Baby Steps: Using Computer-Mediated Communication to Educate Parents on Early Childhood Development

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Natasha Noltimier-Strauss
Victoria Suwardiman
Richard Truong

Research Group:
Human Centered Design Engineering Department's
Computing for Healthy Living and Learning (CHiLL) Lab
Supervisor/Mentor: Julie Kientz
PI: Julie Kientz
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ABSTRACT

From birth through age five, children experience a wide range of development and growth, which they will build off of for the rest of their lives. It is during this time that the detection of childhood delays is most essential. The goal of this project is to research whether Computer-Mediated Communication (CMC), specifically social networking, Twitter, and SMS, will enable parents to learn more about childhood development and therefore be more sensitive to the early warning signs of developmental delays. We hope to find that using CMC as an educational tool will increase awareness in parents with respect to the development of their children, and that these services will encourage more periodic tracking of milestones to share in the pediatric setting. These behaviors may in turn promote earlier detection of developmental delays. We will conduct a deployment study of the CMC system and measure parent knowledge of children's development before and after its use and study its effectiveness and usability. The information found from this research can be used to design a fully functioning CMC application with the goals of earlier detection of developmental delays and improved pediatric health.

INTRODUCTION

It is estimated that as many as 19.5 percent of children between the ages of 3 and 17 in the United States have had a developmental delay, learning disability, or an emotional disorder. [2]. However many of these disorders aren't apparent at birth, but appear between the ages of 2 and 6, when children are developing the most. Research has shown that early detection and intervention proves much more effective in helping children manage disabilities. [2]. Tracking and understanding child development are key to early detection of such disorders, and should therefore be a priority among parents and pediatricians. Regular visits to the pediatrician and detailed record keeping of child development can help ensure developmental delays are detected early because not meeting specific milestones by certain ages may be an early warning sign of a developmental delay. As a part of their "Learn the Signs: Act Early" campaign the Centers for Disease Control and Prevention in the United States (CDC) has outlined around 250 detailed milestones children should reach during different times between birth and five years of age. This is used to educate parents on child development and promote early detection. Although this information is helpful and informative tracking every milestone can be tedious, and is mostly left for parents to complete on their own. Kientz, Arriaga, & Abowd developed a computing system called Baby Steps, which is designed to help and encourage parents to track the development of their children, while also providing them with sentimental records. [2]. This project branches off of the Baby

Steps system, using the results of the effectiveness of Baby Steps found through the study, as well as information from the CDC on childhood milestones to create a comprehensive Computer-Mediated Communication system aimed at making information about child development more accessible and making milestone tracking easier for parents.

COMPUTER-MEDIATED COMMUNICATION IN THE LAB

Computer-Mediated Communication (CMC) is defined as communicative interaction between two or more computer supported communication technologies. The most popular examples of such are text messaging, email, instant messaging, and social networking forums. In recent years the use of such technologies has skyrocketed into popularity and with the introduction of smart phones and other similar technologies, using them has become easier than ever.

The Computing for Healthy Living & Learning (CHiLL) lab at the University of Washington has the goals of researching applications of computing technology that aim to promote healthy lifestyles and education. With this goal in mind, the lab is currently investigating projects regarding child development and tracking, using computing to support healthy sleeping behaviors, researching empathetic interfaces, and understanding and designing persuasive technologies for health.

CONTINUATION & MODIFICATION OF BABY STEPS

The original stand alone Baby Steps prototype program designed by Kientz, Arriaga, & Abowd gave parents the capability to record each milestone as it was completed by their child by responding "Yes", "Sometimes", or "Not Yet" in the program. Parents could also record when the milestone was completed and add any pictures or videos that may have occurred at the time the milestone was completed. This program proved to be effective because it found that parents recorded a higher number of milestones, accessed their child's data more frequently, and was more confident in the tracking of their child's progress. We wanted to extend this system to one that uses Computer-Mediated Communication because the Internet and technologies that use it are becoming increasingly popular. Our goals were to develop and analyze a CMC version of the Baby Steps system that would promote better awareness and education of pediatric health for parents.

Website

Our work includes the design and creation of a social networking version of the Baby Steps program. Through making an online website, parents will be able to log on from anywhere and access their child's information and developmental progress. It is a convenient way to store important data for both the parent and child, providing functionalities to store photos and record answers to milestones specific to the child. Because we have also implemented a way for milestones to be sent to parents via SMS and Twitter, the website will provide a way for parents to see a complete summary of their responses as well as fix errors as necessary.

