

Curb: Increasing Awareness of Real-time Phone Usage and Promoting Positive Behavioral Change to Improve General Well-being

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ABSTRACT

Today's advanced technology allows for the cell phone to essentially become a computer, containing the many of the same functionalities at an easy grasp. Although cell phone use has become a very popular activity today, college students are the most populous and frequent users. Students are spending anywhere from eight to ten hours a day actively engaged with their cell phones, and are in fact wasting time aimlessly. Experts have referred to the overuse of cell phones by college students as an addiction, and one that can lead to very serious implications in many areas including academics, social, and health. We created an application to increase awareness of real-time phone usage in order to encourage and motivate users to put down their phones, engage in new experiences, decrease cell phone usage, and improve certain aspects of their lives.

Author Keywords

Smartphone; usage; awareness; real-time; college students

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

The fascination with technology has been an ever-growing phenomenon ever since the inception of early technology into our culture—from the radio, to the television, computer, and now the cell phone. Use of cell phones, more specifically the use of smartphones, has skyrocketed within the past couple of years. Today, people are spending an increasingly amount of time using technology, and smartphones are the major source of this technological use. So much so that the smartphone has essentially began to replace the laptop and desktop computers as the preferred technology and mode of access to the Internet. Recent studies show that 56% of Internet access is now achieved via the smartphone [15].

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Despite the consensus among all that smartphone use has become increasingly popular and continues to grow in popularity, there is one population that has undergone the most significant impact as a result of smartphone use: college students. There are several pros associated with smartphones that explain their rising popularity, first and foremost being their ease of use and their ability to provide fast and easy access to tools and information. However, there are also several cons that are associated with the overuse of the smartphone, which can often lead to development of negative behaviors [13]. Because of this negative aspect, there is a growing concern on whether college students are overusing their smartphones and developing subconscious addictions and dependencies to their devices [6, 7]. Similarly, studies have shown strong correlations between high frequency phone use and decrease in academic, cognitive, and physical fitness performance as well as increase in anxiety and stress [10].

There are plenty of applications for Windows and Mac whose functionality is to block access to websites for set periods of time, with the purpose of decreasing Internet activity. However, users often find this option obtrusive and coercive. On the mobile side, there is also a general lack of effective applications in the Google Play Store or Apple App Store for controlling cell phone overuse. Existing applications simply track and display usage of certain apps but do not provide any incentives for behavior change, or endeavor to block distracting applications altogether. With Curb, our proposed application, we intend to bridge this gap by allowing its users to (1) analyze their own phone usage patterns in real time and (2) receive motivating feedback about their actions. We believe the correct combination of the two will lead to a positive change in behavior.

We hypothesize that (1) the use of smartphone applications is one of the biggest contributors of inefficiency for college students needing extended periods of concentration, (2) users are unaware of how much time they spend on these distracting applications, and (3) by displaying gentle reminders during smartphone use, we can make users more conscious of the time the users spend on these distractions. We hypothesize that becoming aware of the time one is spending on one's device will (3.1) decrease one's cell phone use and (3.2) provide incentives to increase

participation in more life enriching and satisfying activities. Our goal is therefore not only to decrease smartphone usage, but by doing so, to allow users to focus on the real world.

BACKGROUND INFORMATION

College students view the cell phone as a fundamental part of their daily lives and an integral aspect of who they are [15]. There is no arguing that one reason for such an appreciation of the cell phone is due to the positive outcomes that it enables. Today's cell phone has the ability to allow the user to call, text, email, video conference, blog, social network, use the internet, watch and share videos and pictures, and use academic tools, personal utilities, and software driven applications [10]. Thus, the cell phone's main features are to allow for immediate communication and access to information resources, which are great tools for everyone to have, and especially for college students.

College students find that communicating and staying connected with friends and family is a priority [6, 13]. Cell phones also provide students with access to calculators, dictionaries, and other tools, as well as immediate access to virtually all library resources and databases without the need to be at a computer [13]. All of this is indeed an incredibly positive feature provided by the cell phone. The problem, however, arises when the cell phone use becomes excessive and unmonitored, and interferes with aspects of daily life. College students qualify as excessive cell phone users as shown by a study in which it was determined that the average time a college student spent on a phone in one day was 8.8 hours [15].

Excessive cell phone use tends to lead to unhealthy habits and behavior, in which the user crosses the threshold from being productive to counterintuitive and self-degrading. High frequency cell phone use has been noted to have tremendous effects on a student's academics, social interactions, and fitness. Smartphone are most definitely convenient, but they are taking a toll on many student abilities.

