on the front instead, which means that all interactive controls are now on the same side. This makes it easier for the user to understand how everything is set up and started (figure 3).

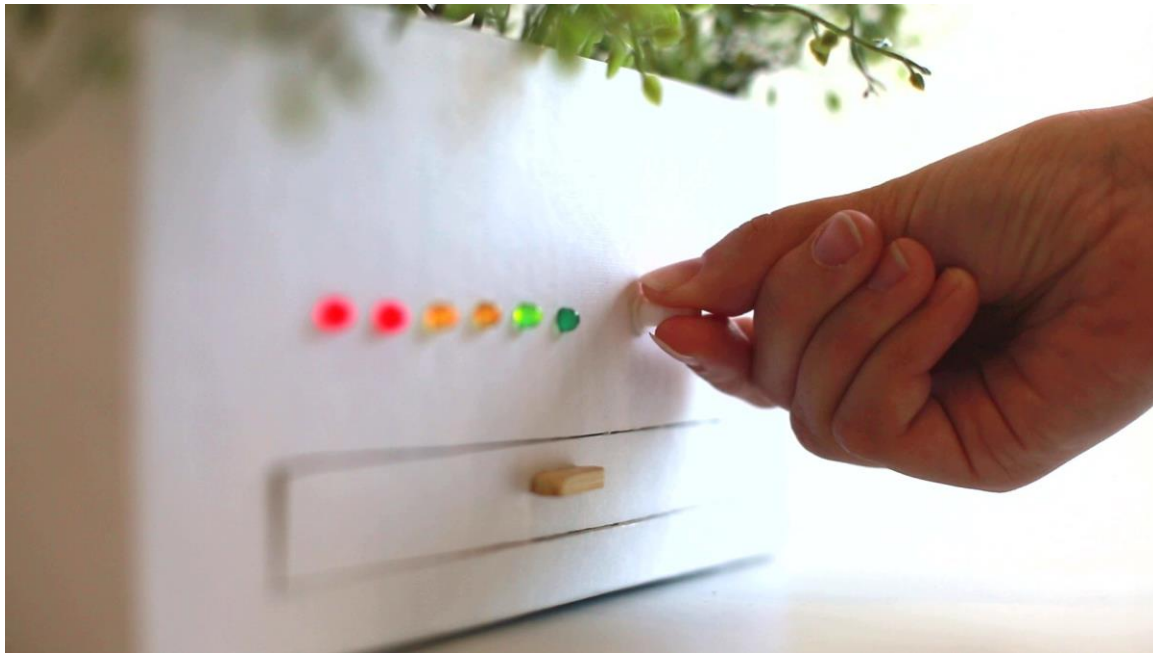


Figure 3: Front of the Study Buddy. Shows how the diodes lit up when study time is set. Mobile phone compartment is placed underneath.

Unlike the paper prototype, where text and pictograms are placed on the box (figure 2), we created instructions instead (figure 4) for how to use the design. The reason for that choice was that the student is considered to memorize how the box works after a first use. Removing text and pictograms from the box also created a more aesthetically pleasing and minimalist look.

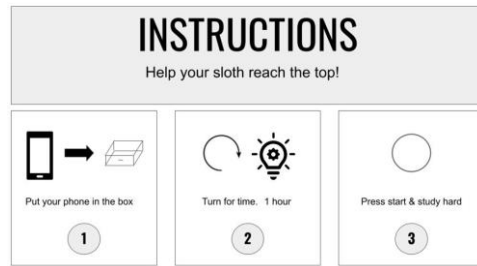


Figure 4: Instructions on how to interact with the Study Buddy.

From the results of the evaluation of the paper prototype, it turned out that there may be a desire for a cancel function if the student suddenly needs to abort the session. The idea with the product is to remove the mobile phone distraction. The student should not be able to easily switch off the product before the selected study time is over. We have therefore chosen not to implement any cancel function. We believe that the student is aware of Study Buddy's purpose and therefore agrees not to be able to use the mobile phone during the study session.

