

Interface Design Guidelines to Improve Usability of Websites for Teenagers

by

Cathy Marie Bailey

A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn, Alabama
May 6, 2017

Keywords: interaction design, website evaluation, teen usability, cool, TeenCI, health websites
for teenagers

Copyright 2017 by Cathy Marie Bailey

Approved by

Cheryl D. Seals, Chair, Associate Professor of Computer Science and Software Engineering
Richard Chapman, Associate Professor of Computer Science and Software Engineering
Jared Russell, Professor of Kinesiology
David Umphress, Professor of Computer Science and Software Engineering

Abstract

Although most teenagers (aged 13-17) use the Internet daily, very little human-computer interaction (HCI) research exists on design of websites for teens. Several authors have published web usability guidelines and “cool” engagement design guidelines for teenagers, but these guidelines were not validated through the implementation and testing of an interface. The research reported here investigated the guidelines through empirical studies. Eight teenagers evaluated the *BAM! Meeting the Challenge* interface to provide insights into designing for engagement, multimedia, interaction, and “cool” factor. Teen participants suggested the interface needed more color and pictures, sports, and fun facts about asthma, all of which were implemented into the newly redesigned *Center for Teen Health and Prevention (CTHP)* interface, along with other guideline based changes. A comparative evaluation of both interfaces was conducted with 14 teenagers who rated them on satisfaction, aesthetic appeal, ease of use, engagement, and cool usability factors. The findings from this study are consistent with the recommended usability and “cool” guidelines, at least on the usability factors measured.

Acknowledgments

I would like to express my sincere gratitude to Dr. Cheryl Seals for her creative thinking, patience, and dedication while serving as my Chair. As a remote student, I am very grateful for the extra support you provided when I had critical administrative deadlines. I am also grateful for your mentoring, which was not only instrumental in helping me accomplish this goal, but which also inspired me to become an ambassador for STEM education.

Sincere thanks and appreciation to my dissertation committee members Dr. Richard Chapman, Dr. Jared Russell, and Dr. David Umphress for your intellectual advice, encouragement to narrow the scope of my research, and foresight to recommend use of mobile devices.

A special thanks to Dr. Joni Lakin for serving as my university reader.

To my Centers for Disease and Control and Prevention (CDC) colleagues, Peter Edwards, Dr. Judith Qualters, Dr. Hatice Zahran, Dr. Ayana Perkins, Dr. Paul Garbe, and Sidoine Lafleur Kamgang, I am forever grateful for your years of support and words of encouragement during my research journey, particularly when I had challenges with accessing organizations and teen participants, learning new software and statistical techniques, and locating funding.

Thanks to the Teen Activities Director and teen participants at the YMCA, for being accommodating and participating in my research. I learned a lot about implementing a usability experiment with a large group of teens and will be forever grateful to you for the experience. To

the other teen participants and parents who allowed your children to participate, I could not have come this far without your willingness to help. You helped me make it to the home stretch!

My mom is always very proud of my accomplishments. Mom, here's something else to brag about. Go for it!

To my brothers and sister, thanks for your support and understanding during this journey. To my many friends who helped me recruit participants and constantly encouraged me to "hang in there," thank you very much.

Table of Contents

Abstract.....	ii
Acknowledgments	iii
1 INTRODUCTION	1
1.1 Motivation	1
1.2 Goals and Approach.....	2
1.3 Distinction and Contribution of Research.....	4
1.4 Organization of the Dissertation	5
2 LITERATURE REVIEW	6
2.1 Teens and Technology Use	6
2.2 Human-Computer Interaction	6
2.3 Teen-Computer Interaction (TeenCI).....	7
2.4 Design for Teenagers Cognitive and Physical Abilities and Personal Preferences	8
2.5 Web Usability Guidelines for Teenagers	9
2.6 Cool Design Guidelines for Teens	10
2.7 Health Information for Teenagers	12
2.8 Health Information Websites for Teenagers	12
2.9 Conclusions	19
3 METHOD: IDENTIFICATION OF DESIGN GUIDELINES FOR TEENAGERS.....	21

3.1	Identification of Web Interface Guidelines for Teenagers.....	21
3.2	Identification of “Cool” Design Guidelines for Teenagers.....	23
4	METHOD: PHASE ONE INFORMANT DESIGN EXPERIMENT.....	24
4.1	Purpose.....	24
4.2	Statement of the Problem.....	24
4.3	Research Questions.....	25
4.4	Research Approach.....	25
4.5	BAM! Meeting the Challenge Interface.....	25
4.6	Participants.....	27
4.7	Materials.....	27
4.8	Design Session Procedures.....	28
4.9	Tasks.....	29
4.10	Facility.....	30
4.11	Equipment.....	30
4.12	Instrumentation.....	30
4.13	Measures.....	31
4.14	Analysis of Results.....	32
5	RESULTS: PHASE ONE INFORMANT DESIGN EXPERIMENT.....	33
5.1	Participants.....	33
5.2	BAM! Meeting the Challenge Problem Space.....	35
5.3	Designing for the Usability Guidelines.....	37
5.4	Incorporating Cool Aspects.....	40
5.5	Discussion.....	42

5.6	Conclusions	44
6	SYSTEM DESIGN	45
6.1	User-Centered Design Approach	45
6.2	BAM! Meet the Challenge Problem Space	46
6.3	Conceptual Model	46
6.4	Requirements.....	48
6.5	CTHP Design Implementation.....	49
6.6	CTHP Redesigned Interface.....	51
6.7	CTHP Development	54
6.8	Design Challenges.....	54
7	METHOD: PHASE TWO USABILITY EVALUATION	55
7.1	Purpose.....	55
7.2	Statement of the Problem.....	55
7.3	Research Approach	56
7.4	Research Questions	56
7.5	Research Hypotheses.....	56
7.6	Participants.....	59
7.7	Materials.....	59
7.8	Procedures	59
7.9	Tasks.....	61
7.10	Facility.....	62
7.11	Instrumentation.....	62
7.12	Measures.....	63

7.13	Analysis of Results.....	64
8	RESULTS: PHASE TWO USABILITY EXPERIMENT	65
8.1	Demographics.....	65
8.2	Internet Access and Use	66
8.3	Data Collection Characteristics	66
8.4	Comparative Usability Evaluation	67
9	DISCUSSION.....	72
10	CONCLUSIONS.....	75
	REFERENCES	76
	APPENDIX A GUIDELINES AND INTERFACE CONFORMANCE CROSSWALK	82
	APPENDIX B DETAIL IMAGES BAM! MEET THE CHALLENGE INTERFACE	88
	APPENDIX C DETAIL IMAGES CTHP INTERFACE	94
	APPENDIX D QUESTIONNAIRE AND TASK LIST (INFORMANT DESIGN EXPERIMENT).....	96
	APPENDIX E QUESTIONNAIRE AND TASK LIST (USABILITY EXPERIMENT)	99
	APPENDIX F SUMMARY QUESTIONNAIRE (USABILITY EXPERIMENT).....	105
	APPENDIX G QUESTIONNAIRE SOURCES AND ALIGNMENT (USABILITY EXPERIMENT).....	106
	APPENDIX H RECRUITMENT SCRIPT (INFORMANT DESIGN EXPERIMENT)	108
	APPENDIX I RECRUITMENT SCRIPT (USABILITY EXPERIMENT)	109

APPENDIX J PARENTAL PERMISSION/CHILD ASSENT (INFORMANT DESIGN
EXPERIMENT)..... 110

APPENDIX K USABILITY EXPERIMENT PARENTAL PERMISSION/CHILD ASSENT 113

APPENDIX L DEBRIEFING SHEET (INFORMANT DESIGN EXPERIMENT)..... 116

APPENDIX M DEBRIEFING SHEET (USABILITY EXPERIMENT)..... 117

List of Tables

Table 1. Research framework	4
Table 2. Usability questions by mean scores	36
Table 3. Design suggestions about written content to improve ease of use	38
Table 4. Design suggestions to improve engagement.....	39
Table 5. Design suggestions to improve aesthetic appeal.....	39
Table 6. Design suggestions to improve satisfaction.....	40
Table 7. Ease of use usability goal and measures by interface mean score preferences	68
Table 8. Satisfaction usability goal and measures by interface mean score preferences.....	68
Table 9. Engagement usability goal and measures by interface mean score preferences.....	69
Table 10. Aesthetics usability goal and measures by interface mean scores	69
Table 11. Cool usability goal and measures by interface mean scores.....	69
Table 12. Comments on why CTHP was selected as the coolest interface	71
Table 13. Comments on why BAM! was selected as the coolest interface	71

List of Figures

Figure 2.1 Planned Parenthood (Teen Micro Site)	14
Figure 2.2 AVERT Teen Website www.avert.org	15
Figure 2.3 Scarleteen Teen Website www.scarleteen.com	15
Figure 2.4 Teen-targeted Section of USA.gov Government Website	16
Figure 2.5 KidsHealth Website www.kidshealth.org	17
Figure 2.6 Teen Website www.kidshealth.org	18
Figure 2.7 NIDA Teen Website drugabuse.gov	19
Figure 4.1 CDC BAM! Meeting the Challenge interface (Informant Design Experiment)	27
Figure 5.1 Demographic Characteristics of Participants	34
Figure 5.2 Internet Access and Use and Experiment Location.....	35
Figure 6.1 User-Centered Design Lifecycle	46
Figure 6.2 CTHP Interface.....	52
Figure 6.3 CTHP Interface Design Changes.....	53
Figure 6.4 CTHP Interface Design Changes.....	53
Figure 6.5 BAM! Meeting the Challenge Informant Design/Usability Experiment Interfaces....	54
Figure 8.1 Participant Demographics	65
Figure 8.2 Internet Access and Use	66
Figure 8.3 Data Collection Characteristics	67
Figure 8.4 Preference for Cool Interface	70

List of Abbreviations

HCI	Human-Computer Interaction
CDC	Centers for Disease Control and Prevention
CTHP	Center for Teen Health and Prevention

1 INTRODUCTION

1.1 Motivation

It is a common practice in human-computer interaction (HCI) to design for users' needs. Design considerations for differences in users' age, physical capabilities, and cognitive abilities can result in interfaces that not only meet the needs of intended users, but also improve the user experience and usability of an interface [1]. As a result, interfaces are often designed differently for adults and children [2, 3, 4, 5, 6]. Some authors advocate designing for even more distinct age groups of children and adults, such as kids 3-12, teens 13-17, college students 18-24, and adults 25-64 [7].

HCI research predominantly focused on adult users, subjecting kids and teens to interfaces that were not designed with their unique needs in mind. It wasn't until the early 1980s when the HCI community published its first article on child-related HCI issues, and in the early 1990s a significant number of papers were published [8]. This early work primarily focused on younger children. Teenagers didn't emerge in the HCI literature until 2001 [9]. This new teen-targeted HCI research area emerged as Teen-Computer Interaction (TeenCI) [9]. Currently, there is very little published work on teen users and HCI, and most of the existing work focuses on methods for involving teens in the design process [10, 11, 12, 13, 14, 15].

More teens use the Internet than adults 30 years and over, and 92% of teens that use the internet do so daily [16, 17]. Teens typically use the Internet for "school assignments, hobbies or other special interests, entertainment, news, learning about new topics, talking to friends, and shopping," whereas adults are very task-oriented (i.e., get things done, find information, and communication) [7]. In contrast to adults, teens' reading and research skills are not as sophisticated, and they don't have as much patience, all factors that impact usability and must be considered when designing interfaces for them [7]. Given these unique patterns, very little HCI

usability research exists on designing usable websites for the teen user group's needs, abilities, and preferences [18]. This research aims to address some of these shortcomings.

1.2 Goals and Approach

With most teens using the Internet and the limited literature on HCI and teenagers, there is a need for usability research aimed at understanding how to design web interfaces that meet the needs and preferences of teenage users. A wealth of general guidelines exists to help make design decisions, and these guidelines are used as best practices to improve interface designs, but they were not written for teen users. McCloskey, Loranger, and Nielsen conducted extensive research to develop a set of 111 teen-specific usability guidelines [7]. These authors highlight the potential impact of their guidelines on a website's appeal to teenagers. Several authors investigated "cool" guidelines as a design factor that engages teens [19, 20, 21]. Although the work of these authors was extensive, they did not validate their guidelines through the design, implementation, and testing of a website, interface, or other product. Fitton & Bell [23] described several opportunities in TeenCI. Their main questions were "How to use insights gathered from teen participants?" and "How can we design technology to be successfully adopted and appropriated by teenagers?" McCloskey et al. [7] addressed the latter through the development of their teen-specific usability guidelines. Our research aims to address both opportunities, through an informant design experiment to gather design ideas from teens and a usability experiment where teens evaluated web interfaces.

This research builds on the extensive list of teen-specific usability guidelines reported by McCloskey et al. [7] and "cool" guidelines of Read et al. [21]. The purpose of this study is to validate the published guidelines by investigating the effect they have on software usability for teenagers aged 13-17.

In Table 1, we present our framework for this research. A literature review was conducted to identify teen-specific web usability and cool guidelines. Design sessions involving teen informants were implemented in phase one. In phase two, a comparative usability experiment was conducted.

In phase one, we conducted design sessions with teen informants, who evaluated the Centers for Disease and Control and Prevention (CDC) *BAM! Meeting the Challenge* interface. The objectives of these sessions were to investigate the *BAM! Meeting the Challenge* problem space and gain insights into how to design for specific aspects of the guidelines, such as engagement, interactive features, multimedia components, and cool. The results of the informant design experiment and the usability and cool guidelines were used as input for redesigning the *BAM! Meeting the Challenge* interface as the new *Center for Teen Health and Prevention* (CTHP) interface. Both interfaces communicate health information on asthma, a chronic health condition that impacts the lungs of six million young children and teenagers in the United States [22].

In phase two, we conducted a usability experiment with teenagers aged 13-17 to compare our newly redesigned *Center for Teen Health and Prevention* interface with the *BAM! Meeting the Challenge* interface, to show the effects that implementing the guidelines had on satisfaction, aesthetics, ease of use, engagement, and cool usability factors.

Table 1. Research framework

Phase	Methods	Output
Identify teen-specific web interface and “cool” guidelines	<ul style="list-style-type: none"> ▪ Literature review 	Summary of teen-specific usability and cool guidelines adopted for this research
Phase One: Informant Design Experiment	<ul style="list-style-type: none"> ▪ Design sessions with teen informants aged 13-17 ▪ BAM! Meeting the Challenge interface review, task implementation, and evaluation ▪ Qualitative and quantitative paper-based questionnaire 	Understand the <i>BAM! Meeting the Challenge</i> interface’s problem space and how to design for specific aspects of the guidelines on engagement, interactive features, multimedia components, and “cool”
	<ul style="list-style-type: none"> ▪ Informant design experiment data analysis 	Informant design experiment results
	<ul style="list-style-type: none"> ▪ Redesigned the <i>BAM! Meeting the Challenge</i> interface using informant design experiment results and usability and cool guidelines 	New redesigned <i>Center for Teen Health and Prevention (CTHP)</i> interface
Phase Two: Usability Experiment	<ul style="list-style-type: none"> ▪ Comparative usability evaluation of the <i>BAM! Meeting the Challenge</i> and <i>Center for Teen Health and Prevention (CTHP)</i> interfaces with teen participants ages 13-17 	User interface preferences and usability ratings

1.3 Distinction and Contribution of Research

Although teenagers are possibly the “most dynamic and technologically-aware user group that will soon become the next generation of adults,” they have been given very little attention in the HCI community until recently [9]. While HCI has been expanded by inclusion of teenagers in the form of Teen-Computer Interaction (TeenCI), there is still limited published work in this area [9, 10, 23].

While several authors [7, 19, 20, 21] have proposed teen-specific web interface design guidelines, empirical usability studies are needed to validate the guidelines published by these authors. To meet this need, we redesigned an interface implementing the guidelines and conducted a comparative usability study to evaluate the impact they have on usability for the target user group, teenagers aged 13-17.

Although there are numerous health websites for teens, to our knowledge, there is very little empirical usability research on teenagers and health information interfaces. Furthermore, the work that does exist was primarily on sexual health.

This research contributes to the limited body of knowledge in the TeenCI HCI research area, particularly on designing web interfaces for teenagers. We expect validation of the published guidelines will improve the usability of web interfaces for teenagers. This research also identifies teenagers as a subgroup that will benefit from access to health information websites with content that is appropriately designed for them.

1.4 Organization of the Dissertation

The remainder of this dissertation is organized as follows. Chapter 2 provides a review of the literature on teens and technology use, HCI, design considerations, design guidelines, and health information and health websites for teenagers. Chapter 3 documents our methods for identifying the teen-specific interface design guidelines we adopted. Chapter 4 describes in detail the methodology employed in the informant design experiment, and Chapter 5 presents the results and their contribution to the study's research objectives. Chapter 6 outlines the system design process. Chapter 7 presents the methodology used for the usability experiment, and in Chapter 8 the empirical results of this experiment are reported. Finally, Chapter 9 presents our discussion points and Chapter 10 offers concluding remarks for the research.

2 LITERATURE REVIEW

2.1 Teens and Technology Use

Almost all (95%) teens use the Internet [17]. Boys (97%) are slightly more likely than girls (93%). Teens aged 12-13 (93%) are slightly less likely to use the Internet than those aged 14-17 (96%). Teens with a White (98%) parent are more likely to use the Internet than those with a Black (92%) or Hispanic (88%) parent. Teens living in rural (99%) areas are online slightly more than those in suburban (96%) and urban (94%) areas [17]. Teens are not savvy Internet users as perceived by most. They perform worse on websites and make more mistakes online than adults [7]. This is likely due to their reading abilities, research skills, and low levels of patience [7].

Almost all (93%) teens have a desktop or laptop computer or have access to one [17]. Mobile devices such as smartphones are pervasive in the lives of teenagers. Almost three-quarters of teens have or have access to a smartphone [16]. Nearly all (91%) teens use either cell phones, tablets, or other mobile devices to go online at least occasionally and almost all (94%) of these teens go online daily or more often [16]. Teens living in lower socioeconomic (i.e., income and education) households are just as likely, and in some instances, more likely, to use their cell phone as the primary source to access the Internet compared to teens in the higher socioeconomic households [17].

2.2 Human-Computer Interaction

Human-computer interaction (HCI) is “concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” [24]. Usability is one of the components of human-computer interaction that aides in assessing an interface’s effectiveness, efficiency, safety, utility,

learnability, memorability, errors, and satisfaction [25, 26]. Interaction design is also concerned with developing products and interfaces that are usable, while also addressing the users experience (e.g., how it looks and feels) [26]. Most HCI practitioners agree that both usability and interaction design should be considered when designing interfaces [26]. It is a common practice in HCI to establish goals to measure the usability and user experience of interactive products and interfaces being developed. These goals can be either subjective or objective. This research aims to measure subjective satisfaction and ease of use usability, and aesthetic appeal, engagement, and “cool” user experience goals.