Past studies show that cell phone use occurs mostly during class time or while studying [10]. On average, about 95% of university students will use their cell phones during a class setting and will check their cell phones on average seven times per class [2, 16]. When compared to users with lower levels of cell phone use, users with high levels of cell phone use had a significantly negative difference in academic performance, in the form of classroom retention and participation, study habits, and grades [2, 6, 16].

This is a result of the multitasking that is involved during cell phone use, which leads to an undermined academic performance [10]. Cell phone use shortens a student's attention span dramatically, which significantly impairs the ability to concentrate effectively on the material presented.

As a result, students using their cell phones are removing themselves from the classroom and disrupting their studies [13, 15]. In addition, one student's cell phone use tends to be disruptive and distracting to his or her classmates and will negatively affect them as well [2]. Simply put, high frequency cell phone users will spend less of their time devoted to their academics and more time devoted to their cell phones [10].

Students exhibiting high frequency cell phone use are also experiencing negative effects connected to psychological behavior that are associated with anxiety, social isolation, low self-esteem and satisfaction with life, shyness, stress, and lack of emotional and social skills [7]. One instance is the result in decreased interactions with other people [15]. Smartphones are encouraging people to spend less time with others and more with technology and on their phone. This sometimes occurs when users pretend to take a call, or send a text or email just to avoid a social interaction. With an increase cell phone use for communication and social media, users are losing important physical connections to the outside world. These users are experiencing trouble interacting with others in face-to-face encounters since they are becoming less and less accustomed to the cues exhibited in a live conversation [13, 15].

Another behavioral pattern change is an outcome of staying up too late at night due to cell phone use, where high cell phone use effects sleep quality [7, 17]. Concurrently, evidence shows that high cell phone use at night goes beyond effecting sleep and into the next morning and day, where the user will experience a depletion in regulatory resources and an impairment in engagement and productivity throughout the day and during sessions of work activity [8].

Lastly, high frequency cell phone use is likely to develop an emotional dependence between the users and the cell phone [7]. This dependence can take two parts. First, users can become dependent on the cell phone to perform simple functions that they could have performed on their own, decreasing their cognitive abilities, such as the ability to think on their feet in certain situations [13]. In the second part, the dependency on the cell phone is sometimes referred to as an addiction. Studies have found that most cell phone users don't feel that their cell phone use disrupts their schoolwork or sleep when in reality, it does [6]. Similarly, studies have shown that students underestimate the number of times they access their cell phones and how much time they tend to spend on them [2]. When it comes to the cell phone's association with feelings of anxiety, a study showed that four out of five college students experience panic and stress when they attempted to separate themselves from their phones for a full twenty-four hours [10, 12, 13]. It is no wonder why the cell phone has been coined "the biggest non drug addiction of the 21st century" [14].



Figure 1: Transformation of The Clouds throughout the day at 2-hour intervals, until 10 hours of usage time is recorded.

We believe this app will be beneficial because the reason behind why students are so easily distracted by technology is because of how easy smartphones, and mobile phones in general, have made accessing anything and drifting away from the outside world. The app does not aim at blocking or taking away any of these distractions, but instead allows the user to analyze the pattern of phone usage they have been engaged with in an effort to motivate the user to change their current behaviors and habits and ultimately use their phone less.

RELATED WORK

Our app will embody the design methodology known as persuasive technology. According to BJ Fogg, persuasive technology involves the use of technology to attempt to persuade its users to shape, reinforce, or change their behaviors [4]. A change in behavior can only be done if the user is motivated sufficiently, has the ability to perform the desired behavior, and there must be some sort of trigger that will prompt the behavior change [3].

Through additional research and studies, it has been noted that persuasive technology will be most effective if it supplies direct feedback [11] and sustains motivation over time. Our app will continuously provide feedback to the user about the usage activity. This feedback will serve the purpose of redirecting the user back to the activity they lost engagement with in the first place.

Bruno Latour has studied the effects of social technology on shaping human behavior [9]. Specifically, Latour noted that in order to successfully solve a problem of shaping human behavior, work has to be delegated to technology. Curb delegates the act of motivating the user to get off their phone and engage in a more positive activity. Curb will be the mechanism that intervenes, motivates, and reinforces.