The website interface was written using PHP, providing access to our MySQL database. The database holds tables for account information, child information, contact information, and media. PHP is a scripting language embedded into HTML web pages, which makes it compatible with almost all platforms. It is growing in popularity because it is open-source software that is available for free download to the public. We used PHP because of its speed and accessibility; it allows any person with Internet access, regardless of platform, to view the website. We also used MySQL for our database management system because it is open-source software, compatible with many platforms, fast, and one of the most popular of its kind. It is important that we make the website compatible to a wide range of systems because we want to provide the Baby Steps system to all parents regardless of their resources [1].

We hope that because the Internet is becoming one of the most popular sources of information, parents will no longer have to look for information from different sources or encounter misinformation with the comprehensiveness of the Baby Steps system. Our website provides example parenting tips as well as milestones for children to accomplish, and stores specific information for those parents who choose to create an account. Those who create accounts have the ability to track their child's development more thoroughly and conveniently through our interface. Milestones are grouped in age groups so that parents can visually see what types of things their child should be able to do for their age. Once the child has accomplished each milestone, parents can check it off the list. By getting into the routine of checking the website, parents will be able to see areas where their child may be behind, remaining on top of their tracking. This will hopefully transpire into better correspondence with the pediatrician and thus keep parents well informed on their child's progress and issues.

Short Message Service (SMS)

To further improve our CMC system, we linked the ability to use a mobile phone's capability to send and receive SMS messages to remind parents of their children's needs as well as allow parents to update their children's milestones. In the United States, 91 percent of the population, over 285 million people, possess a mobile phone [4]. Our users will gain the ability to update their children's milestones and receive messages and alerts using their mobile phones. We are greatly increasing the user's convenience as well as increasing the speed in which the alerts are received and the accuracy in which the milestones are updated. Our system will be accessible to more people due to the broad penetration of mobile phones across all socioeconomic classes.

To implement the SMS communication system, we created a Google Voice account which we used as a tool to send and receive text messages. Using Python 2.6 and pygoogle (Google Voice for Python), we were able to easily access Google Voice's Database using Python. By installing the MySQL Module for Python, we were able to add messages received by Google Voice into our MySQL database. Further-more, by using Python, we were able to calculate the user child's age and choose the desired messages and milestones in our MySQL database to be sent. Then we used Python to access Google Voice which sent the desired messages to the users. Being able to update the child's milestones using their mobile phone is a great tool for the user's convenience and enhances the ability for users to receive alerts and update their children's milestones.

Microblogging
In addition to the website and SMS features we have been working to create a system, which works with popular microblogging networks using the CDC's milestones, to automatically update parents about where their children should be developmentally. The idea behind this technology is to use an already existing popular social networking tool to educate parents with respect to child development. We hope that this combination of available options for receiving information will promote earlier detection of developmental disorders and disabilities, regardless of a parent's preference of medium.

The microblogging network we have chosen to use is Twitter. Twitter is one of the most popular microblogging networks on the Internet. It is the third most used social network, with more than 50 million users, growing steadily at 8 million a month [3]. We chose this site for its popularity, which grants it enormous potential as an educational tool. With so many users tuned in, it also provides us with access to a large target audience. This

service would be connected to the website subscription, and parents would have the option of choosing this as way of receiving daily updates.

The system would work using the same program as the SMS tool to send out automated "tweets" (140 character status updates) regarding milestones relevant to their child's age group to a public account. The idea is that a parent would follow the account for the month in which their child was born, and this public account would be updated periodically with information regarding their child's age group, including proper milestones to be reached, activities, vaccinations, and health and safety tips. Parents can then retweet (or respond back to a given tweet) whether or not their child has reached a given milestone, and responses would then be saved to the website's database.

A great advantage of the microblogging medium is the ability to easily share with family and friends the progress of a child's development. Parents can retweet regarding their child's first steps, and post videos and photos for relatives to view as easily as updating their status. This system will also provide helpful information to pediatricians about where a child is developmentally. It can be hard to track and journal the progression of development, but the idea of using microblogging tools is to incorporate this usually mundane and tedious task into an activity that many people already use and enjoy. We hope that this form of tracking will become systematic, leaving users to feel as though it is not a chore but part of their daily routine.

FUTURE STUDY AND CONCLUSIONS

Since we have not yet tested the CMC system, our next step will be to conduct a study to analyzes how parents react and potentially benefit from the CMC Baby Steps system. We will conduct a deployment study of the CMC system and measures parental knowledge of child development before and after usage and study the effectiveness and usability of our system. The information found from this research can be used to design a fully functioning CMC application, and we hope that the system will encourage parents to keep better track of their child's development with the goal of earlier detection of developmental delays and improved pediatric health. The results of the previous Baby Steps application provided information proving the effectiveness of such systems, and we hope to see a similar response with the addition of more varied popular mediums.

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