2.3 Teen-Computer Interaction (TeenCI)

Historically, the HCI community predominately focused on adults and later progressed to including young children as the Child-Computer Interaction (CCI) research area. Teenagers had not been given much attention in the HCI community until recently. Including teens as a separate Teen-Computer Interaction (TeenCI) research area is an indicator of progress, and most current authors suggest designing for a specific age group, particularly when an interface targets them [7], but there is still limited published work on the teen user group [9, 10, 23]. Several potential contributing factors are discussed in the literature. Poole and Peyton [14] documented the work of other authors who found that teens lack commitment even when they demonstrate interest and further lack ability and willingness to articulate opinions in one-on-one interviews, both of which are likely contributing factors.

Most of the related work in the literature focused on methods for involving teens in the design process and working with them during the design process as informants and participants. Fitton, Horton, and Read [11] explored using scaffolding in their design sessions. Iversen, Dindler, and Hansen [12] identified rewards, storytelling, and collaboration techniques to

motivate teenagers to participate. Mazzone, Read, and Beale [13] tailored their design activities to the range of learning styles to improve the design of their product.

2.4 Design for Teenagers Cognitive and Physical Abilities and Personal Preferences

Designing for teenagers requires consideration of their cognitive development, physical abilities (i.e., Fitts's law), and personality differences. According to psychologist Jean Piaget, a teenager's development falls into the formal operational (ages 11 and up) stage. At this stage of development, they think similarly to adults, except their interests and tastes are different [27]. Compared to children, teenagers "think in more abstract, logical, and complex ways, and these abilities improve with age" [28, p. 22]. Known cognitive and physical differences among children provide insights into designing for teens. For instance, font size preferences are associated with a child's age, such that the younger the child, the larger the font preference [27]. In one example, children ages nine to eleven (9-11) like 14-point fonts better than 12-point fonts. A child's ability to use a mouse or other input device improves with age, and like adults, children can use point-and-click more easily than drag-and-drop movements [27].

McCloskey et al. [7] reported similarities and differences related to cognitive, physical, and personal preferences among different age groups. Kids want instant gratification, like to explore things to click, enjoy a lot of animation and sound effects, don't like scrolling, and primarily use the Internet for entertainment. In contrast, teens don't like waiting for content to load, are reluctant to explore and click unknown items, prefer limited use of animation and sound effects, accept some scrolling, and prefer some interactive features. Adults want information quickly, don't explore and click unknown items, dislike animation and sound effects, and are very task oriented when using the Internet. To test the concept of designing websites differently for adults and children, Harrison, Zappen and Watson [29] conducted participatory design

sessions with middle-school children on a prototype of an adult interface to understand if the children could navigate the site and locate information, and to get their opinions on the site's look and feel. They found that navigation and searching needed to be easier, brighter colors were preferred, and white space was least preferred, similar to other findings in the literature on interface design guidelines for teens.

2.5 Web Usability Guidelines for Teenagers

Design guidelines are commonly used by interface designers as low-level best practices and context-dependent recommendations, considerations, and rules that inform the design of specific aspects or components to accomplish design principles [1, 30, 31]. Various interaction design guidelines have been published over the past 40 years [30]. Today's guidelines focus more on the user interface than they did in the past. Guidelines for Microsoft Windows and Apple were platform specific [30]. An extensive set of guidelines have been recently published by the U.S. Department of Health and Human Services [32]. These guidelines are considered universal and don't target the teen user group.

McCloskey et al. [7] published 111 usability guidelines for engaging teens on websites. The guidelines cover a range of teen-specific design recommendations on ergonomics, music, mobile devices, loading time, social networking, entertainment and multimedia, images, videos, writing for the web, navigation, and visual design. The guidelines are intended to supplement conventional usability attributes (i.e., effectiveness, efficiency, safety, utility, learnability, and memorability), design principles of Donald Norman [33] and Jakob Nielsen [25, 34], Eight Golden Rules of Ben Shneiderman [1], and usability heuristics. Observational studies were conducted using usability testing, field studies, interviews, and focus group methods with teens, who reviewed websites and provided insights into the published guidelines. They tested 152 sites

that either specifically targeted only teens or had a broad target audience that included teens. Boys and girls in the U.S. and Australia living in urban and rural areas participated in the study. Because their work was very extensive, select guidelines, discussed in Chapter 3, were adopted for this research.

2.6 Cool Design Guidelines for Teens

The word “cool” is one of the most popular slang words, with many meanings. To some, cool means nice, good, hip, popular, or fashionable, generally referencing that someone is cool or something is cool. “Designing cool” was introduced at CHI 2011 and is relatively new in terms of designing for teens. In this early work, essential characteristics (i.e., rebellious, anti-social, retro, authentic, rich, innovative) of cool were developed by Read et al. [20].

We explored guidelines for incorporating cool aspects to engage teen users. Several published studies on teenagers’ perspectives of cool were designed to understand its application to designing cool interfaces and artifacts [19, 20, 21]. This work identified categories of cool to assist interaction designers with designing products that are “at least not entirely uncool” [21]. The group of authors describe cool as a design Hierarchy of Cool: ‘Being Cool’, ‘Doing Cool Things,’ and ‘Having Cool Stuff’. To support the hierarchy, Read et al. [21] developed eight essential categories of cool to understand the impact that the hierarchy and essential categories have on designing for teens. The eight categories of cool are expensive, authentic/real, retro, social, innovative, rebellious, inherent, and attractive.

Fitton et al. [35] identified preferences for cool things among teens. The findings from their study are associated with the expensive, authentic, and rebellious categories of cool published by Read et al. [21]. Teens that participated in their “Cool Wall” study ranked things they perceived to be cool. The top four cool things were “desirable technologies” such as Apple

products. The 5th, 6th, and 7th ranked items were unhealthy food items. Items ranked 8th through 10th were an expensive sports car, PlayStation 3, and branded sportswear such as Adidas.

McCrickard, Barksdale, and Doswell [36] evaluated the innovation, richness, authenticity, anti-social, and rebellious essential categories of cool reported by Read et al. [21] by demographic (i.e., age, sex, and technology expertise) characteristics. Their results suggest the cool categories are appropriate, but they evoke different reactions among the different demographic groups.

Although Cowan, Avramides, and Beale [37, p.5] questioned if cool should be a design goal and discussed challenges with designing cool, they concluded “products that are easy to use, beautiful, fun, and engaging are more likely to be described as cool.”

As demonstrated, progress has been made in identifying ways to incorporate cool into teen-targeted designs. The next logical step is to understand how to measure cool. Sundar, Tamul, and Wu [38] validated a set of measures to assess coolness of digital devices and interfaces. They conducted a literature review to identify statements about coolness. From an exploratory factor analysis study, they identified a set of cool questions. Two additional studies [38] resulted in a final questionnaire to measure coolness by three factors, originality, attractiveness, and subcultural appeal (i.e., uniqueness, makes me stand apart), that together contribute to perceived coolness. The authors also describe nine questions to measure holistic coolness (i.e., this product is cool, this product has some cool features). Bruun, Raptis, Kjeldskov, and Skov [39] focused on inner cool as someone’s or something’s personality or character being an indicator of cool and a basis for measuring cool. Their COOL questionnaire was developed using EFA (exploratory factor analysis) and CFA (confirmatory factor analysis)

statistical methods. Results of these analyses suggest inner coolness is determined by desirability, rebelliousness, and usability.

2.7 Health Information for Teenagers

Health topics are important to both male (43%) and female (59%) teenagers, and teens need access to health information to understand “serious health and safety issues such as motor vehicle crashes, violence, substance use, and risky sexual behaviors that can adversely affect them” [40, 41]. For instance, some teens are at risk of developing chronic diseases in adulthood as a result of behaviors such as not eating nutritiously, not engaging in physical activity, and choosing to use tobacco [41]. Other teens are more at risk for developing chronic diseases such as asthma that impact their quality of life.

The Internet serves as a source for health information that supports formal and informal health education as well as personal interest needs, and has the potential to improve knowledge about health and change health-related behaviors [42]. Teens use the Internet to access health information because it provides on-demand access and a sense of anonymity [42]. Eighty-four percent (84%) of teens ages 13-18 get health information from the Internet [43]. Thus, the Internet serves as a major source for accessing health information, only slightly behind parents (96%), health classes in school (90%), and doctors/nurses (90%) [43]. Although most teens use some type of social media site, websites still remain the preferred mechanisms among teens for health information [40, 43]. These findings support the need to design websites specifically for teens, particularly for health-related topics that impact them.

2.8 Health Information Websites for Teenagers

Although there are numerous health websites for teens, to our knowledge, there is very little empirical usability research on teenagers and health information interfaces. The HCI

literature on health websites for teens is varied in content and scope. Most literature is focused on sexual health. The scope of literature included reviews/surveys, usability studies, and issues related to searching online for health information. The goal of our study is to understand the extent that teen-targeted health websites conform to usability criteria consistent with our guidelines.

Ypulse, ISIS, Inc. and Youth Noise [44] conducted an online survey to understand the views of youths (ages 13-24) on the Internet and mental health and wellness issues, where respondents were asked to make suggestions for a new site on these topics. Respondents listed important attributes such as publicizing the resource, safety, anonymity, and ease of use. Other suggestions included that information must be comprehensive, accurate, not too technical, and presented in a fun and interactive manner.

Nemire, Beil, and Swan [45] conducted a usability study where teens evaluated a smoking virtual world and positively rated the effectiveness of presenting information, an area of the interface that had been given a lot of effort during development.

Keller and La Belle [46] found that navigability, accuracy, and authority were the most important usability attributes when teens rated STD-prevention websites.

Danielson et al. [47] tested a HIV/STI prevention website for African-American adolescents and received design suggestions that were similar to the guidelines published by McCloskey et al. [7]. Participants suggested using meaningful images instead of all text and to avoid overuse of animation and random sound effects.

Lam, Roter, and Cohen [48] evaluated 56 adolescent osteosarcoma websites and found that 96% didn't meet the recommended Flesch Reading Ease score of 65 or higher.

Whiteley, Mello, Hunt, and Brown [42] conducted a review of 29 teen-targeted educational health and sexual health websites. Most content in the sites was organized as static text and graphic format that didn't take advantage of the Internet's interaction capabilities. Only two sites, www.plannedparenthood.org (Figure 2.1) and www.avert.org (Figure 2.2) had mobile capabilities. Planned Parenthood's site, www.plannedparenthood.org (Figure 2.1) was the "most well rounded" of the sites assessed, because of its overall scores on interactivity and educational content. Two other sites, www.avert.org (Figure 2.2) and www.scarleteen.com (Figure 2.3) scored high for credibility and educational content, but average for interactivity. Overall, these three sites scored the highest of all the websites assessed.



Figure 2.1 Planned Parenthood (Teen Micro Site)
<http://plannedparenthood.org/teens/>



Figure 2.2 AVERT Teen Website www.avert.org

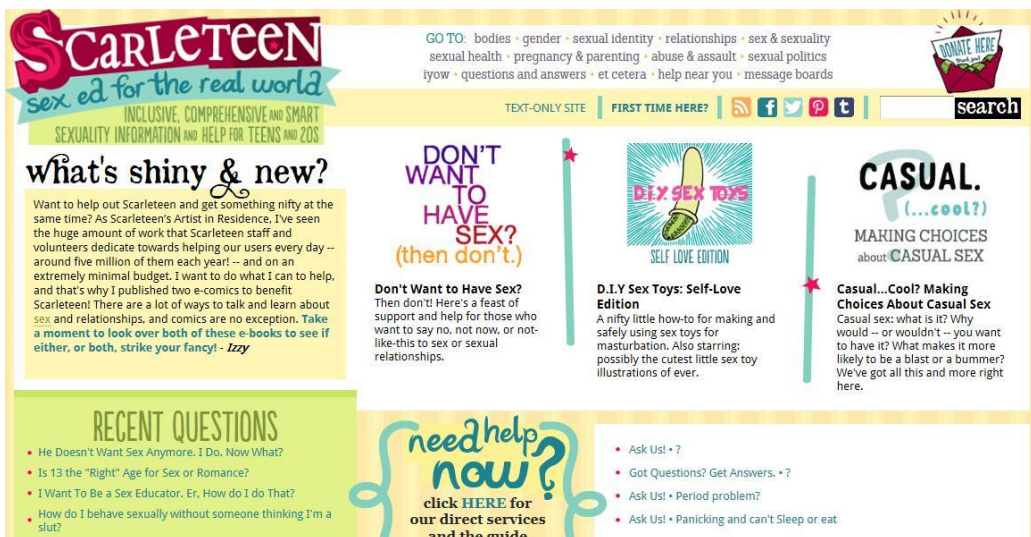


Figure 2.3 Scarleteen Teen Website www.scarleteen.com

D'Auria [49] suggests government websites such as the Centers for Disease Control and Prevention (www.cdc.gov), Medline Plus (www.nlm.nih.gov/medlineplus), the National Institutes of Health (<http://health.nih.gov/topic/TeenHealth>), and USA.gov (www.usa.gov/Topics/Teens.shtml) as reliable sources of health information for teens (Figure 2.4).

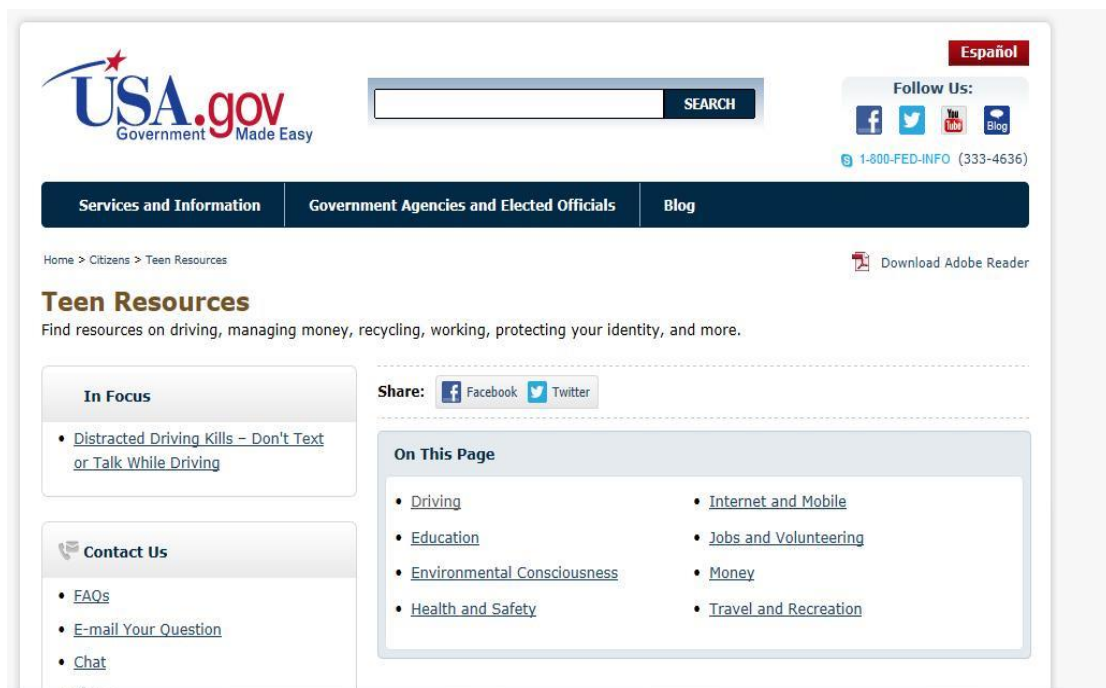


Figure 2.4 Teen-targeted Section of USA.gov Government Website

McCloskey et al. [7] developed the usability guidelines used for our study. Three websites out of the 152 sites tested in their study were on health topics. A summary of the findings related to the three health websites and their associations with the guidelines is below.

Example of Childish Appeal (Figure 2.5)

Teens viewed the KidsHealth.org splash page as too childish. They were unimpressed by the "cute" sound effects that accompanied the graphical elements. "Given the cartoon pictures and overuse of pastel colors, participants assumed the site was designed only for young children" [7].

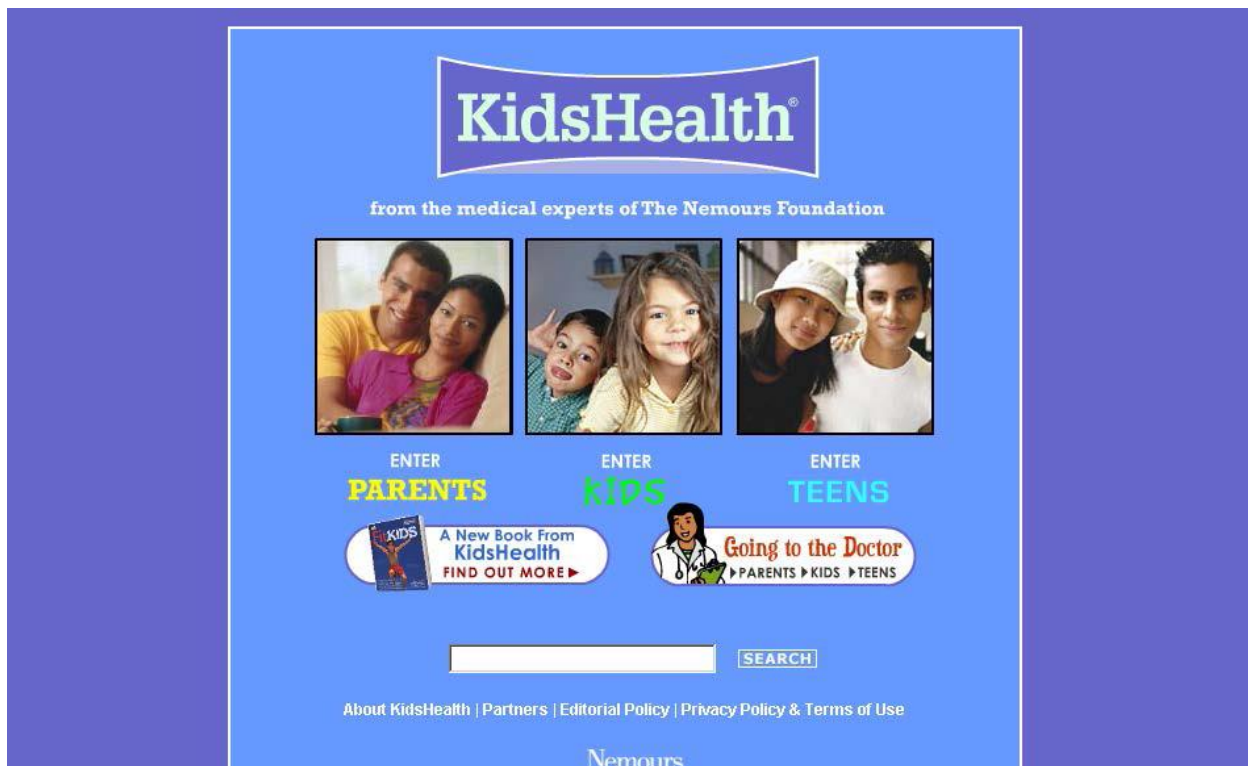


Figure 2.5 KidsHealth Website www.kidshealth.org
Source: Teenagers on the Web, McCloskey et al. (2013)

Example of Writing for Teens (Figure 2.6)

KidsHealth.org has a micro site, TeensHealth that is dedicated to teens. The TeensHealth site has good and bad examples of writing on the web for teens. Comments about the site are below.