Carl DiSalvo and Jon Froehlich, who have design UbiFit and UbiGreen [1, 5], respectively, focused on the design of mobile phones that produced interactive displays that gave their users feedback on gave revealed information about their behaviors. This method of visualizing information

about behaviors served the purpose of raising awareness to the individuals about their behaviors as well as motivated them to perform a certain way or perform a certain behavior that corresponded with a change in the information visualized and displayed.

APPLICATION OVERVIEW

Curb consists of 3 major components: Background Notifications, Curb Mode, and The Clouds. Each component reminds the user of their phone usage in a different way, from a different angle.

The purpose of the Background Notifications is to remind users of their usage in real time as they are using their phone, primarily to prevent unconscious long periods of use. A new session tracker is created every time the user unlocks their phone; every 10 minutes that it remains unlocked, the app will notify the user through a push notification (“You have used your phone for X minutes”). This feature is designed to be gentle so that users don’t become irritated or ignore the notifications altogether.

Curb Mode, on the other hand, is designed to be more aggressive. The feature is meant to be used for times when the user wishes to prevent themselves from using their phones altogether, such as while in class, at meetings, while studying, or during important meals. The feature can be toggled on and off on the home page of the application. When on, a notification will appear the moment the user unlocks their phone, reminding them they should not be using it (“You shouldn’t be on your phone right now!”). If they choose to ignore the notification, they will continue to receive push notifications every 2 minutes until they either lock their phone or turn off Curb Mode. Although this feature may be more intrusive than the other components of our application, we hope to minimize negative effects by giving users themselves the freedom to decide when this mode is needed.

The Clouds feature a series of images that appear on the home screen of the user’s smartphone used to track phone usage throughout the period of 1 day. There is no image at



Figure 3a: Final Curb logo.

the beginning of the day. After 2 hours of phone usage, clouds will begin to appear on the user's background. As the user's phone usage increases throughout the day, more clouds will appear and become darker in 2-hour intervals. See Figure 1 for the progression of The Clouds throughout the day. The phone usage counter and image is reset every day at midnight. The main purposes of The Clouds are to (1) provide a quick and easy way for users to estimate their phone usage throughout the day without having to look at and decipher numbers, and (2) provide small and gradual incentive to decrease usage by suggesting through the darkening and increasing of the clouds the negative effects of overuse.

DESIGN AND TECHNICAL CONSIDERATIONS

UI Development

The visual aspects of the Curb application were specifically designed to keep things simple and tidy. The project has been through a couple changes in scope, and these chances for design overhaul have helped drive the visual components in a better direction. Our design goals for our app were to be (1) un-intrusive, (2) flexible, and (3) effective in limiting screen time.

The word 'curb' means 'a check or restraint on something'. Initial designs for the logo involved references to a roadside curb, road signs, bright yellow, and changing directions. This was quickly changed as road signs are often designed to be extremely intrusive, and we hoped not to confuse users that our application involved traveling. We retained the concepts of curved lines and changing directions, as well as the imagining of phone usage as a plotted line. Our logo takes this line concept and plots it in a semi-circle around the letter 'C', designed to show that Curb can turn around poor phone habits. Keeping in the theme of time, the semi-circle also resembles the movement of hands around a clock face. See Figure 2 for the final iteration of the logo.

The light olive green color was chosen as it is bright and evokes positive emotions and yet is soothing, as well as to symbolize the application's healthy intentions. Green is the color of growth, safety, and nature – we wish our users to



Figure 2b: Progression of designs for Curb logo and background animations.

limit their time on their phones and spend it more on life and their surroundings.

The user interface for the application was designed in Eclipse platform itself. Eclipse and the Android libraries offer an extensive list of UI elements that can be easily used to design the interface of app. After the prototype was developed on various wireframe toolkits freely downloaded from the Internet, the design was translated manually on Eclipse using the graphical interface. Fine elements of the UI design were hard coded by making changes to the screens' corresponding xml files.

Three screens were created for the application. The home screen was the interactive screen, featuring a set of buttons through which the user could switch on or off the Curb mode and navigate between various screens. It also featured the logo of Curb. The other two screens were non-interactive and were used to display information about the app and the timing parameters being measured. Users are able to access other screens by swiping left or right. Swiping right takes the user to the 'About' page, which gives a brief description of the app and its goals. The inclusion of this page is meant to keep the user informed about what the goals of the application as well as minimize confusion regarding how to use the app. Swiping left brings us to the 'Stats' page where specific usage data is displayed (screen unlock time in current session, total screen unlock time today). The purpose is to give users a concrete number for usage time, as the main features of Background Notifications and The Clouds give a more summarized version of this data.