6 WORKING PROTOTYPE

For the working prototype, we chose to create the sloth in felt material to give it a soft and friendly appearance (figure 5). We made the tree from bamboo tubes and plastic plants to give an aesthetically satisfying look correlating with the sloth's habitat (figure 5). Moreover, studies report that plants can have a greater impact on humans than just the aesthetic part [17]. The study shows that plants in a classroom have a positive impact on students, which in turn resulted in enhancing students' performance. In addition, the green color of the plants has a harmonizing effect, which can lower the student's stress levels, and increase their concentration [18].



Figure 5: Study Buddy as a working prototype.

6.1 How Study Buddy Works

The mobile phone is placed in a compartment and the study time is set using a rotary control. The lit diodes present the time that the student wishes to study, where each diode represents one hour (figure 3). When the Study Buddy starts, the time cannot be altered, and the compartment that stores the mobile phone is locked until the study time is over. When the design has started, the sloth begins climbing the tree. During the study session, the sloth announces when there is time for a break and encourage the student (figure 6). When a study hour is completed, the diode for that hour is turned off. To clarify the difference between a break and active study time, the diode that represent the current hour blinks for break, and is steadily lit for study time. When the sloth has reached the top of the tree, the study time is over, and the student gets access to the mobile phone again. Study Buddy retains selected settings for the next study session to avoid repetitive interaction and easily use the same study time repeatedly.



Figure 6: The sloth announces when it is time for a break, when the break is over, and encourage the student.

The working prototype was implemented using an Arduino Uno kit. For the sloth climbing, we connected a string to the sloth, and used a DC motor to wind the string. The sloth reaches the top in six steps based on the chosen study time. To control the locking of the mobile phone compartment, we used a servo motor. When the prototype starts, the servo motor moves from one position to another and locks the mobile phone compartment. The servo moves back to its original position and the compartment can be opened again when the study session is over.

7 FORMATIVE EVALUATION

The user experience working prototype was also evaluated with three computer science students. The formative evaluation was an informal “reality check” with the students that complemented the design process to indicate the validity of the design’s experiential qualities [13], rather than affirm the design’s usability. The setup for the evaluation was similar to the formative evaluation of the paper prototype. In the follow up interviews the users confirmed their problems with their mobile phones during their studies: “The mobile phone is my biggest nuisance when I study, so this would be great!” Furthermore, one of the users liked the idea to lock away the mobile phone during study sessions: “Feels like you will get more done when you lock the phone and really cannot access it until you have studied for a while. If you are addicted to the phone, this can make it easier and force you to study and not be interrupted all the time to check text messages, social media etc.” In this utterance, the user refers to phone addiction in general rather than his own ditto, whereas the following utterance indicated that the user relates the design to his own lived experience: “Perfect that it reminds one of breaks, which is important. Something I myself am bad at taking when I study.” The following quote further indicated the soundness of the design through the users own experience: “The mobile phone is a big distraction for me when

I study as there is always something to check on the mobile phone. When you think that you should only check a quick thing on the mobile phone, it also becomes easy to check a hundred other things. So, this invention would be a fun solution to the problem.” Additionally, this user chose the adjective “fun”, which is in accordance with our design goals of playful design with a friendly sloth.

8 DISCUSSION

Previous research shows that the mobile phone today has a negative impact on student performance through distractions and through concentration impairment [2, 3]. On the basis of our design process, grounded in the problem description from literature and our lived experience, and the formative evaluation, we have a strong indication that the Study Buddy design can remedy mobile phone distraction during study sessions. Our main contribution to previous designs [6, 7, 8, 9] is that we have chosen to remove a distraction factor by locking the mobile during the study session. However, only removing the phone is not enough, the helpful aid of the sloth telling the students to have breaks and provide encouragement give the students something in return for locking away their mobile phones. Here, we have grounded the design on Caballa et al. [8], who showed that a tangible design which schedules breaks, improves students' results. Furthermore, the use of the adjective “fun” to describe the design in the formative user experience evaluation also indicates that our design gives the students a reward for locking away their mobile phone. However, we need to make further user studies to measure what effects the removal of a distraction factor can generate, for instance the causality between phone removal using the Study Buddy during studies and the participating students' improved performance. The current design of the Study Buddy is suitable for students where the mobile phone is as a distraction, or an addiction. Further studies should be carried out to analyze active study time versus break in relation to the student's age [8].

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