“The pleasant graphical treatment and inviting language on KidsHealth.org facilitated learning and kept teens interested.”

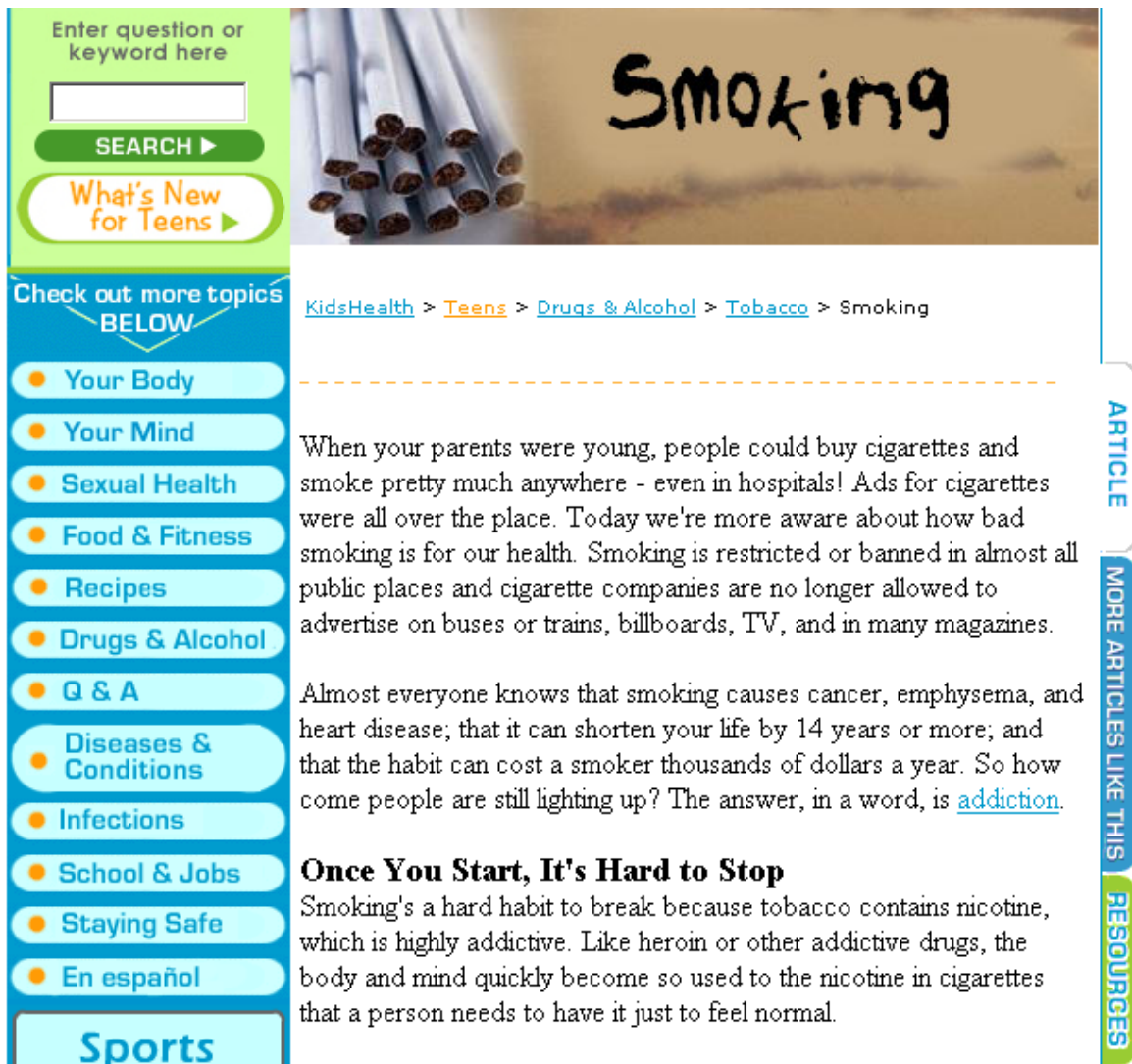


Figure 2.6 Teen Website www.kidshealth.org
 Source: Teenagers on the Web, McCloskey et al. (2013)

Example of Attractive Images (Figure 2.7)

Users liked the appearance of drugabuse.gov site because it had some attractive graphical elements.

"I like [this site] better because it's not just different links written out, and it's more decorated. It makes the website look a little more fun. So it's not just a totally boring website." — 14-year-old female



Figure 2.7 NIDA Teen Website drugabuse.gov
National Institute on Drug Abuse www.nida.nih.gov
Source: Teenagers on the Web, McCloskey et al. (2013)

2.9 Conclusions

Most of the related work in the HCI literature focused on methods for involving teens in the design process and working with them during the design process as informants and participants. Designing for teenagers requires consideration of their cognitive development, physical abilities, and personal preferences, which are different from those of young children and adults. Using interface design guidelines is an acceptable method for designing interfaces and technologies for an intended user population. Designing interfaces for young children and adults has been well documented in the HCI literature, but very little has been published on teenagers, presenting numerous research opportunities. Teens are the next generation of adults, who have a need to understand health issues and particularly health issues that impact them now. The Internet serves as a primary source for health information for teenagers. Although there are

numerous health websites for teens on the Internet, to our knowledge, there is very little empirical usability research on teenagers and health information interfaces.

3 METHOD: IDENTIFICATION OF DESIGN GUIDELINES FOR TEENAGERS

This chapter presents two sections that describe methods used to identifying the teen web interface design guidelines adopted from McCloskey et al. [7] and “cool” guidelines from Read et al. [21]. The information is organized to give an overview of the final set of guidelines selected for this research and the literature review process that led to selecting these guidelines as our primary source. We present the usability guidelines grouped by our design goals of improving satisfaction, ease of use, aesthetics, and engagement usability factors.

3.1 Identification of Web Interface Guidelines for Teenagers

To find published research on web interface design guidelines for teenagers, we searched digital libraries such as ACM, IEEE, and PubMed on terms such as children, teens, interaction design, web design guidelines, and usability. In addition, we used reference articles that were closely related to our topic. After reviewing the literature, we selected McCloskey et al. [7] as our primary source. Beginning with their 111 usability guidelines, guidelines on social networking, account sign up, school assignments, online shopping, customizations, audio/video, and searching were excluded because they were not applicable to our interface. We excluded articles that were developed for children younger than age 13 [3, 5, 6, 8, 50, 51, 52, 53, 54] and non-web interfaces [55], included all child ages [4, 27, 56] or included only females [2].

We adopted 25 guidelines, grouped by our design goals: to improve satisfaction, aesthetic appeal, ease of use and engagement usability factors. The numbers in parentheses correspond to the McCloskey et al. [7] guideline number.

Satisfaction Design Goal

Teen-targeted Content: Separate teen information from public, kids, and adults when their content is different. (1,2)

Ergonomics: Design for teen's use of laptops and mobile devices. (4)

Navigation and Links: Allow teens to determine where they are and where they can go quickly.

- Use meaningful menu items and link labels. (81)
- Use mega-menus to show the breadth of information. (83)
- Links should change color to indicate visited/unvisited. (85)

Credibility and Trust: Teens prefer current information and sites that are free of bugs.

- Keep information up to date and consistent. (97)
- The website must work – no bugs, broken links, or server errors. (98)

Aesthetic Appeal Design Goal

Visual Appeal: Teens like visually attractive websites.

- Website should be visually attractive. (107)
- Display text and graphics in small meaningful chunks balanced with white space to facilitate scanning. (108)
- Avoid using too many kid indicators such as bright colors, big fonts, and rainbows. (109)
- Design should be gender neutral unless targeting a specific gender, including choice of images and colors. (110)

Ease of Use Design Goal

Written Content: Teens prefer information that is concise, easy to understand, and easy to find.

- Be concise, but provide details, facts, and figures. (62, 63)
- Optimize scanning with short sentences (less than twenty words), headings, subheadings, and paragraphs (less than four sentences). (64)
- Use simple format when viewed by mobile device. (7)
- Use bulleted points and numbered list where appropriate. (64)
- Supplement text with pictures or illustrations to help understand the content and minimize plain text. (65)
- Place most important information at the top of the page. (67)
- Bold, italicize, and enlarge important words. (67)
- Use long pages so teens can scroll instead of using pagination. (68)
- Use at least a 10-point or larger font and avoid all caps. (70)
- Use contrast between text and background colors. (71)

- The content should not be too difficult (6th grade or lower reading level), vague, or ambiguous. (73)

Engagement Design Goal

Entertainment - Interaction: Teens like to be entertained, but too much can be frustrating.

- Use interactive features such as quizzes and games to facilitate learning. (29)

Entertainment - Images: Teens enjoy looking at pictures and images online.

- Use meaningful pictures that relate to the topic. (37)

- Use pictures and images of other teens. (38)

3.2 Identification of “Cool” Design Guidelines for Teenagers

We explored guidelines for incorporating “cool” to engage teen users. Read et al. [21] published studies on teenagers’ perspectives of cool to understand their application to “designing cool.” After three rigorous studies, the authors developed the following eight categories of cool that can be applied to designing interfaces.

1. Expensive (i.e., value based on achievement, hard to obtain, rare, takes hard work to achieve)
2. Authentic/real (i.e., new, innovative, “real thing”)
3. Retro (i.e., from the past, but familiar)
4. Social and anti-social (i.e., controlled social exclusion and inclusion)
5. Innovative (i.e., unusual, unusual situations, novel)
6. Rebellious (i.e., support for breaking rules)
7. Inherent (i.e. do not emphasize uncontrolled circumstances)
8. Attractive (i.e., attractive technology and people).

4 METHOD: PHASE ONE INFORMANT DESIGN EXPERIMENT

This chapter presents methods employed to implement the informant design experiment. It includes the purpose of the experiment, problem statement, research questions, and approach to accomplishing our study objectives. The *BAM! Meeting the Challenge* interface used for the experiment is presented, including details of the site's contents. This chapter also describes recruitment, design session procedures, instrumentation, measures, and analysis.

4.1 Purpose

In this experiment, teen participants evaluated the *BAM! Meeting the Challenge* interface to provide insights into the interface's problem space and how to design specific aspects of the guidelines on engagement, multimedia components, interaction, and cool. We expected the resulting outcome from these design sessions would be valuable to redesigning the *BAM! Meeting the Challenge* interface.

4.2 Statement of the Problem

There are many benefits of involving children in the design process, particularly to gain insights into how to keep them engaged and motivated [57]. Children can be involved as users, testers, informants, and design partners (i.e., participant design and cooperative inquiry) [8]. Scaife et al. [57] used an informant design framework in which children provide input and feedback into the design as "native informants" at various stages of the design process without having to be involved in the entire process. Our informant design experiment was influenced by this framework. We used teen informants to provide design suggestions for improving the *BAM! Meeting the Challenge* web interface.

The *BAM! Meeting the Challenge* interface was developed by the CDC to encourage older children and younger teens (aged 11-14) with asthma to participate in physical activity.

Our objective was to understand how to redesign the interface to appeal to a broad age of teens 13-17 years old.

4.3 Research Questions

The informant design experiment aimed to investigate the following research questions related to the *BAM! Meeting the Challenge* interface:

1. What is the problem space?
2. How can we design for the usability guidelines on engagement, multimedia components, and interaction?
3. What “cool” features should we incorporate to improve engagement?

4.4 Research Approach

We recruited teen informants aged 13-17 to participate in design sessions to evaluate and provide opinions about the *BAM! Meeting the Challenge* interface. We expected the outcomes from the design sessions would be valuable to understanding how to design specific aspects (i.e., engagement, multimedia, interaction) of our usability and cool engagement design guidelines.

4.5 BAM! Meeting the Challenge Interface

Asthma is a lung disease that causes the airways to tighten and swell. It is a common long-term disease among children and teens – 6 million children have asthma [22]. Asthma can be controlled by taking medicine and avoiding triggers that can cause an attack. Having asthma doesn't mean children and teens can't play or actively participate in sports.

Government websites such as the Centers for Disease Control and Prevention (www.cdc.gov) are considered reliable sources for health information [49]. The CDC developed *BAM! Meeting the Challenge* (Figure 1) to communicate that adolescents with asthma can be

active and live normal lives. The *BAM! Meeting the Challenge* homepage is part of the *BAM!* website. The *BAM!* website has other webpages on health topics such as diseases, food and nutrition, physical activity, safety, life, and body. To simplify the experiment, the homepage was the only page evaluated, primarily because it has all the relevant content on asthma. The other links and icons are for other diseases, which would have complicated the experiment and expanded its scope.

The *BAM! Meeting the Challenge* webpage has five sections. “Don’t Let Asthma Keep You Out of the Game,” which points out that asthma is not a barrier to physical activity and describes 1984 Olympic medal winners and athletes with asthma. The second section, “Who has asthma?” explains asthma, list the number of children that have asthma, and introduces Coolio, a famous rapper that has asthma. The third section, “Physical Activity – Asthma,” explains the relationship between physical activity and asthma. The fourth section, “Get Fit,” describes asthma-friendly activities and encourages regular physical activity. The last section, “Feel Good,” advises to follow the doctor’s advice.

The *BAM! Meeting the Challenge* webpage was selected because it targets young teens and does not contain most of the design guidelines. Although the webpage is primarily text with long pages, does not have interactive features, and has one image, it does meet two key guideline recommendations: the Flesch Reading Ease score of 65 or higher (68.9%) and grade level of 6-8 or below (6.7).

In Appendix A, a crosswalk is offered to convey the extent that the *BAM! Meeting the Challenge* interface conforms to the usability and cool guidelines.



Figure 4.1 CDC BAM! Meeting the Challenge interface (Informant Design Experiment)

4.6 Participants

Convenience sampling methods were used to recruit teen (aged 13-17) participants with and without asthma who reside in Georgia and Illinois. Almost all of the participants had over one year of experience browsing the Internet and using computers.

4.7 Materials

The materials for the informant design component of the study included a recruitment script, a parental consent/child assent form, a paper-based questionnaire, and a debriefing sheet. Participants used desktop and laptop computers to view the interface. The informant design experiment was approved by the Auburn University Institutional Review Board (IRB). The consent/assent form (Appendix J) was reviewed by the Auburn IRB and was stamped with approval dates and protocol number. The questionnaire (Appendix D) captured background information, participant demographics, task list and responses, and usability ratings. The

debriefing sheet (Appendix L) summarizes the experiment, reminds participants that participation is voluntary and that they can withdraw, and provides contact information for the lead researcher, advisor, and Auburn IRB.

Survey data was entered into Microsoft Excel. The Statistical Analysis Software (SAS) version 9.3 was used to analyze all questionnaire data.

4.8 Design Session Procedures

The informant design sessions had the following components:

Consent/Assent:

One week prior to participating in the study, potential participants were given a Recruitment Script (Appendix H), which described the details of the study, and a Parental Consent (Appendix J) form, to inform them of the study details and of their rights. Parental consent forms were signed by a parent and the participant before participating in the experiment.

Experiment Instructions:

The lead researcher explained the purpose of the experiment and relevant instructions. Participants were instructed to stay on the *BAM! Meeting the Challenge* webpage and only provide feedback for that page. Participants were also reminded of their right to refuse participation at any time during the experiment. We also stressed that we were interested in their opinions and that there were no right or wrong answers.

Screening/Eligibility

The lead researcher asked participants screening questions “How old are you?” to confirm they were 13-17 and “Do you use the Internet?” to make sure they had online experience.

Background Questions

Background information on demographics, computer and Internet experience, and online health information access were collected from each participant.

Tasks and Survey Questions

Participants were given up to 60 minutes of uninterrupted time to answer questions on cool things, cool people, and cool websites. Participants then explored the *BAM! Meeting the Challenge* webpage, completed four tasks, and wrote responses to the remaining qualitative questions and quantitative usability ratings.

Debriefing

A debriefing session was conducted to answer questions about the study and thank the participants.

Compensation

Participants were paid \$5.00 compensation.

4.9 Tasks

A task list was included on the survey so that participants would explore the webpage to become familiar with it and its contents. All participants performed the following four tasks:

1. What is the name of the famous rapper that has asthma?
2. Write at least one thing that can “trigger” asthma.
3. What is the boy doing?
4. Fill in the blank below. Dr. _____ says that people with asthma "should expect to live a life that really isn't affected by asthma, except for having to follow the directions."

4.10 Facility

The informant design experiment took place at the teen’s home.

4.11 Equipment

Laptop and desktop computers were used to review the webpage.

4.12 Instrumentation

The informant design questionnaire (Appendix D) was paper-based with quantitative and qualitative open-ended questions. All participants received the same questionnaire. The questionnaire had the following content:

Eligibility and Background Information

Background and eligibility data were collected to confirm participants were of eligible age, collect demographics, and to understand the participant’s experience using the Internet and computers.

Task Questions

Task questions were embedded into the questionnaire for easy navigation through the survey.

Qualitative Questions

Qualitative questions on “cool”, suggested changes, and likes and dislikes were administered in this section.

Quantitative questions

Quantitative usability questions were administered in this section.

For some questions on the questionnaire, we asked participants to draw or write responses. Almost all participants wrote responses instead of drawing them. To understand how to incorporate “cool” into the design, participants answered questions about cool websites, cool things, and cool people before seeing the webpage. Participants then reviewed the webpage and completed tasks, after which questions were asked about adding a cool factor and cool changes to replace the image of the boy on the bike. To design for engagement (i.e., entertainment and interaction) participants answered questions about how to change the webpage to make it fun and entertaining. They also answered questions about other changes, likes, and dislikes to measure additional recommendations for any of the guidelines. To understand the problem space, participants rated the interface on fourteen usability attributes.