Features Development

Screen unlock time was used as the measure of phone usage for both Background Notifications and The Clouds. Most time management applications track application use.

However, because Curb does not target specific applications but rather overall time spent on one's phone, we decided that using unlock time would be simpler to implement, easier for users to understand, and less intrusive on the user's privacy. We measured both time spent per session (one session being from the time you unlock your phone to when you lock it again) and total time the phone is spent unlocked per day.

Notifications were provided to the user regarding phone usage in the form of toast notifications during the curb mode and more passively in the notification bar in the general operating mode. Notifications were designed to be either neutral or positive in tone. To reduce intrusiveness, we limited frequency and altered the message to be friendlier. Curb Mode messages were designed to not mention studying specifically to prevent possible stress that may be related to the term and to not limit the potential uses of the feature.

The Clouds are designed as a visual representation of the users screen time, a shortcut to informing the user of their phone usage. Initial designs revolved around a slightly animated feature dubbed 'Little Dude', a hard-working student who would grow more exhausted and accumulate more homework the longer you were on your phone. Ultimately the animation was changed to clouds, as we believed users might purposefully use their phones in order to see what happened to the poor animated avatar. The Little Dude, being expressive and distracting itself, may have been counterproductive for the purposes of our application. Instead we chose a neutral icon: clouds. Similar to the way other apps have used flower gardens and trees in their backgrounds, we hoped clouds would come off as simple and less distracting. The 2-hour intervals between changes in images were designed according to research findings mentioned earlier suggesting that the average college student uses their phone for 8.8 hours per day. By the time the user has recorded 10 hours of screen unlock time, it is clear through our images that they have used their phones for too long.

Technical Development

The major function of Curb is to act as a background application that monitors phone usage all the time. Therefore, one major consideration was the effect on phone battery life. To counter this problem we came up with following key ideas:

1. To allow the application to run even when other applications are in use, we used Service class and threads timed at regular intervals → broadcast + broadcastReceivers.
2. To run the Background Notification code only when the phone is unlocked and killing it promptly every time the user locks his or her phone screen.

3. To monitor the phone state, we set up a timer of 2 minutes while the phone is in use, so that the application checks phone state every 2 minutes rather than continuously.

The only major issue we faced with Curb was how to reset user data every day in order to monitor daily phone usage of users. The original thread we used for this purpose would set off more than once a day at random intervals. It was also difficult to monitor this functionality through the emulator as testing it requires running the application for at least a day. We tested multiple Android functions such as timer, timertask, and alarmmanager. Currently this feature remains slightly buggy and will therefore be a focus in future developments of the application.

USER STUDY

We conducted a full-scale user study to test the functionality and effectiveness of our application as well as our hypotheses (stated in the Introduction). The target population for our application is college students. Therefore, we recruited from the Cornell undergraduate and graduate populations varying in major, degree type, and age for our study. This section discusses each component of our user study and what we discovered through them.

Study Components

Our study consisted of five major components: Entry Survey, Control Test, Mid-Study Habits Survey, Full Application Test, and Exit Interview.

Entry Survey

The purposes of the Entry Survey were to gain a sense of phone usage among Cornell students and recruit participants for the study. We hoped to gauge both the necessity of and interest in an app such as ours, and to pinpoint specific problems or details that we could focus on during application testing.

The survey was given through Google Forms, and advertised through various Facebook groups and Cornell list-serves. The prerequisites for taking the survey were (1) must be a full time student at Cornell and (2) must own a smartphone. The first prerequisite was maintained by requiring a Cornell email to enter the survey. We sorted through the results later to take out non-current students to maintain data quality. The second prerequisite was maintained by the demographic questions asked at the beginning of the survey; if the participant stated that they did not own a smartphone, they were taken to the end of the survey without completing the rest of the survey. The full entry survey can be found in Appendix I.

Control Test

The Control Test acted as a control measure for the participants' usage before being exposed to Curb. The main purpose was to gather phone usage data that would be compared to the data collected during the application-testing phase in order to test the effectiveness of Curb. Participants were instructed to download RescueTime, an app that tracks time spent on applications and websites and gives detailed reports and data based on activity.

The test was conducted in a one-week period, giving us 7 full days or one full week's worth of phone usage data. The only instructions users were given were to download the RescueTime application and use their phones as they normally would.