Participants were also asked to circle any of the quantitative usability questions that were confusing. One person mentioned the questions on “It is fun to use” and “It is pleasant to use” appear to be asking the same thing. We used this method to be sure that the teens understood the questions because we were using them for the usability experiment.

4.13 Measures

Many of the questions on the survey instrument are from the validated Usefulness, Satisfaction, and Ease of Use Questionnaire (USE), Computer System Usability Questionnaire (CSUQ), and others that we developed to meet the study's needs. Participants answered the usability rating questions using a Likert response scale of 1=Disagree and 5=Agree.

4.14 Analysis of Results

All data were analyzed using the SAS 9.3 statistical software. Descriptive statistics of the survey response were calculated. Responses to questions that measured cool websites, cool things, cool people, and cool changes to replace the image of the boy on the bike were collapsed and coded into themes. All responses were categorized by their contribution to designing a particular guideline.

5 RESULTS: PHASE ONE INFORMANT DESIGN EXPERIMENT

The main goal of the informant design experiment was to understand how to improve the design of the *BAM! Meeting the Challenge* interface. To fulfill this goal, we had to understand the interface's problem space as it relates to improving ease of use, aesthetic appeal, satisfaction, and engagement. We also needed to know how to design for specific aspects of the guidelines on engagement, multimedia components, and interactive features. Lastly, we explored "cool" features that could be incorporated to improve the interface's engagement.

This chapter presents the results of the informant design experiment. The section describing participant demographic characteristics and internet access and use provides descriptive statistics and frequency counts. The results that contribute to understanding the problem space and how to design for the usability and cool guidelines are grouped by our design goals of improving satisfaction, ease of use, aesthetics, engagement, and cool usability factors.

5.1 Participants

Five males and three females ages 13, 15, and 16 participated in this phase, during the period of November 8, 2015-November 27, 2015. Participants self-reported their race/ethnicity as either Black, Asian, Hispanic, or multiple race. One participant had asthma. (Figure 5.1)

Demographics: age, sex, race/ethnicity, and asthma status

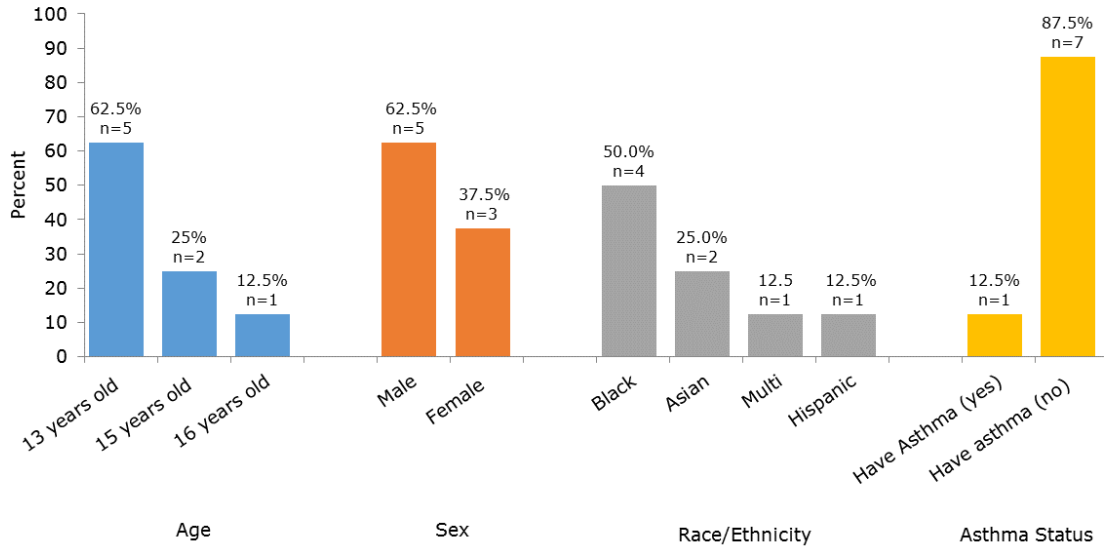


Figure 5.1 Demographic Characteristics of Participants

Almost all of the participants had over one year of experience browsing the Internet and using computers. On an average day, participant's Internet use ranged from less than one hour to as much as five or more hours. All participants used a cell phone to access the Internet, and some used tablets and other mobile devices in addition to cell phones. Most participants have looked for health information online. (Figure 5.2)

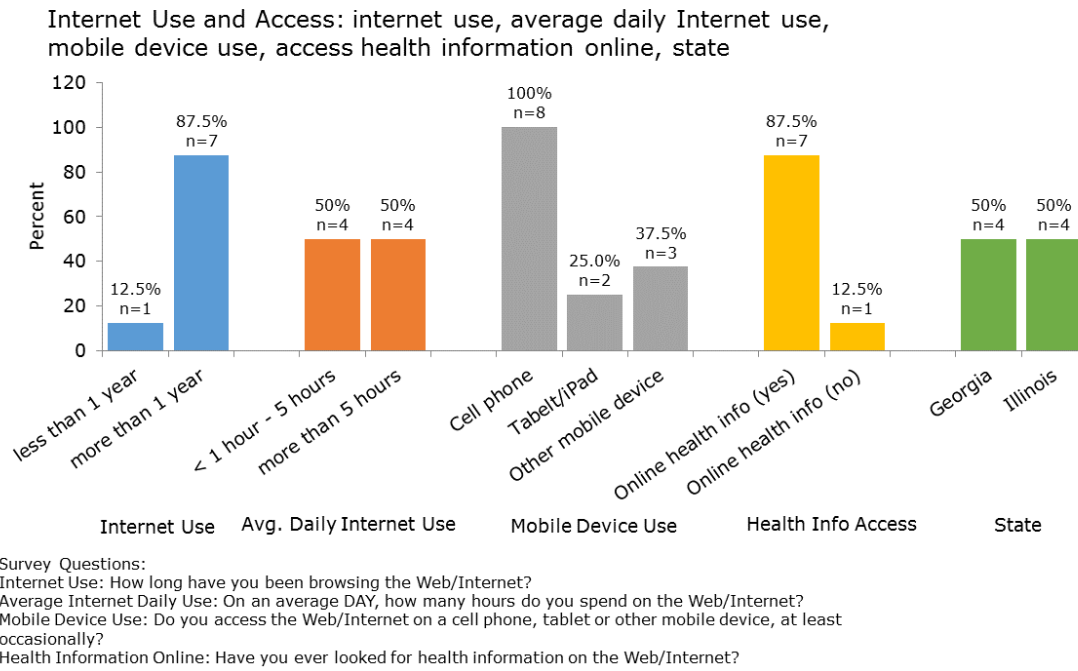


Figure 5.2 Internet Access and Use and Experiment Location

5.2 BAM! Meeting the Challenge Problem Space

To understand the interface’s problem space, we calculated mean statistics for eleven usability questions (five questions on ease of use; three questions satisfaction, one question on engagement; two questions on aesthetics). We grouped the usability questions and mean ratings from highest to lowest within each design goal category, and present overall mean ratings for each category.

Ease of Use

Overall, teens agreed the interface’s written content was organized, easy to read, understand and find, and was displayed just right, giving this category the highest mean rating of 4.1 (Table 2).

Satisfaction

We used perceptions of overall satisfaction and being pleasant, and likelihood of recommendation to a friend to assess satisfaction. The satisfaction category mean rating of 3.3, indicates most teens were somewhat satisfied with the interface (Table 2).

Engagement

The interface's level of engagement was assessed on being fun to use. Most teens disagreed (category mean rating of 2.8) that the interface was fun to use (Table 2).

Aesthetics

The interface's aesthetics were assessed on having pleasant colors and attractiveness. Most teens disagree (category mean rating of 2.7) that the colors are pleasant and the interface is attractive (Table 2).

Table 2. Usability questions by mean scores

Usability Questions	Mean
Ease of Use	(4.1)
The information provided is easy to understand	4.4
This site organized its information in a way that is easy for me to read	4.4
It is easy to read	4.3
It is easy to find the information I needed	3.8
The amount of information displayed is just right	3.5
Satisfaction	(3.3)
I would recommend it to a friend if he or she had asthma.	3.6
I am satisfied with it	3.4
It is pleasant to use	3.0
Engagement	(2.8)
It is fun to use	2.8
Aesthetics	(2.7)
The colors are pleasant	2.9
The site is attractive	2.5

5.3 Designing for the Usability Guidelines

To understand the teens' preference on how to design for the usability guidelines, we present responses summarized across the four qualitative questions and grouped by our usability goals. To capture this information, we asked teen informants the following questions:

1. Draw or write an example of what you would change about the BAM! Meeting the Challenge homepage to make it FUN AND ENTERTAINING.
2. What other changes to BAM! Meeting the Challenge would you suggest?
3. What do you like least about the *BAM! Meeting the Challenge* homepage?
4. What do you like most about the *BAM! Meeting the Challenge* homepage?

Ease of Use

We used written content as an indicator of ease of use. When asked about likes and dislikes, some teens mentioned the names of sections on the page. We included those comments under the ease of use goal because those sections were primarily text.

Comparing the number of comments across all four questions, the majority of the responses were about the written content. Even when asked about what they "liked most", all of the comments for this particular question were about the written content. Opinions varied in scope regarding changes to the written content. Suggestions include add fun facts about asthma, emphasize important points and words, and be concise. Another suggestion was to move information (e.g., contact us, print page, social media) in the right navigation to the bottom of the page. Teens liked a lot of the information (e.g., facts, trigger info, tips) on the page, the amount of information, and the use of bold and bullets. A few participants liked the "Don't Let Asthma

Keep You Out of the Game” section. Some teens liked the “Who Has Asthma” section and others disliked it. They also disliked having to look for information, the interface’s lack of clear message and focus, and the “Feel Good” and “Need More Proof” sections. (Table 3)

Table 3. Design suggestions about written content to improve ease of use

Survey questions and comments	# Responses (n=22)
Q.1 What you would change about the <i>BAM! Meeting the Challenge</i> to make it FUN AND ENTERTAINING?	
More concise/less words	2
Add fun facts about asthma	1
Make important points larger	1
Emphasize important points (put Meeting the Challenge in bubbles)	1
Use bold	1
Q2. Other changes to <i>BAM! Meeting the Challenge</i>?	
Put contact, print, etc. at bottom	1
Put social media links at bottom	1
Q3. Like most about <i>BAM! Meeting the Challenge</i>?	
Facts about asthma	2
Asthma trigger info	1
Tips about what you can do	1
Amount helpful information	1
Organization (bold and bullets)	1
Page section (Don't Let Asthma Keep You Out of the Game Section, Who Has Asthma)	2
Q4. Like least about <i>BAM! Meeting the Challenge</i>?	
Have to look for information	1
Has no clear main message	1
Unfocused	1
Page section (Who Has Asthma section, Feel Good Section, Need More Proof)	3

Engagement

To improve engagement, most suggestions were to add a game, more pictures, and more people that have asthma (Table 4).

Table 4. Design suggestions to improve engagement

Comments on engagement	# Responses (n=9)
Game	3
More pictures	2
More people that have asthma	2
Replace text with video	1
Change graphics	1

Aesthetic Appeal

Most of the comments on aesthetic appeal were about the color. The interface’s lack of color or wrong color choice were mentioned in all questions, except “What do you like most about the BAM! Meeting the Challenge homepage?” (Table 5)

Table 5. Design suggestions to improve aesthetic appeal

Comments on aesthetic appeal	# Responses (n=7)
Add light blue	1
More color	2
Sidebar should not be more eye catching than the page	1
It’s bleak	1
Lack of color	1
Why green	1

Satisfaction

We consider site efficiency and credibility integral to overall satisfaction. The results show teens were not very concerned with the interface’s efficiency and credibility. One person indicated the page should be quicker and another person suggested adding “modern day things” (Table 6).

Table 6. Design suggestions to improve satisfaction

Comments related to satisfaction	# Responses (n=2)
Quicker	1
Put modern day things	1

5.4 Incorporating Cool Aspects

As a secondary objective, we were interested in identifying how the results gave insights into designing for the cool guidelines. To better understand this, we summarized and present some results categorized by themes and others by their relationship to our study goals.

Cool Websites

To deconstruct cool features from websites that teens perceived to be cool, we asked them to “Describe a cool website that you have used, including what was cool about the site.” Four of the responses were related to interactive engagement features where they could get information such as “help with math” and “can check grades.” Four comments were about the written content. Written content that changed often and had a variety of content as well as a lot of random information were cool factors about some sites. Interactive features such as “talk to friends” and “lot of people to interact with” were mentioned once each. A vibrant visual aesthetic was mentioned once.

Cool Things

Teens were asked to “List some things that you think are COOL.” Several schematic themes emerged. Sports (n=7) and apps (n=6) were mentioned most often. Other cool things with

three mentions each were related to technologies/science; include games, phones, other tech stuff and science. Two-wheeled boards and music were each mentioned twice. Single mention responses include food, laser pointers, Pandora, school, selfies, Jordan's, and shopping.

Cool People

To understand how to design for our cool guidelines, teens were asked to “List people that you think are COOL.” Specific names of musicians/singers were mentioned (n=9) and family members, friends, and themselves were also mentioned (n=8) as cool people. Teachers, actors, and LeBron James/NBA players were each mentioned two times. Single mentions included astronaut, YouTube personality, boss, boys, Kendall Jenner, and game publisher. Every teen listed a different person as an example of a cool people.

Overall Cool Changes

To gather general insights into designing for our cool guidelines, we asked teens to “Draw or write an example of how they would change the *BAM! Meeting the Challenge* homepage to make it cool.” Consistent with previous questions we asked related to our usability guidelines, most of the responses were related to improving engagement by adding pictures (n=5) or a video (n=1) and ease of use by changing the written content (n=5) to be more concise and emphasize important things. Four responses were about adding more color and vibrancy to improve aesthetics. Scrolling was mentioned once.

Cool Changes to Boy on Bike Image

To understand how to design for our cool guidelines and to gain insights into cool themes for changing the image of the boy on the bike, teens were asked “Please draw or write an example of something that would be cooler than the boy on the bike.” Incorporating sports was mentioned 5 times. Teens suggested

“boy should be playing a sport,”

“boy should be swimming,”

“have him racing someone,”

“show him on podium with gold medal and inhaler in mouth,”

“two people racing against each other.”

Additional suggestions (n=2) were related to animation - make it animated, more cartoon characters representing asthma. There was one suggestion to put the boy on a sky walker.

5.5 Discussion

The results of the informant design experiment were instrumental in understanding the *BAM! Meeting the Challenge* problem space. We also obtained design suggestions for improving the interface’s engagement, multimedia components, and interaction. Lastly, our teen informants suggested cool features that could improve engagement.

We gained valuable insights into the interface’s problem space. Overall, most teens agreed the interface’s information was easy to read, understand and find, and displayed just right, giving the ease of use (written content) category the highest mean rating of all 4 categories evaluated. This is a clear indicator that the written content should not be drastically changed. Furthermore, teens were somewhat satisfied with the interface. Alternatively, the results further indicate aesthetic appeal and engagement are problem areas that should be targeted.

Our second goal was to understand how to design for specific aspects of the guidelines on cool engagement, multimedia components, and interactive features. To accomplish this, we reported the results by our design goals of improving ease of use (i.e., written content), aesthetics, satisfaction, and engagement usability factors. Comments on improving the written content varied in content and scope and no one major theme emerged, except for the few suggestions to be more concise and emphasize important points that should be considered. Moreover, most suggestions were similar to our usability guidelines, indicating if we design according to the written content guidelines, we can expect satisfactory ease of use usability rating. There was a clear indication that interaction features such as more pictures, games, or video were needed to improve engagement. There was also a considerable number of suggestions to add more color to improve aesthetics. There were no major concerns with overall satisfaction as measured by site efficiency, credibility, and trust.

To understand how to design for cool and incorporate cool aspects, a series of questions about cool websites, cool things, and cool people were asked. These questions were asked before the teen informants saw the *BAM! Meeting the Challenge* webpage to minimize bias in responses. Similar to the findings of McCloskey et al. [7], most of the teens preferred websites with interactive features and where they can get information such as news and help with math. A new finding in our study was that teens considered websites with a variety of content and a lot of random information as cool. Adding sports was a key finding as it was the top response for “cool things” and “cool changes to the boy on the bike.” This finding is similar to the Paper Cool Wall Study [35], which identified sports as one of teens’ interest. Apps as a cool thing was also a top response and is a new finding, having never being previously reported in the literature. Musicians and singers were mentioned most often as cool people, indicating including them,

particularly if they have asthma, would be cool. Similar to the suggestions from the usability questions, adding pictures or video of people with asthma was perceived as cool.

5.6 Conclusions

Given that some of the findings were consistent with the usability guidelines McCloskey et al. [7], we gained valuable insights into how to change the *BAM! Meeting the Challenge* webpage to make it more aesthetically appealing, easier to use, more engaging, and more cool to the teen user groups, all contributing to overall satisfaction. A new finding in our informant design study was that websites with a variety of content and a lot of random information and apps are considered cool among teen user group. Although our findings were consistent with the guidelines, study limitations should be considered. Our findings are based on a convenience sample of teens and a small sample size; therefore, the findings from this study could not be generalized to all teens in the United States.

6 SYSTEM DESIGN

This chapter presents the requirements for developing the new redesigned Center for Teen Health and Prevention (CTHP) interface (Figure 6.2), our implementation process, and design challenges. It also outlines the design changes made to the CTHP interface and the sources (i.e., usability and cool guidelines, informant design experiment) that influenced the changes.

6.1 User-Centered Design Approach

A user-centered design (UCD) approach (Figure 6.1) was used throughout the development process to aid in the design of an interface that is easy to use and understand and that satisfies the needs of the teen user group. Users and users' characteristics were considered throughout the design process. Requirements were gathered from existing literature to understand our users and their technological characteristics, interests, and interface design preferences, to compile the list of web interface design guidelines described in Chapter 3. In the first phase, teens served as design informants to suggest design ideas for improving the interface's interaction, fun/entertaining engagement, aesthetics, and cool aspects with the goal of improving usability. The interface design guidelines in Chapter 3, system requirements in this chapter, and informant design results (Chapter 5) were inputs into redesigning *BAM! Meeting the Challenge* as the CTHP interface. Usability evaluations in phase two were conducted to compare both the comparative *BAM! Meeting the Challenge* and new redesigned CTHP interfaces.

User-Centered Design Lifecycle

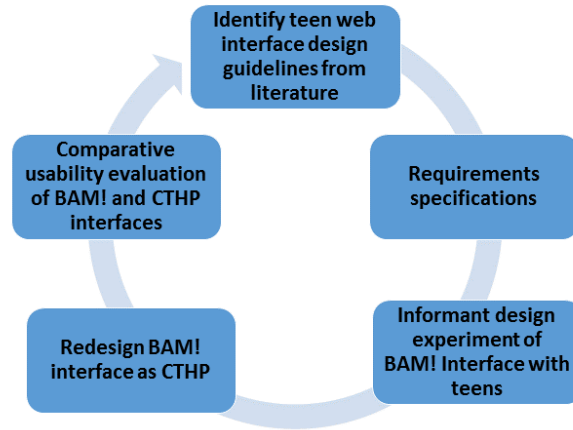


Figure 6.1 User-Centered Design Lifecycle

6.2 BAM! Meet the Challenge Problem Space

Teens rated the CDC’s *BAM! Meeting the Challenge* interface as part of the informant design experiment to help us understand the interface’s problem space. We presented the results in Chapter 5. Teen informants were satisfied with the interface and its written content, suggesting the interface already has good ease of use and satisfaction usability. Alternatively, the results further indicated priorities for improving the interface should be aesthetic appeal and engagement.

6.3 Conceptual Model

The objective is to redesign the *BAM! Meeting the Challenge* interface to improve its usability among the teen user group. Our conceptual model of the redesign is based on understanding the problem space, results of the informant design experiment, and design guidelines (usability and cool). Given that some of the findings were consistent with the usability

guidelines of McCloskey et al. (2013), we gained valuable insights into how to change *the BAM! Meeting the Challenge* interface to make it aesthetically appealing, easier to use, engaging, and cool to teens.

Based on these inputs, the conceptual design for redesigning the BAM! Meeting the Challenge interface include:

Engaging

Make webpage fun and entertaining such as incorporating fun facts about asthma, game, more pictures (i.e., picture of boy/girl smiling with asthma pump, picture with someone running with an inhaler in their hand) or a video.

Aesthetic Appeal

Use more color or add more color for contrast.

Easy to Use

Written content should be concise, emphasize important points, and provide a clear message.

Cool

Improve cool factor by including a variety of information, interactive feature to get information, app, sport, or musician/singer. Add cool factors by incorporating more pictures of teens with asthma or teens doing sports (i.e., boy swimming, racing, getting medal).

6.4 Requirements

The overall goal is to design an interface that is an improvement over the existing BAM! Meeting the Challenge interface. Teen usability guidelines were selected from those of McCloskey et al. [7] to guide our design decisions. Chapter 3 outlines the subset of guidelines used for this research. We were also inspired by the work on designing cool for teenagers [21]. The usability and cool guidelines are considered our interface design requirements. The study has the following functional requirements:

Usability Guidelines

- Design according to the teen web usability guidelines.
- Incorporate a cool aspect.

Informant Design Input

- Use results of the informant design experiment for direction on designing interaction, multimedia, aesthetic, and cool features.

Web-based Interface

- Interface must be web-based.
- Implementing a responsive design to support teen's use of mobile devices.

Security

- Interface should not have server-based connections. Government security requirements for this type of site prohibit network connections, therefore limiting the scope of interaction.

6.5 CTHP Design Implementation

Interface improvements of the *BAM! Meeting the Challenge* interface made to the CTHP interface are described below and are grouped by our usability goals with indicators for the source of the improvement. The letter G in parentheses indicates a usability and cool guideline influenced improvement and I indicate an informant design related improvement.

Satisfaction

- Designed using responsive design for teens' use of laptops and mobile devices. (G)
- Removed the outdated content on rapper Coolio from the "Who has asthma?" section. (G)
- Updated outdated 1984 Olympics content to 2008 Olympics. (G)

Aesthetic Appeal

- To facilitate scanning we split the Get Fit section into two sections of Get Fit and Follow These Tips. We also split the Feel Good section into two sections, Feel Good and So, Get Out There and Get Moving. (G)
- Added more teen-appropriate colors such as black, red, green, and teal blue. (I)
- Added gender neutral images of males and females and gender neutral colors. (G)

Easy to Use

- To be concise we shortened the text in the “Who has Asthma” and “Don’t Let Asthma Keep You Out of the Game” sections. (I, G)
- To optimize scanning we made minor changes to shorten some paragraphs. (G)
- Supplemented text with picture of the Olympics to help understand the context. (G)
- To emphasize important information, we added a main message “Asthma is not a barrier to physical activity” to top of page. (I) We also moved the “Who has Asthma?” and “Physical Activity” sections to top of page. (I)
- To emphasize important words, “Asthma” is enlarged in the title and section headings are color (red and white). (G, I)
- We changed the font style to optimize reading. (G)
- Added color contrast between text and background (I, G)
- We lowered the reading level and reading ease slightly. (G)

Engagement

- Added “Guess how many teens in your state have asthma” interactive feature to the “Who has Asthma” section. (I)
- Added more images of teens doing sports to support the topic. (I)
- Added more sports images – trophy, bikes, and hands as icons in bulleted lists to support the topic. (I)

Cool

- Added interactive feature, guess the number of teens in state with asthma. (I)

In Appendix A, a crosswalk is offered to convey the extent that the *BAM! Meeting the Challenge* interface conforms to usability and cool guidelines. It also outlines sources for the

modifications made to the redesigned CTHP interface and the interface's conformance to the guidelines.

6.6 CTHP Redesigned Interface

The redesigned CTHP interface is presented in Figure 6.2. Select design changes are highlighted in Figure 6.3 and Figure 6.4.



Asthma Is Not A Barrier To Physical Activity

Who Has Asthma?

Asthma — which makes it hard to breathe, and causes coughing and wheezing — affects about five million American kids and teens.

Guess how many teens in your state have asthma

Physical Activity — Asthma

Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into your lungs, and causing an asthma attack.

Physical activity can trigger asthma attacks too. Experts don't know why. They suspect that heat (or cooling through the wind) (the actual happens when you get winded) can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels are higher in the day.



Meet The Challenge — Don't Let Asthma Keep You Out Of The Game

Today, more than ever, asthma is not a barrier to physical activity. In fact, if you keep your asthma under control, you can do it all! Well, did you know that:

- 81% of all Olympians have asthma.
- In the 2008 Beijing Olympics, asthmatics had had asthma in over 30% of the medals.



Asthma didn't hold them back, and it shouldn't hold you back, either.

Get Fit

Yes, should you get a doctor's note and a MyAsthma? Party, too.

Doctors want their asthma patients to get active, especially in self-directed activities like fitness swimming, bicycling, golf, inline skating, and weightlifting.

Why are these good choices if you need to be physically active?

- They let you work at your level and feel your breathe.
- They let you breathe through your nose at all times.
- They don't dry out your airways.
- They mix cool, intense activities with long, steady state workouts.
- You can do them in a controlled environment (for example, a gym with air ducts that cool or dry).
- Usually you do them with other people, who can help you if an attack occurs.



Getting regular physical activity can improve your breathing, and lead to fewer asthma attacks.

Follow These Tips

Just remember to follow these tips. In fact, this is good advice for everyone, not just those with asthma.

- Plan ahead.**
 - Start your workout with a warm-up, and don't exercise if you're feeling run down on your first day if you get winded walking around the block. Warm-up with a cool-down.
- Take a break.**
 - It's more fun and a better way to get into fitness.
- Plan your party.**
 - They may have fun things that trigger your asthma. Pick and your airways by breathing through your nose instead of your mouth. Take it easy on days when your asthma symptoms are really bothering you. Stick to the weather station that your doctor has set up.
- Take breaks.**
 - Treat yourself to rest and drink plenty of water.
- Mix it up.**
 - For example, try going inline skating one day and taking a long walk the next.

Feel Good

To keep your cool, do the right stuff to control your asthma. And listen to your doctors — they're on your team!

Dr. Asthma says that people with asthma "should expect to live as life that really isn't affected by asthma, except for having to follow the directions."

For more tips to work up if you are having symptoms, and remember to "breathe in good attitude and keep on being the coolest kid around!" (Doctors would be so impressed, wouldn't they?)



So, Get Out There And Get Moving!

With good habits and today's medications, you can go for the gold — or just give your it a try on the basketball court, in the pool, or the dance floor...

Get Out There!



Get Moving!



Dance!



Center for Teen Health and Prevention

Figure 6.2 CTHP Interface

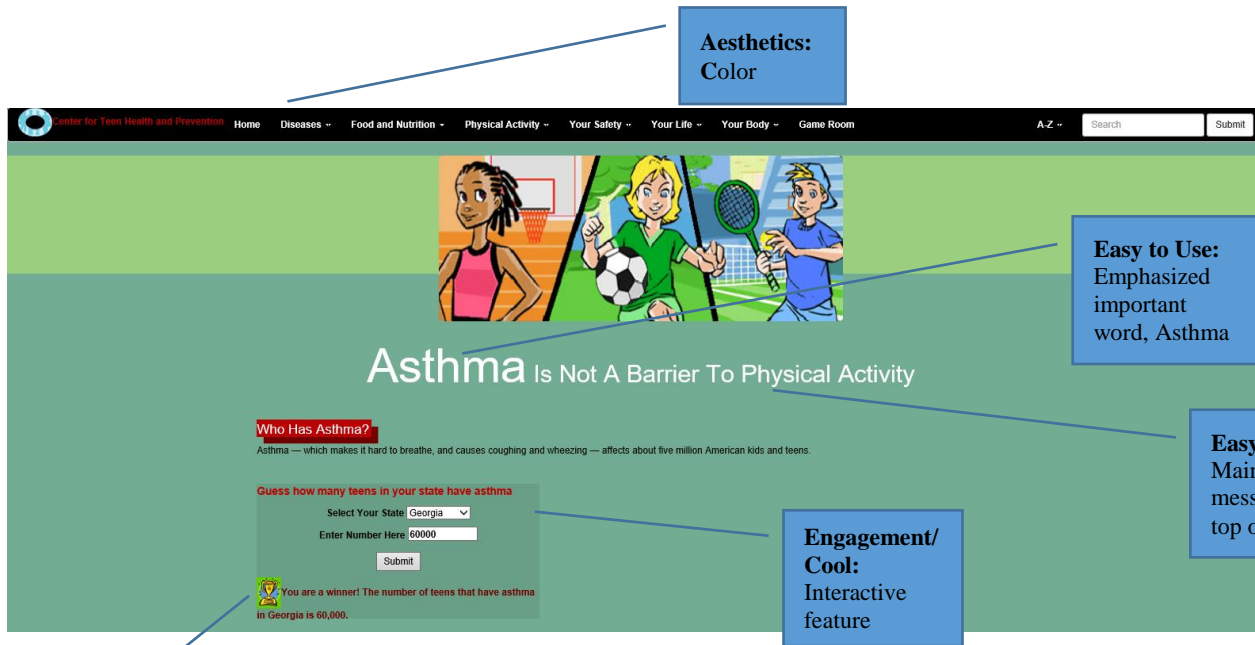


Figure 6.3 CTHP Interface Design Changes



Figure 6.4 CTHP Interface Design Changes

6.7 CTHP Development

Adobe Creative Cloud Dreamweaver CC 2015 software was used to design the CTHP webpage. The Dreamweaver development tool provided support for HTML5, Cascading Style Sheets (CSS), and JavaScript development. A CSS was used to implement the styling for how the HTML elements are to be displayed on screen. JavaScript was used to code the “Guess how many teens in your state have asthma” interactive feature.

6.8 Design Challenges

The BAM! Meeting the Challenge webpage template changed from a non-responsive design (Figure 6.5a) to a responsive design template (Figure 6.5b) after the informant design study. Although the template changed, the actual written content for the site did not change. Unfortunately, we were not informed of this pending change. According to archive.com the change took place sometime between April 27, 2016 and May 10, 2016. Therefore, the interface on the right (Figure 6.5b) is the design evaluated as part of the usability experiment.

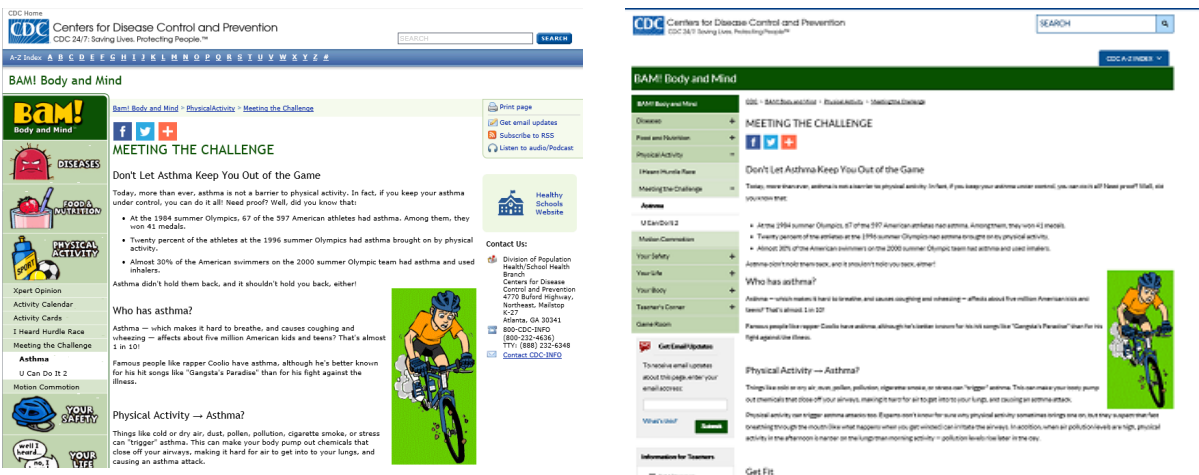


Figure 6.5 BAM! Meeting the Challenge Informant Design/Usability Experiment Interfaces

The left image is the informant design experiment interface (6.5a) and the right image is the usability experiment responsive design interface (6.5b) (<https://www.cdc.gov/bam/activity/challenge-asthma.html>)

7 METHOD: PHASE TWO USABILITY EVALUATION

This chapter presents methods employed to implement the usability experiment. It includes a description of the purpose of the experiment, problem statement, research questions, and approach to accomplish our study objectives. There are also sections describing recruitment, experimental procedures, instrumentation, measures, and analysis of results.

7.1 Purpose

In our phase one informant design experiment, we worked with teen informants to understand how to improve the *BAM! Meeting the Challenge* interface by designing for particular guidelines related to multimedia components, interaction, engagement, and cool usability factors. The focus of this experiment is the comparative evaluation of the new, redesigned *CTHP* interface (Figure 6.2) and the *BAM! Meeting the Challenge* interface (Figure 6.5b). The objective of this research is to investigate the validity of teen-specific web interface design guidelines on interface usability among teenage users.

7.2 Statement of the Problem

The Internet has become an integral part of teenagers' lives at home, in school, and even socially. Despite this, most human-computer interaction (HCI) research to improve usability and understand how to design interfaces for specific populations focuses on adults or young children ages 3-12, and rarely involves teens ages 13-17. It has been established in the HCI community that interfaces should be design for the intended user's cognitive, physical, and personal preferences. With so many teens using the Internet, there is a need for usability research aimed at understanding their design preferences. McCloskey et al. [7] implemented several studies with teens to develop usability guidelines for enhancing their user experience and engaging them. Several authors [19, 20, 21] further investigated "cool" as a design factor to engage teens. These

authors did not design a website, interface, or other product implementing their recommended guidelines to validate them.

7.3 Research Approach

This experiment was approved by the Auburn University Institutional Review Board (IRB). The approach to our research includes teens participating in a comparative evaluation of the *BAM! Meeting the Challenge* interface (Figure 6.3b) and the redesigned *CTHP* interface (Figure 6.2). The approach to reach our study objectives are:

1. Recruit teens aged 13-17 to participate in the experiment.
2. Conduct usability testing with teens.
3. Analyze usability data to compare results of the *BAM! Meeting the Challenge* interface and the redesigned *CTHP*.

7.4 Research Questions

This research aims to investigate interface redesign using usability and cool guidelines. This experiment evaluates the differences in overall satisfaction with the *BAM! Meeting the Challenge* interface and its ease of use, engagement, aesthetics and cool usability compared to the redesigned *CTHP* interface. Specific research questions include:

1. Will an interface designed based on teen-specific design guidelines be easier to use, more aesthetically pleasing, more engaging, and more satisfying compared to a website that isn't?
2. Will incorporating "cool" aspects contribute to engagement?

7.5 Research Hypotheses

The overall usability of the *BAM! Meeting the Challenge* interface and the new redesigned *CTHP* interface were evaluated based on ease of use, aesthetics, engagement, satisfaction, and cool. The usability results will be used to test the hypotheses of the research as described below.

The *CTHP* interface was redesigned as an improvement over the *BAM! Meeting the Challenge* comparative interface, using usability guidelines specifically for teenagers that considered their cognitive and physical abilities and personal preferences. Hypotheses for this research include the following:

Hypothesis: Ease of Use

The overall design of the *CTHP* interface was influenced by our usability guidelines on written content and is intended to be perceived as easy to use.

H₀: There is no difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on ease of use.

H_a: There is a difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on ease of use.

Hypothesis: Engagement

The interaction of the *CTHP* interface was influenced by our usability guidelines on entertainment is intended to be perceived as engaging.

H₀: There is no difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on being engaging.

H_a: There is a difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on being engaging.

Hypothesis: Aesthetically Pleasing

The attractiveness of the *CTHP* interface was influenced by our usability guidelines on visual appeal and cool, and is intended to be perceived as aesthetically appealing.

H₀: There is no difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on aesthetic appeal.

H_a: There is a difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on aesthetic appeal.

Hypothesis: Satisfaction

The overall design of the *CTHP* interface was influenced by our usability guidelines on ergonomics, navigation, trust, and credibility and are intended to satisfy teen users.

H₀: There is no difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on overall satisfaction.

H_a: There is a difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on overall satisfaction.

Hypothesis: Cool

The interaction and aesthetics of the *CTHP* interface were influenced by our usability and cool guidelines on attractiveness and innovation (unusual/unexpected situation) and are intended to be perceived as engaging.

H₀: There is no difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on being “cool.”

H_a: There is a difference between the *BAM! Meeting the Challenge* (experimental) and *CTHP* (redesigned comparative) interfaces on being “cool.”

7.6 Participants

Convenience sampling methods were used to recruit participants ages 13-17 from the YMCA in Atlanta, Georgia and others through personal contacts in the Atlanta, Georgia area. Fourteen teens participated in the usability component of the study (phase two) during the period of November 14, 2016 to January 28, 2017.

7.7 Materials

The materials for the usability component of the study included English and Spanish parental consent/child assent forms, paper-based usability questionnaire, summary questionnaire, and a debriefing sheet. The consent and assent forms (Appendix K) were reviewed by the Auburn IRB and were stamped with the approval dates and protocol number. The debriefing sheet was available to participants. The debriefing sheet (Appendix M) summarizes the experiment, reminds participants that participation is voluntary and that they can withdraw, and provides contact information for the lead researcher, advisor, and Auburn IRB.