Mid-Study Habits Survey

The purpose of the Habits Survey was to gain more specific insight into smartphone habits of the participants that were going to test out the app and obtain data that would be used to explain the results after the user study. In particular, we hoped to measure the degree of reliance each participant felt towards their smartphone, and their ability to estimate their phone usage without the use of Curb. The survey consisted of two parts. The first contained 17 statements about specific cell phone use habits and asked to what extent the participants agreed or disagreed with each. The second asked each participant to provide the top 5 applications they felt they used the most and provide an estimate for how many times they accessed the app in one day and an estimate of the total amount of time they spend on the app in one day. The survey was distributed through Google Forms and was completed by all 9 participants. The full mid-study habits survey can be found in Appendix II.

Application Test

This stage was used to test the functionality of our application as well as how effective it is in improving awareness of phone usage and productivity. Curb was installed onto the smartphones of each participant upon completion of the Habits Survey. Data collection continued through RescueTime for a 2-week period. Two application updates were made during this time period, one on the second day of the test, and the other on the fourth day of the test.

Exit Interview

The goals of the Exit Interview were to collect user perception towards the study and the application, collect suggestions to update and improve the application, and wrap up the study for all participants. Interviews were given in person the day after the Application Test to ensure that the experience was still fresh for all participants. The interview focused on participants' experiences with as well as their perceptions of effectiveness of the application's

three main components. The full exit interview can be found in Appendix III.

RESULTS

The results for obtained for each of the five components of the user study are outlined as follows:

Entry Survey

We were able to collect 53 responses, and selected 14 to complete the rest of the study. Selections were based on:

- Willingness: asked through survey question
- Type of phone: must be Android
- Area of study: we hoped to find a diverse group in terms of major and year

We also found interesting trends regarding phone use and takeaways to keep in mind during the study, and summarized the results in the infographic found in Appendix IV. Overall we found that most students agree that their smart phones are distracting. They recognize that too much usage distracts them from their everyday lives, and want to fix their habits' therefore there is a space available for Curb to meet the needs of our target market.

Control Test

Excluding 2 outliers of 1.77h and 48.13h, the average usage for the week was 16.74h (18.79h including outliers). There was no recognizable trend in usage among participants per day. Average usage per day was 2.38h (2.68h including outliers). This is much lower than the 8h per day that we originally predicted through research and used in the development of our application.

Mid-Study Habits Survey

Overall, results showed that most participants did not feel that they were or showed that they were dependent on or over-engaged with their smartphones. For the first part of the survey, we found a trend in responses to be that participants agreed that they checked their phones very often for texts, emails, and other messages, but did not feel that their phone usage affected their academic performance or physical health/fitness level. For the second part of the survey, analyzing the estimated amounts provided during the survey in comparison to the actual amounts obtained via RescueTime was a little difficult for some cases. The problematic cases were those in which the participants provided certain applications in the survey that were not recorded or differentiable in the RescueTime logs. For these cases where there was missing data, we did not do analysis for the apps that had missing data for the actual amounts and could only use applications that had both estimated and actual amounts accounted for. Out of the 55 applications provided by the participants in the survey, only 30 were

analyzed. After analysis, it was evident that participants overestimated their usage of specific applications by an average of 68.7%. The results from both parts of the survey showed no signs of addictive tendencies or loss of control over phone usage among our participants. The tables displaying the data analyzed can be found in Appendix V.

Application Test

Week 1 showed an average decrease in usage of 4.17% while Week 2 showed a decrease of 12.32%, with an overall decrease of 8.25% averaged over the two weeks. Although the data suggests a small decrease in usage with the use of the application, it is important to note that more than half of Week 2 occurred during Thanksgiving Break for Cornell students. The lowest usage was indeed the Wednesday through Thursday of the break.

Exit Interview

Of the 14 participants we selected to test the app, 9 were able to follow through and complete the rest of the study. The biggest trend resulting from the Exit Interviews was that the application features did not negatively affect people's moods, but therefore were not as effective in helping participants use their phones less often. However, although there was not much effect on user behavior, most participants did agree that they became more aware of how long they spent on their phone. It is possible that perhaps with more use, we may be able to see behavioral change over time.