Participants used mobile phones to view both interfaces. Survey data was entered into Microsoft Excel and prepared for analysis. The Statistical Analysis Software (SAS) version 9.3 was used to analyze all data.

7.8 Procedures

The subjects who agreed to participate were given recruitment scripts with the details of the study in order for them to become familiar with the study at their own convenience. Before taking part in the study, participants were provided an IRB consent/assent form to inform them of study details and of their rights.

Sixty minutes was allotted for the experiment. During the usability evaluation, participants evaluated both the *BAM! Meeting the Challenge* interface (Figure 6.3b) and the *CTHP* interface (Figure 6.2). To reduce order bias, we used a latin square design, whereas half of the teens reviewed and evaluated the *BAM! Meeting the Challenge* interface and then reviewed and evaluated the *CTHP* interface, whereas the other half did this in reverse order. The experiment procedures are as follows:

1. The lead researcher provided background information on asthma and explained what the participants were going to do and why. Participants were instructed to stay on the *BAM! Meeting the Challenge/CTHP* interface and to only provide feedback for that page.
2. A paper-based questionnaire (Appendix E) was provided to each participant.
3. The lead researcher recorded the review order (i.e., BAM/CTHP, CTHP/BAM) to track the order that the pages were reviewed. The date of the experiment and state were recorded. The participant's asthma status was transferred from the consent form to the questionnaire.
4. Participants answered screening questions, "How old are you?" to confirm they were 13-17, "Do you use the Internet?" to make sure they had online experience, and "Have you participated in this study before?" The brand of phone or tablet was also captured during this section of the questionnaire.
5. Background questions were completed by study participants to collect demographics, Internet and mobile device use, and experience looking for health information online.

6. The lead researcher walked around and checked to make sure each person was reviewing the correct interface. After completing the tasks and usability questions, a separate page (Appendix F) was provided to collect information on their experience using the mobile device for the experiment and to capture their selection for the coolest site.
7. A debriefing session was conducted to answer any questions about the study and thank the participants. A debriefing form was available for each participant.
8. Participants were paid \$5.00 compensation.

7.9 Tasks

A task list was included in the questionnaire so that participants would explore the interface to become familiar with it and its contents. All participants performed the same four tasks and completed the same questionnaire.

Participants were asked to complete the following four task questions as they explored the *BAM! Meeting the Challenge* webpage.

- T1. What is the name of the famous rapper that has asthma?
- T2. Write at least one thing that can “trigger” asthma.
- T3. What is the boy doing?
- T4. Fill in the blank below. Dr. _____ says that people with asthma "should expect to live a life that really isn't affected by asthma, except for having to follow the directions."

Participants were asked to complete the following four task questions as they explored the *CTHP* webpage.

T1. How many teens in Georgia have asthma?

T2. Can physical activity trigger asthma attacks?

T3. Write one asthma friendly activity.

T4. Fill in the blank below. With good habits and today's medicines, you can go for the gold or just join your friends on the _____, in the _____, on the _____.

7.10 Facility

The usability experiment took place in the context of the teen's home or at the YMCA.

7.11 Instrumentation

We explored several well established and validated instruments to select questions that best support our study goals and that were appropriate for the study subjects. All participants received the same background and usability questionnaire. The instrument contained the following components:

Usability questionnaire (Appendix E)

Captures background information, participant demographics, task responses, and subjective usability ratings. Usability rating questions were included on the instrument to assess overall satisfaction, aesthetics, ease of use, engagement of interaction features, and cool and mobile aspects.

Summary questionnaire (Appendix F)

To minimize bias, we provided a separate summary questionnaire after completion of the usability questionnaire. The intent was to capture opinions of using mobile devices for the experiment and select either *BAM* or *CTHP* as a cool interface.

7.12 Measures

Most of the usability questions are from the Usefulness, Satisfaction, and Ease of Use Questionnaire (USE) and Computer System Usability Questionnaire (CSUQ) validated questionnaires, and others that we developed to measure our design goals of improving satisfaction, ease of use, aesthetics, engagement, and cool usability. Participants answered the usability questions using a Likert response scale of 1=Disagree and 5=Agree. Questions to assess the coolness of the interfaces were adopted from Sundar, Tamul, and Wu [38], who validated a set of cool measures to assess coolness of digital devices and interfaces. The sources for our usability and cool survey questions are documented in Appendix G. Questions are grouped by our design goals.

Several subjective criteria were selected to measure our usability goals. Satisfaction measures the user's overall satisfaction, perception of how pleasant and wonderful the interface is to use, and if the participant would recommend it to a friend. Ease of use is the extent that a user can accomplish an intended task when using an interactive product or interface. For this research, we are measuring the ease of use as an assessment of the amount of information and how easy it is to understand the information and find information needed. Aesthetics is being measured based on colors being pleasant, attractiveness, and the extent that the interface looks great. Consistent with the cool design guidelines, aesthetic attractiveness (i.e., stylish, hip) is also measured as an indicator of cool usability. The perception of fun contributes to measuring

engagement. Cool is assessed as a measurement of innovative (unusual situation) and attractiveness.

7.13 Analysis of Results

All data collected during the experiment were analyzed using SAS statistical software version 9.3. Means scores were calculated using the SAS PROC MEANS procedure. Statistically significant differences in mean scores between BAM! and CTHP were estimated using the non parametric Wilcoxon Signed-rank test at the $\alpha=0.05$ level.

8 RESULTS: PHASE TWO USABILITY EXPERIMENT

This chapter presents the results of the usability experiment. The section describing participant demographic characteristics and internet access and use provides descriptive statistics and frequency counts. The results from the comparative evaluation of the two interfaces are reported by mean scores and are grouped by our design goals of improving satisfaction, ease of use, aesthetics, engagement, and cool usability factors.

8.1 Demographics

Teen participants, 8 males and 6 females, were aged 13, 15, 16, and 17 years old (mean 15.6 years). Participants self-reported their race as either Hispanic (42.9%), White (35.7%), Black (14.3%), or Asian (7.1%). Two (14.3%) participants had asthma (Figure 8.1).

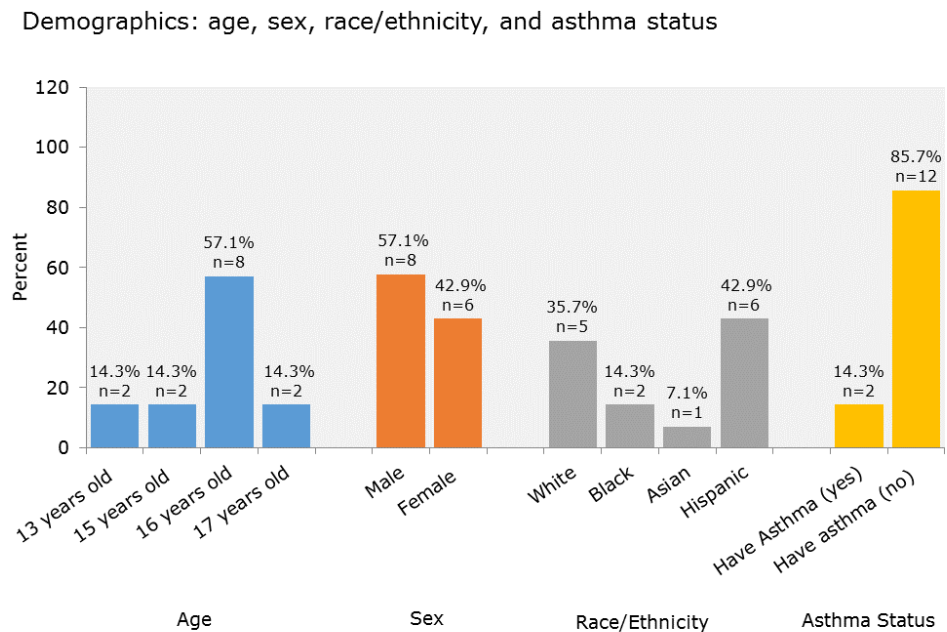
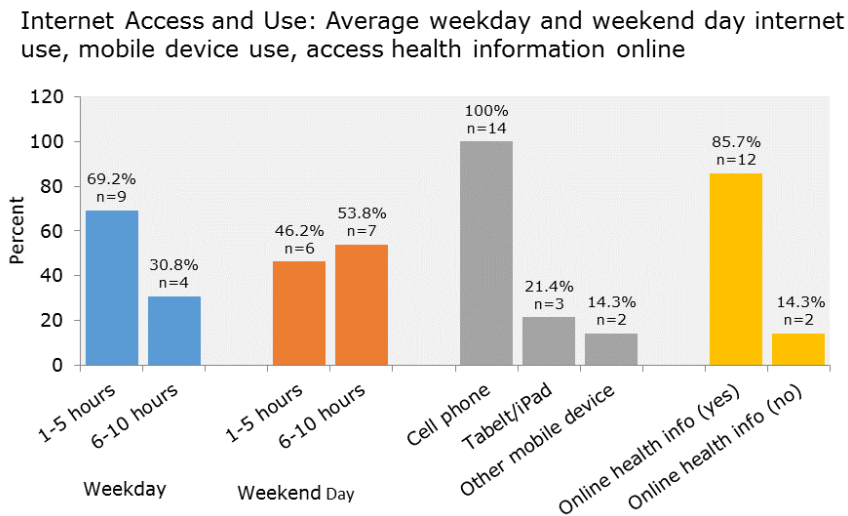


Figure 8.1 Participant Demographics

8.2 Internet Access and Use

All participants had been using the internet for more than one year (not shown). On an average weekday, each participant’s Internet use ranged from 2 hours to 7 hours, while on an average weekend day participant’s Internet use ranged from 1 hour to 10 hours. One respondent’s weekday Internet use was excluded because it exceeded 24 hours and their weekend Internet use was also excluded because it was the only value out of the range of the other values. All participants used a cell phone (100%) to access the Internet, and some also used tablets (21.4%) and other mobile devices (14.3 %). Twelve (85.7%) participants had looked for health information on the Internet. (Figure 8.2)



Missing values: n=1 outlier excluded from weekday and weekend day Internet use results
 Survey Questions:
 On average WEEKDAY, how many hours do you spend on the Web/internet?
 On average WEEKDAY, how many hours do you spend on the Web/internet?
 Do you access the Web/Internet on a cell phone, tablet/iPad or other mobile device at least occasionally?
 Have you ever looked for health information on the Web/Internet?

Figure 8.2 Internet Access and Use

8.3 Data Collection Characteristics

The usability experiment took place at either the teen’s home (35.7%) or at the YMCA (64.3%). We used a Latin square design, wherein half of the teens reviewed and evaluated the

BAM! Meeting the Challenge interface first and then reviewed and evaluated the *CTHP* interface while the other half did this in reverse order. HTC, Samsung, and Apple mobile phones were used for the experiment. (Figure 8.3).

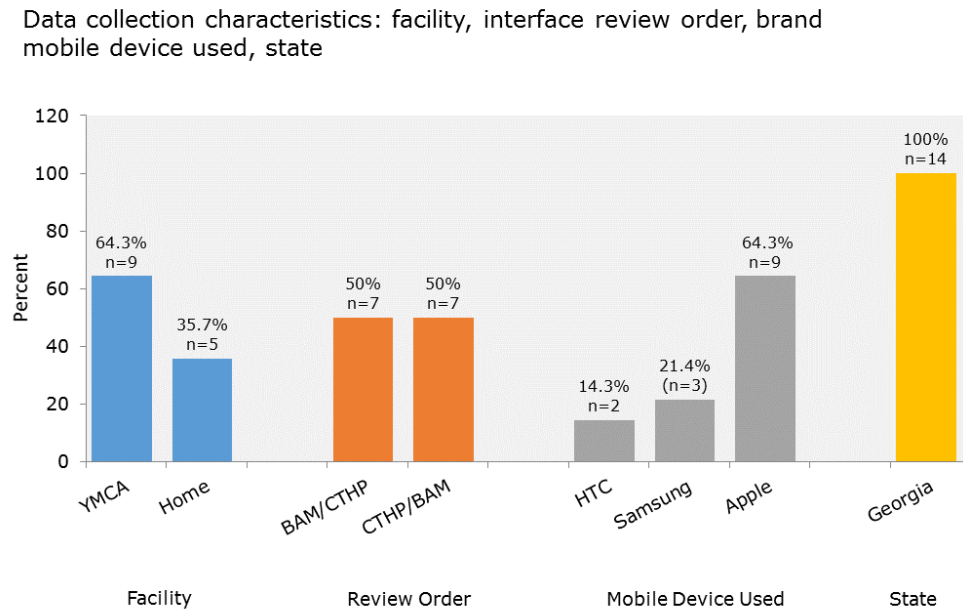


Figure 8.3 Data Collection Characteristics

Participant’s perceptions about using their mobile device to review the two interfaces were collected to understand the impact of using them for the study. Almost all (92.9%) participants indicated it was useful to learn about asthma on a cell phone/mobile device. Similarly, almost all (92.9%) participants enjoyed using their cell phone/mobile device to review the two interfaces.

8.4 Comparative Usability Evaluation

The usability experiment is designed to evaluate the *BAM! Meeting the Challenge* and *CTHP* interfaces based on usability goals of improving satisfaction, ease of use, engagement,

aesthetics, and cool usability. Teen users evaluated both interfaces. The results of the usability measures are presented in separate tables grouped by their corresponding usability goal and mean rating. Statistically significant results are indicated as a table footnote where applicable.

Ease of Use

There is no clear preference for ease of use (Table 7). The results show no difference in the information being easy to understand for *BAM!* (5.0) and *CTHP* (5.0). Although the redesigned *CTHP* interface was preferred for the amount of information being just right (4.5 vs. 4.2), *BAM!* was preferred for being easy to find information (4.5 vs. 4.1).

Table 7. Ease of use usability goal and measures by interface mean score preferences

Usability Measures	Mean Score (n)	
	BAM!	CTHP
Ease of use		
The information provided is easy to understand	5.0 (13)	5.0 (13)
It is easy to find the information I needed	4.5 (13)	4.1 (13)
The amount of information displayed is just right	4.2 (14)	4.5 (14)

Satisfaction

Table 8 indicates teens were satisfied with both interfaces, but were more likely to recommend *BAM!* to a friend (4.5 vs. 4.1). Moreover, teens were slightly more likely to rank *CTHP* than *BAM!* as being wonderful (3.7 vs. 3.3) and pleasant to use (4.1 vs. 3.9).

Table 8. Satisfaction usability goal and measures by interface mean score preferences

Usability Measures	Mean Score (n)	
	BAM!	CTHP
Satisfaction		
I am satisfied with it	4.2 (13)	4.2 (13)
I would recommend it to a friend if he or she had asthma	4.5 (13)	4.1 (13)
It is wonderful	3.3 (14)	3.7 (14)
It is pleasant to use	3.9 (14)	4.1(14)

Engagement

There is a clear preference for the *CTHP* (3.6) interface being fun to use compared to *BAM!* (2.9) (Table 9). The *CTHP* interface was rated significantly higher on engagement.

Table 9. Engagement usability goal and measures by interface mean score preferences

Usability Measure	Mean Score (n)	
	BAM!	CTHP
Engagement		
It is fun to use*	2.9 (14)	3.6 (13)

*Difference in mean scores between BAM! and CTHP is statistically significant. p-value=0.03 (Wilcoxon)

Aesthetics

Teens preferred the aesthetics of the *CTHP* interface compared to *BAM!*. *CTHP* rated higher for pleasant colors (3.8 vs. 3.3), looks great (3.5 vs. 3.3), and attractiveness (3.6 vs. 3.1) (Table 10).

Table 10. Aesthetics usability goal and measures by interface mean scores

Usability Measures	Mean Score (n)	
	BAM!	CTHP
Aesthetics		
The colors are pleasant	3.3 (14)	3.8 (13)
It looks great	3.3 (14)	3.5 (13)
Its attractiveness makes me want to go further into the site	3.1 (14)	3.6 (14)

Cool

Overall, *CTHP* fared better than *BAM!* on being cool. It was more likely to be considered stylish (3.5 vs. 2.8), hipper (2.8 vs. 2.6), and having cool features (3.5 vs. 2.9) (Table 11).

Table 11. Cool usability goal and measures by interface mean scores

Usability Questions	Mean Score (n)	
	BAM!	CTHP
Cool		
It is stylish	2.8 (14)	3.5 (14)
It is hip	2.6 (14)	2.8 (14)

Preference for Cool Interface

After reviewing both interfaces, participants were asked a forced choice question, “Which homepage is the coolest?” More teens considered the CTHP interface (64.3%) to be cool compared to BAM! (35.7%) (Figure 8.4).

Teens were asked why they chose a particular site. Several themes emerged that were consistent with our design guidelines and design goals. The CTHP interface was selected primarily for its aesthetic color, having more color, engaging interaction, and having more pictures (Table 12). Among those who selected BAM!, there was no one majority reason (Table 13).

Cool Interface

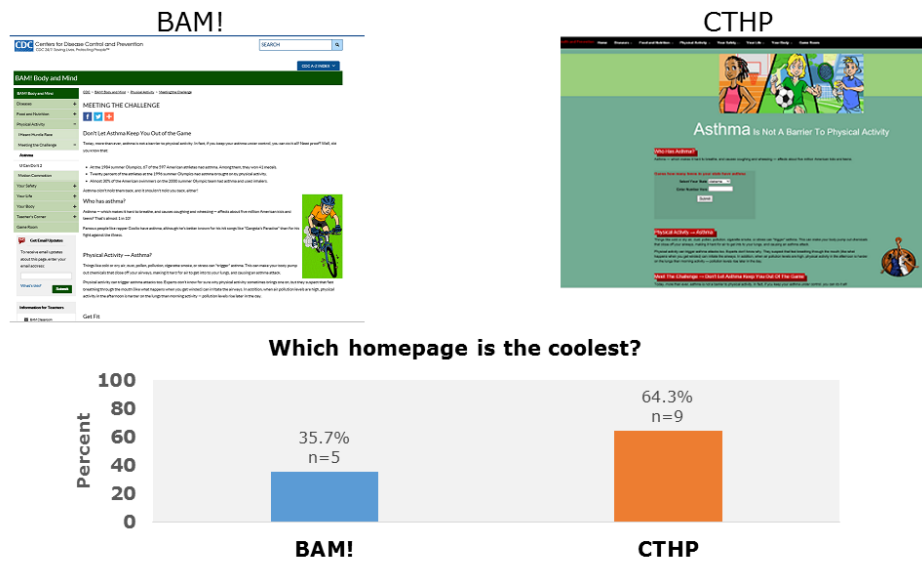


Figure 8.4 Preference for Cool Interface

Table 12. Comments on why CTHP was selected as the coolest interface

Design Goal Category and Comments	# Responses (n=27)
Aesthetics: color/more color	8
Aesthetics: captures attention	1
Engagement: had interaction	4
Engagement: more pictures/pictures more appealing/pictures lively	3
Ease of Use: organized	2
Ease of Use: easy to read	1
Ease of Use: easy to understand	2
Ease of Use: more details	1
Ease of Use: information interesting	1
Other: both were nice	1
Other: not trying to be cool; just inform about asthma	1
Other: both low on spectrum of cool	1
Other: BAM! is more organized	1

Table 13. Comments on why BAM! was selected as the coolest interface

Design Goal Category and Comments	# Responses (n=12)
Aesthetics: simple	2
Aesthetics: looked nicer	1
Aesthetics: teens don't like a lot of color	1
Ease of Use: teens don't like information dumbed down	1
Satisfaction: doesn't try too hard to ponder towards teens	1
Satisfaction: gets job done fine	1
Satisfaction: easier to navigate	1
Other: pictures on CTHP made me feel like kid	1
Other: liked the population question on CTHP	1
Other: CTHP tacky	1
Other: CTHP difficult to read with green background	1

9 DISCUSSION

This research investigated web interface design guidelines for the teen user, a group who are frequent Internet users and haven't been researched much in the HCI community. The literature suggests that designing website for teens should have the following design considerations: 1) page design should be simple, 2) content should be easy to read and understand, 3) navigation and controls should be appropriate, 4) site should be attractive, 5) interaction should not be overused, 6) design should consider use of portable devices, 8) site should be fast, 9) site should incorporate cool attractive and innovation (unusual situation) aspects to enhance engagement. These considerations were reported as teen usability and cool guidelines that were used for this study.