Particularly interesting was participant perception of The Clouds, which is meant to decrease phone usage through negative reinforcement. Most participants did not find that the Clouds affected their mood at all, stating reasons such as how clouds are relatively neutral objects, many people don't care much about clouds, or that they are already used to the clouds in Ithaca and thus were not affected by the ones on their phone screens. It is also possible that, because our participants had lower usage than what we researched to be the average, they did not experience the full extent of The Clouds, as they did not use their phones enough to cause any dramatic changes to their screens.

DISCUSSIONS AND FUTURE WORK

Through the development of our application and deployment of our user study we have discovered that there is definitely a need for an application such as Curb to increase awareness of every day smartphone usage. However, there is still much work to be done to make the application effective. In addition, if our target population continues to be Cornell students, we must cater our algorithms to more adequate average values for this population, as we discovered through our study that habits among this market are different than that of the general

population. This section discusses key challenges that must be solved to advance our research as well as improvements that must be made before the application can be deployed.

Creating Behavioral Change

Our results suggest that although un-intrusive notifications are effective in providing information that is interesting for the user, it is not quite effective in creating the positive behavioral change our application is meant for. Thus the challenge is to find how to not just be informative, but also effective in "curbing" phone usage.

One factor that must be considered is the flexibility of the application features. Curb offers the user the freedom to turn Curb Mode on and off as they please. However, it is perhaps incorrect to assume that a user downloading the application will have sufficient self-control to keep the mode on for as long as they need it. To stimulate behavior change, the application may need to be less flexible—for example, requiring Curb Mode to be on for at least 5 minutes after being turned on to halt the user's initial urges to surf their phone. The appropriate time period for such a function will require more research to establish, but ultimately we hope to find better balance between the flexibility of Curb Mode and its effectiveness.

Another important factor is the degree of emotional response elicited by the application. It is important to stimulate some kind of emotional response from the user to provide external encouragement. We had hoped to attach a negative connotation to The Clouds in order to provide negative feedback as phone usage increases. But as seen through our user study, this function was not effective. Because we are using negative reinforcement, it is particularly important to be careful not to push users past their limit of acceptance and cause them to ignore or delete the application. In the future we may increase the intensity of our images or try switching to positive reinforcement instead.

Measuring Health and Productivity

Through usage tracking we were able to measure participants' smartphone usage, and through various surveys and interviews we were able to measure increase in awareness of usage. However, the overarching purpose of our application is not just to increase awareness and decrease usage, but also to use these tactics to allow users to focus on real life activities and therefore improve health and productivity. We have not been able to measure the latter aspects in the current iteration of our study; our challenge therefore lies in finding an effective method to measure the correlation between use of our application and change in health and productivity of the user.

Because "health" is such an intangible and subjective item to measure, it may be more feasible to define and measure factors of health that our application can focus on

improving. For example, user emotions throughout the day in comparison to the status of the application, or user activity after turning Curb Mode on and off. Acquiring information such as these will require much more user input than our original study required, but can provide more insight into how our application functions.

Technical Improvements

Before we can conduct a more extensive user study on the effectiveness of Curb, certain updates must be made to minimize technological limits of the application present during the initial study and decrease the noise caused by these issues.

The time period of 10 minutes for each Background Notification was found to be a good average number for our users, but not quite accurate for individual needs. Therefore the updated application will include an option to customize the time period between each notification within a window of 5 to 30 minutes. The motivation of creating a window is to find a balance between flexibility and effectiveness of the application discussed in the previous section. The lower limit is set to not conflict with Curb Mode, and upper limit is set according to feedback received from the Final Interview phase of the User Study. Users that often use their phones for activities such as writing emails, reading news articles, and watching presentations asked for longer periods between notifications.

The other two components will also be updated. Curb Mode notifications will be changed from push notifications to alerts. We hope that by requiring more active participation in Curb Mode, it will be more effective in short-term prevention of phone use. The Clouds will be updated to change more frequently. Currently we estimate a time period of 1 hour between changes, but will not finalize the period until after conducting more surveys.

Aside from the features, we will also update the application interface to provide a more positive and stimulating experience for users. An iOS version of the application will also be created to cater to a wider pool of users and provide more data for our study.

CONCLUSION

By focusing on a major issue faced by college students today and extending past research done in this field, we have been able to create an un-intrusive application that goes further than simply displaying usage data, into the realm of behavioral change. Through extensive user studies we have proved the effectiveness of Curb in increasing awareness of real time phone usage. More research and development will make the application more effective in creating greater behavioral change and promoting healthy habits. Curb has much potential to attack the problems of smartphone addiction and dependency in the future.

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