We gained valuable insights into the interface's problem space as well as design ideas from our informant design experiment. Overall, teens were satisfied with the *BAM! Meeting the Challenge* interface and its ease of use and overall satisfaction, although the results pointed to aesthetics and engagement as areas for improvement. For aesthetics, there was a consensus on changing the color and adding color. Specific design suggestions for engagement included adding "fun facts about asthma," and adding more pictures, a game, or video. A novel finding of our study was that teens considered websites with a variety of information to be cool. Similar to the usability guidelines, we adopted from McCloskey et al. [7], teens preferred websites with interactive features and where they can get information such as news and help with math. Adding sports was a key finding as it was the top recommendation for the "cool things." We used these guidelines and results from our informant design as criteria to redesign the *BAM! Meeting the Challenge* interface as the *CTHP* interface.

The usability experiment was designed to evaluate the *BAM! Meeting the Challenge* and *CTHP* interfaces based on five usability goals of improving satisfaction, ease of use, engagement, aesthetics, and cool usability. There was no clear preference between *BAM!* and *CTHP* for ease of use. This finding supports the design guidelines for ease of use (focusing on written content), where no major changes were made based on the favorable informant design results in this area and the fact that the *BAM!* interface already met most of the design guideline requirements in this area. Overall, teens were satisfied with both interfaces, but were slightly more likely to agree that *CTHP* was wonderful and pleasant to use compared to *BAM!* This finding supports the design guidelines on credibility and trust, likely due to the content on the Olympics being updated and references to the rapper Coolio being removed. This can also be an indication that the overall changes contributed to the improved satisfaction. Teens were more likely to recommend *BAM!* to friends. This finding further supports the guidelines, in that *BAM!* may have been more credible because teens living in Georgia are likely predisposed to know of the CDC as a government entity compared to *CTHP*. There was a significant preference for the *CTHP* interface as a fun site compared to *BAM!* This further supports the usability guidelines on engagement, which recommend a conservative amount of interaction. Our design improvements included adding an interactive feature (i.e., guess how many teens in your state have asthma) and related images of teens participating in sports as suggested by our informant design experiment. Teens also preferred the *CTHP* interface for aesthetics, indicating that adding color and color contrast in compliance with the guidelines had the expected effect. Overall, *CTHP* fared better than *BAM!* on cool aspects such as stylish, hip, having more cool features, and being the coolest site, all confirming the cool guidelines that recommend the interface should be attractive and have some level of innovation such as an unusual situation. The *CTHP* had been redesigned to be

attractive, and the interactive feature was implemented as the unusual and unexpected component.

10 CONCLUSIONS

This research investigated the validity of teen-specific published guidelines through a comparative evaluation of a redesigned interface that complied with most of the guidelines and the original interface that had less guideline adherence, to investigate the effect that the guidelines had on usability. The evaluation of the two interfaces verified our expectations on all of the usability factors. We expected the CTHP interface would be preferred for its aesthetic appeal, engagement, satisfaction, and cool factors, because of the improvements made in these areas. In contrast, we expected both interfaces to be equally preferred for ease of use, because this area met the guideline recommendations initially and was primarily the same across both interfaces. Thus, this work verified the positive impact of implementing the guidelines we tested, at least on our usability goals. This work also contributes to the limited literature on teen-specific web development. We anticipate this research will encourage the design of websites and interfaces for teenagers that meet their cognitive and physical abilities and personal preferences to improve usability among teen users.

Although our findings were consistent with the guidelines, study limitations should be considered. Our findings are based on a convenience sample of teens and a small sample size; therefore, the findings from this study could not be generalized to all teens in the United States.

REFERENCES

- [1] Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., & Elmqvist, N. (2017). *Designing the user interface: Strategies for effective human-computer interaction*. 6th Edition. Hoboken, NJ: Pearson Education Inc.
- [2] Agosto, D.E. (2002). A model of young people's decision-making in using the Web. *Library & Information Science Research*, 24 (4), 311-341. [http://dx.doi.org/10.1016/S0740-8188\(02\)00131-7](http://dx.doi.org/10.1016/S0740-8188(02)00131-7).
- [3] Darejeh, A. & D. Singh, (2013). A review on user interface design principles to increase software usability for users with less computer literacy. *Journal of Computer Science*. 9, 1443-1450.
- [4] Fang, Z., Luo, W., & Xu, J. (2011). A structure for children-oriented human computer interaction. In *Advanced Computational Intelligence (IWACI), 2011 Fourth International Workshop on* (pp. 205-208). IEEE.
- [5] Large, A. & Beheshti, J. (2005). Interface design, web portals, and children. *Library Trends*, 54, 2,318-342.
https://ideals.illinois.edu/bitstream/handle/2142/3478/Large_InterfaceDesign.pdf?sequence=2
- [6] Nielsen, J. (2010). Children's Websites: Usability Issues in Designing for Kids. Retrieved from <http://www.nngroup.com/articles/childrens-websites-usability-issues/> Accessed 02/07/2014.
- [7] McCloskey, M., Loranger, H., & Nielsen, J. (2013). *Teenagers (Ages 13-17) on the Web*. second ed., Nielsen Norman Group, Freemont CA.
<https://www.nngroup.com/reports/teenagers-on-the-web/>
- [8] Druin, A. (2002). The Role of Children in the Design of New Technology. *Behaviour and Information Technology*, 21(1), pp. 1-25.
- [9] Fitton, D., Little, L., & Bell, B. T. (2016). Introduction: HCI Reaches Adolescence. In *Perspectives on HCI Research with Teenagers* (pp. 1-9). Springer International Publishing.
- [10] Fitton, D., Read, J.C. & Horton, M. (2013). The challenge of working with teens as participants in interaction design. *Ext. Abstracts CHI 2013*. ACM Press (2013), 205-210.
- [11] Fitton, D. B., Horton, M., & Read, J. C. (2014). Scaffolding design sessions with teenagers: the PDA approach. In *Proceedings of the extended abstracts of the 32nd annual ACM conference on Human factors in computing systems* (pp. 1183-1188). ACM.

- [12] Iversen, O. S., Dindler, C., & Hansen, E. I. K. (2013). Understanding teenagers' motivation in participatory design. *International Journal of Child-Computer Interaction*, 1(3), 82-87.
- [13] Mazzone, M., Read, J.C., & Beale, R.. (2008). Design with and for disaffected teenagers. In Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges (NordiCHI '08). ACM Press (2008).
- [14] Poole, E.S. & Peyton, T. (2013). Interaction design research with adolescents: methodological challenges and best practices. In Proc. IDC 2013. ACM Press (2013), 211-217.
- [15] Read, J.C., Horton, M., Iversen, O., Fitton, D., & Little, L. (2013). Methods of working with teenagers in interaction design. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 3243-3246). ACM.
- [16] Lenhart, A., & Page, D. Teens, Social Media & Technology Overview 2015. Retrieved from: <http://www.pewinternet.org/2015/04/09/teens-social-media-technology-2015/>
- [17] Madden, M., Lenhart, A., Duggan, M., Cortesi, S., & Gasser, U. (2013). Teens and technology 2013. Washington, DC: Pew Internet & American Life Project. Retrieved from http://www.pewinternet.org/files/old-media/Files/Reports/2013/PIP_TeensandTechnology2013.pdf, Accessed 02/27/2014
- [18] Dhir, A. & Al-kahtani, M. (2013). Ubiquitous computing for teenagers: A new perspective on child-computer interaction. *Technology and Society (ISTAS), 2013 IEEE International Symposium on*, vol.,no.,pp.126,135,27-29, June 2013
doi: 10.1109/ISTAS.2013.6613111
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6613111&isnumber=6613092>.
- [19] Fitton, D., Horton, M., Read, J. C., Little, L., Toth, N. & Guo, Y. (2012). Climbing the cool wall: exploring teenage preferences of cool. In *CHI '12 Extended Abstracts on Human Factors in Computing Systems (CHI EA '12)*. ACM, New York, NY, USA, 2093-2098. <http://doi.acm.org/10.1145/2212776.2223758>
- [20] Read, J.C., Fitton, D., Cowan, B.R., Beale, & R., Guo, Y., Horton, M. (2011) Understanding and designing cool technologies for teenagers. CHI 2011, ACM Press (2011), 1567-1572.
- [21] Read, J.C., Horton, M., Fitton, D., Little, L., Beale, R., & Toth, N. (2013). On being cool: exploring interaction design for teenagers. In *Proceedings of the 27th International BCS Human Computer Interaction Conference (BCS-HCI '13)*, Steve Love, Kate Hone, and Tom McEwan (Eds.). British Computer Society, Swinton, UK, UK, Article 10.
- [22] Centers for Disease Control and Prevention (CDC). National Health Interview Survey (NHIS) Data, Retrieved from <https://www.cdc.gov/asthma/nhis/2015/table3-1.htm>. accessed February 15, 2017.

- [23] Fitton, D., & Bell, B. (2014). Working with teenagers within HCI research: understanding teen-computer interaction. In Proceedings of the 28th International BCS Human Computer Interaction Conference on HCI 2014-Sand, Sea and Sky-Holiday HCI (pp. 201-206). BCS.
- [24] ACM SIGCHI. (1996). ACM SIGCHI Curricula for Human-Computer Interaction. <http://old.sigchi.org/cdg/cdg2.html> Accessed August 17, 2015.
- [25] Nielsen, J. (2012). Usability 101: Introduction to Usability. Retrieved from <http://www.nngroup.com/articles/usability-101-introduction-to-usability/>, Accessed 03/16/2014
- [26] Rogers, Y., Sharp, H., & Preece, J. (2007). *Interaction Design: Beyond Human Computer Interaction*. England: John Wiley & Sons Ltd.
- [27] Bruckman, A., Forte, A., & Bandlow, A. (2007). HCI for Kids. In *The Human-Computer Interaction Handbook*, Edited by Julie Jacko and Andrew Sears, 2nd Ed. NJ: Lawrence Erlbaum Associates.
https://eva.fing.edu.uy/pluginfile.php/52761/mod_resource/content/0/biblioteca/Bruckman_Bandlow_-_HCI_for_Kids_-_IN_The_Human-Computer_Interaction_Handbook.pdf
Reprinted in: Human-Computer Interaction: Designing for Diverse Users and Domains, Edited by Julie Jacko and Andrew Sears. NJ: Lawrence Erlbaum Associates, 2007.
- [28] Bell, B. T. (2016). Understanding Adolescents. In *Perspectives on HCI Research with Teenagers* (pp. 11-27). Springer International Publishing.
- [29] Harrison, T. M., Zappen, J. P., & Watson, D. (2009). Children's use of government information systems: design and usability. In *Proceedings of the 10th Annual International Conference on Digital Government Research: Social Networks: Making Connections between Citizens, Data and Government* (dg.o '09), Soon Ae Chun, Rodrigo Sandoval, and Priscilla Regan (Eds.). Digital Government Society of North America 113-122.
- [30] Hartson, R., & Pyla, P. (2012). *The UX Book: Process and Guidelines for Ensuring a Quality User Experience* (1st ed.) Morgan Kaufmann Publishers Inc., San Francisco, CA, USA., p.689.
- [31] Te'eni D., Carey, J.M., & Zhang, P. (2007). *Human-Computer Interaction: Developing Effective Organizational Information Systems*. John Wiley & Sons., p.195.
- [32] U.S. Health and Human Services. (2006). Research-Based Web Design and Usability Guidelines. http://www.usability.gov/sites/default/files/documents/guidelines_book.pdf, Accessed August 17, 2015
- [33] Norman, D.A. (1998). *The Design of Everyday Things*, MIT, London.

- [34] Nielsen, J. (1990). Traditional dialogue design applied to modern user interfaces. *Communications of the ACM*, 33(10), 109-118.
- [35] Fitton, D., Read, J. C., Horton, M., Little, L., Toth, N., & Guo, Y. (2012). Constructing the cool wall: a tool to explore teen meanings of cool. *PsychNology Journal*, 10(2), 141-162.
- [36] McCrickard, D. S., Barksdal, J., & Doswell, F. R. (2012). Understanding Cool: An Analytic Exploration of Contributing Factors for Teens. *PsychNology Journal*, 10(2), 93-102.
- [37] Cowan, B. R., Avramides, K., & Beale, R. (2013, September). Should cool be a design goal?. In *Proceedings of the 27th International BCS Human Computer Interaction Conference* (p. 23). British Computer Society.
- [38] Sundar, S. S., Tamul, D. J., & Wu, M. (2013). Capturing “cool”: Measures for assessing coolness of technological products. *International Journal of Human-Computer Studies*, 72(2), 169-180.
- [39] Bruun, A., Raptis, D., Kjeldskov, J., & Skov, M. B. (2016). Measuring the coolness of interactive products: the COOL questionnaire. *Behaviour & Information Technology*, 35(3), 233-249.
- [40] Boyar, R, Levine, D, & Zensius, N. (2011). TECHsex Youth Sexuality and Reproductive Health in the Digital Age. Oakland, CA: ISIS, Inc. April, 2011.USA. Retrieved from <http://www.yth.org/wp-content/uploads/YTH-youth-health-digital-age.pdf>.
- [41] Centers for Disease Control and Prevention (CDC), Why Schools? Retrieved from https://www.cdc.gov/healthyyouth/about/why_schools.htm. Accessed February 21, 2017.
- [42] Whiteley, L.B., Mello, J., Hunt, O., & Brown, L. K. (2012). A Review of Sexual Health Web Sites for Adolescents, *Clinical Pediatrics*, 51(3), pages 209-213. doi: 10.1177/0009922811423311.
- [43] Northwestern University. (2015). Teens, Health, and Technology, A National Survey, http://cmhd.northwestern.edu/wp-content/uploads/2015/05/1886_1_SOC_ConfReport_TeensHealthTech_051115.pdf, Accessed October 12, 2015.
- [44] Ypulse, ISIS, Inc., & Youth Noise. (2008). Youth health and wellness: Core issues and views on existing resources. Retrieved from www.isis-inc.org/in-print/Youth_Health_and_Wellness_Report_2008.php
- [45] Nemire, K., Beil, J., & Swan, R. W. (1999). Preventing teen smoking with virtual reality. *Cyberpsychology & Behavior*, 2(1), 35-47.

- [46] Keller, S. N., & La Belle, H. (2005). STDs. com: Sexuality education online. *Education and Health*, 23(1), 10-12.
- [47] Danielson, C. K., McCauley, J. L., Gros, K. S., Jones, A. M., Barr, S. C., Borkman, A. L., ... & Ruggiero, K. J. (2016). SiHLE Web. com: Development and usability testing of an evidence-based HIV prevention website for female African-American adolescents. *Health informatics journal*, 22(2), 194-208.
- [48] Lam, C. G., Roter, D. L., & Cohen, K. J. (2013). Survey of quality, readability, and social reach of websites on osteosarcoma in adolescents, *Patient Education and Counseling*, 90 (1), 82-87, <http://dx.doi.org/10.1016/j.pec.2012.08.006>.
- [49] D'Auria, J. P. (2011). Health web sites for teens. *Journal of Pediatric Health Care*, 25(2), e1-e5.
- [50] Alsumait, A., & Al-Osaimi, A. (2009). Usability heuristics evaluation for child e-learning applications. In *Proceedings of the 11th International Conference on Information Integration and Web-based Applications & Services (iiWAS '09)*. ACM, New York, NY, USA, 425-430. doi: 10.1145/1806338.1806417
<http://doi.acm.org/10.1145/1806338.1806417>
- [51] Chen, C. H., Wu, F. G., Rau, P. L. P., & Hung, Y. H. (2004). Preferences of young children regarding interface layouts in child community web sites. *Interacting with computers*, 16(2), 311-330.
- [52] Druin, A. (2008). LIFELONG INTERACTIONS: Designing online interactions: what kids want and what designers know. *Interactions* 15 (3), 42-44.
<http://doi.acm.org/10.1145/1353782.1353792>.
- [53] Gossen, T., Nitsche, M., and Nurnberger. (2012). A. Knowledge journey: a web search interface for young users. In *Proc. HCIR 2012*, ACM Press (2012), 10 pages.
- [54] Read, J.C., & Bekker., M. M. (2011). The nature of child computer interaction. In *Proceedings of the 25th BCS Conference on Human-Computer Interaction (BCS-HCI '11)*. British Computer Society, Swinton, UK, UK, 163-170.
- [55] Bell, B. T., Toth, N., Read, J. C., Horton, M., Fitton, D., Little, L., ... & Guo, Y. (2013, April). Teenagers talking about technologies: designing technology to reduce teen energy use. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 1491-1496). ACM.
- [56] Read, J.C., & Markopoulos, P. (2013). Child-computer interaction." *International Journal of Child-Computer Interaction*, 1 (2013), 2-6.

- [57] Scaife, M., Rogers, Y., Aldrich, F., & Davies., M. (1997). Designing for or designing with? Informant design for interactive learning environments. In *Proceedings of the ACM SIGCHI Conference on Human factors in computing systems (CHI '97)*. ACM, New York, NY, USA, 343-350. DOI=<http://dx.doi.org/10.1145/258549.258789>

Appendix A Guidelines and Interface Conformance Crosswalk

A crosswalk is offered to convey the extent that the *BAM! Meeting the Challenge* interface conforms to usability and cool guidelines. It also outlines sources for the modifications made to the redesigned CTHP interface.

Usability Design Goal: Satisfaction

Description	Teen-Specific Usability Guidelines* McCloskey et al. [7]	CDC BAM (Figure 4.1) Guideline Conformance	CTHP (Figure 6.5b) Guideline Conformance
Usability Design Goal: Satisfaction			
<u>Targeted Area:</u> Teens enjoy websites that are designed for them.	Separate teen information from public, kids, and adult content (1,2).	Teen-specific site	Teen-specific site
<u>Ergonomics:</u> Design for teens' use of laptops and mobile devices.	Design clickable objects with large target areas (4).	Responsive design	Responsive design
<u>Navigation and Links:</u> Allow teens to determine where they are and where they can go quickly.	Use meaningful menu items and link labels (81).	Both sites have the same menu item names and link labels	
	Use mega-menus to show the breadth of information (83)	Has mega-menus	Has mega-menus
	Links should change color to indicate visited/unvisited (85).	Links change color on both sites	
<u>Credibility and Trust:</u> Teens prefer current	Keep information up to date and consistent (97).	References 1984 Olympics Mentions dated rapper Coolio	Outdated content on rapper Coolio removed from "Who has asthma?" section

information and sites that are free of bugs.			Updated outdated content on the 1984 Olympics to 2008
	Website must work – no bugs, broken links, server errors (98).	Free of bugs	Free of bugs

*For reference purposes, the number in parentheses correspond to the McCloskey et al. (2013) guideline number.

(I) indicate change to CTHP interface as a result of the informant design experiment results.

Usability Design Goal: Aesthetics

Description	Teen-Specific Usability Guidelines* McCloskey et al. [7]	CDC BAM (Figure 4.1) Guideline Conformance	CTHP (Figure 6.5b) Guideline Conformance
--------------------	---	--	--

Usability Design Goal: Aesthetics

Visual Appeal: Teens like visually attractive websites	Website should be visually attractive (107).		
	Display text and graphics in small meaningful chunks balanced with white space to facilitate scanning (108).	Some sections are lengthy	Get Fit section split into two sections – Get Fit and Follow These Tips Feel Good section split into two sections – Feel Good and So, Get Out There and Get Moving.
	Avoid using too many kid indicators such as bright colors, big fonts, and rainbows (109).	Site primarily black and white	Added more teen-appropriate colors such as black, red, green, and teal blue. (I)
	Design should be gender neutral unless targeting a specific gender, including choice of images and colors (110).	Not gender neutral (image is only of boy)	Gender neutral with images of boys and girls. Gender neutral colors

*For reference purposes, the number in parentheses correspond to the McCloskey et al. (2013) guideline number.

(I) indicate change to CTHP interface as a result of the informant design experiment results.

Usability Design Goal: Ease of Use

Description	Teen-Specific Usability Guidelines* McCloskey et al. [7]	CDC BAM (Figure 4.1) Guideline Conformance	CTHP (Figure 6.5b) Guideline Conformance
Usability Design Goal: Ease of Use			
<u>Written Content</u> Teens prefer information that is concise, easy to understand, and easy to find.	Be concise, but provide details, facts, and figures (62, 63).		Shortened the text in the “Who has Asthma” and “Don’t Let Asthma Keep You Out Of The Game” sections
	Optimize scanning with short sentences (less than twenty words), headings, subheadings, and paragraphs (less than four sentences) (64).	Sentences per paragraph: 2.2 Words per sentence: 12.4	Slightly fewer sentences per Paragraph: 2.0 Words per sentence: 13.0
	Use simple format when viewed by mobile devices (7).		
	Use bulleted points and numbered list where appropriate (64).	Three bulleted lists	Two bulleted lists
	Supplement text with pictures or illustrations to help understand the content and minimize plain text (65).	Mostly text	Added image of Olympics to supplement content.
	Place most important information at the top of the page (67).		Added main message “Asthma is not a barrier to physical activity” to top of page. [I] Moved the “Who has Asthma?” and “Physical Activity” sections to top of page.
	Bold, italicize, and enlarge important words (67).		“Asthma” is enlarged in the title

			Section headings are color (red and white).
	Use long pages so teens can scroll instead of using pagination (68).	Pages support scrolling.	Pages support scrolling.
	Use at least a 10-point or larger font and avoid all caps (70).	11-point font	10.5-point font
	Use contrast between text and background colors (71).	Contrast limited to black text on white background	Color contrast between text and background (I,G)
	The content should not be too difficult (6th grade or lower reading level), vague, or ambiguous (73).	Flesch Reading Ease: 69.4 Flesch-Kincaid Grade Level: 6.6	Flesch Reading Ease: 71.9 Flesch-Kincaid Grade Level: 6.4

*For reference purposes, the number in parentheses correspond to the McCloskey et al. (2013) guideline number.

(I) indicate change to CTHP interface as a result of the informant design experiment results.

Usability Design Goal: Engagement

Description	Teen-Specific Usability Guidelines* McCloskey et al. [7]	CDC BAM (Figure 4.1) Guideline Conformance	CTHP (Figure 6.5b) Guideline Conformance
Usability Design Goal: Engagement			
<u>Entertainment - Interaction:</u> Teens like to be entertained, but too much can be frustrating.	Use interactive features such as quizzes and games to facilitate learning. (29)		Added “Guess how many teens in your state have asthma” interactive feature to the “Who has Asthma” section.
<u>Entertainment - Images:</u> Teens enjoy looking at pictures and images online.	Use meaningful pictures that relate to the topic (37).		Added more images of teens doing sports. (I) Added more sports images – swimmers and bikes as bullet icons in list. (I)
	Use pictures and images of other teens (38).	One picture of teen on a bike	Added images of teens.

*For reference purposes, the number in parentheses correspond to the McCloskey et al. (2013) guideline number.

(I) indicate change to CTHP interface as a result of the informant design experiment results.

Usability Design Goal: Cool

Description	Teen-Specific Cool Guidelines Read et al. [21]	CDC BAM (Figure 4.1) Guideline Conformance	CTHP (Figure 6.5b) Guideline Conformance
Usability Design Goal: Cool			
Attractive	The technology and people should not appear unattractive		Added pictures of other teens. (I) Added sports and teens doing sports (I) Added interactive feature to get number of teens in state with asthma Added contrasting color.
Innovation	The technology should have some type of unusual aspect, unusual situation(s), or novelty		Added “Guess how many teens in your state have asthma” interactive feature to the “Who has Asthma” section.

(I) indicate change to CTHP interface as a result of the informant design experiment results.

Appendix B Detail Images BAM! Meet the Challenge Interface

BAM! Informant Design Experiment Interface Image

The screenshot shows the CDC website's 'BAM! Body and Mind' section. The main article is titled 'MEETING THE CHALLENGE' and 'Don't Let Asthma Keep You Out of the Game'. The article discusses how asthma is not a barrier to physical activity and provides statistics from the 1964, 1996, and 2000 Olympics. It also includes a section on 'Physical Activity → Asthma?' and 'Get Fit' with a list of tips for staying active with asthma. The interface includes a navigation menu on the left, social media links, and contact information on the right.

CDC Home
Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

SEARCH [] [SEARCH]

A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

BAM! Body and Mind

BAM! Body and Mind > Physical Activity > Meeting the Challenge

Print page
Get email updates
Subscribe to RSS
Listen to audio/Podcast

MEETING THE CHALLENGE

Don't Let Asthma Keep You Out of the Game

Today, more than ever, asthma is not a barrier to physical activity. In fact, if you keep your asthma under control, you can do it all! Need proof? Well, did you know that:

- At the 1964 summer Olympics, 57 of the 597 American athletes had asthma. Among them, they won 41 medals.
- Twenty percent of the athletes at the 1996 summer Olympics had asthma brought on by physical activity.
- Almost 30% of the American swimmers on the 2000 summer Olympic team had asthma and used inhalers.

Asthma didn't hold them back, and it shouldn't hold you back, either!

Who has asthma?

Asthma — which makes it hard to breathe, and causes coughing and wheezing — affects about five million American kids and teens? That's almost 1 in 10!

Famous people like rapper Coolio have asthma, although he's better known for his hit songs like "Gangsta's Paradise" than for his fight against the illness.

Physical Activity → Asthma?

Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into your lungs, and causing an asthma attack.

Physical activity can trigger asthma attacks too. Experts don't know for sure why physical activity sometimes brings one on, but they suspect that fast breathing through the mouth (like what happens when you get winded) can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels rise later in the day.

Get Fit

So, should you get a doctor's note and skip gym class? Sorry, no. Doctors want their asthma patients to get active, especially in asthma-friendly activities like these: swimming, bicycling, golf, inline skating, and weightlifting.

Why are these good choices if you want to be physically active?

- They let you control how hard and fast you breathe
- They let you breathe through your nose at all times
- They don't dry out your airways
- They mix short, intense activities with long endurance workouts
- You can do them in a controlled environment (for example, a gym with air that's not too cold or dry)
- Usually you do them with other people, who can help you if an attack comes on

Getting regular physical activity can improve your breathing, and lead to fewer asthma attacks. Just remember to follow these tips. (In fact, this is good advice for everyone, not just those with asthma.)


- Ease into it.**
Start your workout with a warm-up, and don't overdo it by running five miles on your first day if you get winded walking around the block! Finish up with a cool-down.
- Take a buddy.**
It's more fun and a friend can help if you get into trouble.
- Respect your bod.**
Stay away from the things that trigger your asthma. Help out your airways by breathing through

Navigation: Xpert Opinion, Activity Calendar, Activity Cards, I Heard Hurdle Race, Meeting the Challenge, Asthma, U Can Do It 2, Motion Commotion, YOUR SAFETY, YOUR LIFE, YOUR BODY

Contact Us:
Division of Population Health/School Health Branch
Centers for Disease Control and Prevention
4770 Buford Highway, Northeast, Mailing K-27
Atlanta, GA 30341
800-CDC-INFO (800-232-4636)
TTY: (888) 232-6348
Contact CDC-INFO

BAM! Informant Design Experiment Interface Image

CDC Home




Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

A-Z Index [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#) <#>


BAM! Body and Mind

BAM!


Body and Mind



DISEASES



FOOD & NUTRITION



PHYSICAL ACTIVITY

Xpert Opinion

Activity Calendar

Activity Cards


I Heard Hurdle Race

Meeting the Challenge


Asthma

U Can Do It 2

Motion Commotion






YOUR SAFETY



YOUR LIFE

[Bam! Body and Mind](#) > [PhysicalActivity](#) > [Meeting the Challenge](#)

MEETING THE CHALLENGE

Don't Let Asthma Keep You Out of the Game

Today, more than ever, asthma is not a barrier to physical activity. In fact, if you keep your asthma under control, you can do it all! Need proof? Well, did you know that:

- At the 1984 summer Olympics, 67 of the 597 American athletes had asthma. Among them, they won 41 medals.
- Twenty percent of the athletes at the 1996 summer Olympics had asthma brought on by physical activity.
- Almost 30% of the American swimmers on the 2000 summer Olympic team had asthma and used inhalers.

Asthma didn't hold them back, and it shouldn't hold you back, either!


Who has asthma?


Asthma — which makes it hard to breathe, and causes coughing and wheezing — affects about five million American kids and teens? That's almost 1 in 10!


Famous people like rapper Coolio have asthma, although he's better known for his hit songs like "Gangsta's Paradise" than for his fight against the illness.


Physical Activity → Asthma?


Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into to your lungs, and causing an asthma attack.

 [Print page](#)

 [Get email updates](#)




 [Subscribe to RSS](#)


 [Listen to audio/Podcast](#)




Healthy Schools Website

Contact Us:

 Division of Population Health/School Health Branch
Centers for Disease Control and Prevention
4770 Buford Highway, Northeast, Mailstop K-27
Atlanta, GA 30341
 800-CDC-INFO (800-232-4636)
 TTY: (888) 232-6348
 [Contact CDC-INFO](#)



BAM! Informant Design Experiment Interface Image



Expert Opinion
Activity Calendar
Activity Cards
I Heard Hurdle Race
Meeting the Challenge
▶ Asthma
U Can Do It 2
Motion Commotion
 YOUR SAFETY
 YOUR LIFE
 YOUR BODY

Who has asthma?

Asthma — which makes it hard to breathe, and causes coughing and wheezing — affects about five million American kids and teens? That's almost 1 in 10!

Famous people like rapper Coolio have asthma, although he's better known for his hit songs like "Gangsta's Paradise" than for his fight against the illness.



Control and Prevention
4770 Buford Highway,
Northeast, Mailstop
K-27
Atlanta, GA 30341
 800-CDC-INFO
(800-232-4636)
TTY: (888) 232-6348
 [Contact CDC-INFO](#)

Physical Activity → Asthma?

Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into your lungs, and causing an asthma attack.

Physical activity can trigger asthma attacks too. Experts don't know for sure why physical activity sometimes brings one on, but they suspect that fast breathing through the mouth (like what happens when you get winded) can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels rise later in the day.

Get Fit

So, should you get a doctor's note and skip gym class? Sorry, no. Doctors want their asthma patients to get active, especially in asthma-friendly activities like these: swimming, bicycling, golf, inline skating, and weightlifting.

Why are these good choices if you want to be physically active?

- They let you control how hard and fast you breathe
- They let you breathe through your nose at all times
- They don't dry out your airways
- They mix short, intense activities with long endurance workouts
- You can do them in a controlled environment (for example, a gym with air that's not too cold or dry)
- Usually you do them with other people, who can help you if an attack comes on

Getting regular physical activity can improve your breathing, and lead to fewer asthma attacks. Just remember to follow these tips. (In fact, this is good advice for everyone, not just those with asthma.)

- **Ease into it.**
Start your workout with a warm-up, and don't overdo it by running five miles on your first day if you get winded walking around the block! Finish up with a cool-down.

BAM! Usability Experiment Interface

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Promoting Healthy®

SEARCH

CDC A-Z INDEX ▾

BAM! Body and Mind

BAM! Body and Mind | [CDC](#) | [BAM! Body and Mind](#) | [Physical Activity](#) | [Diseases and Conditions](#)

MEETING THE CHALLENGE

[Facebook](#) [Twitter](#) [Google+](#)

Don't Let Asthma Keep You Out of the Game

Today, more than ever, asthma is not a barrier to physical activity. In fact, if you keep your asthma under control, you can reach all those goals you've set for yourself.

Asthma

- At the 1994 summer Olympics, 67 of the 197 American athletes had asthma. Among them, they won 41 medals.
- Twenty percent of the athletes at the 1996 summer Olympics had asthma brought on by physical activity.
- About 30% of the American athletes on the 2000 summer Olympic team had asthma and used inhalers.

Asthma doesn't hold them back, and it shouldn't hold you back, either!

Who has asthma?


Asthma — which makes it hard to breathe and causes coughing and wheezing — affects about five million American kids and teens! That's almost 1 in 17!

Famous people like rapper Coolio have asthma, although he's better known for his hit songs like "Coolio's Paradise" than for his fight against the disease.

Physical Activity — Asthma?

Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or even car "fumes" irritate asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into your lungs, and causing an asthma attack.

Physical activity can trigger asthma attacks too. Experts don't know for sure why physical activity sometimes brings one on, but they suspect that fast breathing through the mouth like what happens when you get winded can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels are lower in the day.



Get Email Updates



To receive email updates about this page, enter your email address:

What's Your?

Information for Teachers

[Get It](#)

BAM! Usability Experiment Interface

<p>Your Body +</p> <p>Teacher's Corner +</p> <p>Game Room</p>	<h2>Who has asthma?</h2> <p>Asthma — which makes it hard to breathe, and causes coughing and wheezing — affects about five million American kids and teens? That's almost 1 in 10!</p> <p>Famous people like rapper Coolio have asthma, although he's better known for his hit songs like "Gangsta's Paradise" than for his fight against the illness.</p>	
<h3>Get Email Updates</h3> <p>To receive email updates about this page, enter your email address:</p> <input type="text"/> <p>What's this? <input type="submit" value="Submit"/></p>	<h2>Physical Activity → Asthma?</h2> <p>Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into to your lungs, and causing an asthma attack.</p> <p>Physical activity can trigger asthma attacks too. Experts don't know for sure why physical activity sometimes brings one on, but they suspect that fast breathing through the mouth (like what happens when you get winded) can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels rise later in the day.</p>	
<h3>Information for Teachers</h3>  <p>Teachers: Incorporate BAM! topics into your classroom activities.</p> <p>More ></p>	<h2>Get Fit</h2> <p>So, should you get a doctor's note and skip gym class? Sorry, no. Doctors want their asthma patients to get active, especially in asthma-friendly activities like these: swimming, bicycling, golf, inline skating, and weightlifting.</p> <p>Why are these good choices if you want to be physically active?</p> <ul style="list-style-type: none">• They let you control how hard and fast you breathe• They let you breathe through your nose at all times• They don't dry out your airways• They mix short, intense activities with long endurance workouts• You can do them in a controlled environment (for example, a gym with air that's not too cold or dry)• Usually you do them with other people, who can help you if an attack comes on	
<h3>Related Links</h3> <p>Healthy Schools</p>	<p>Getting regular physical activity can improve your breathing, and lead to fewer asthma attacks. Just remember to follow these tips. (In fact, this is good advice for everyone, not just those with asthma.)</p> <ul style="list-style-type: none">• Ease into it. Start your workout with a warm-up, and don't overdo it by running five miles on your first day if you get winded walking around the block! Finish up with a cool-down.• Take a buddy. It's more fun and a friend can help if you get into trouble.	

BAM! Usability Experiment Interface



Teachers: Incorporate BAM! topics into your classroom activities.

[More >](#)

Related Links

[Healthy Schools](#)

Get Fit

So, should you get a doctor's note and skip gym class? Sorry, no. Doctors want their asthma patients to get active, especially in asthma-friendly activities like these: swimming, bicycling, golf, inline skating, and weightlifting.

Why are these good choices if you want to be physically active?

- They let you control how hard and fast you breathe
- They let you breathe through your nose at all times
- They don't dry out your airways
- They mix short, intense activities with long endurance workouts
- You can do them in a controlled environment (for example, a gym with air that's not too cold or dry)
- Usually you do them with other people, who can help you if an attack comes on

Getting regular physical activity can improve your breathing, and lead to fewer asthma attacks. Just remember to follow these tips. (In fact, this is good advice for everyone, not just those with asthma.)

- **Ease into it.**
Start your workout with a warm-up, and don't overdo it by running five miles on your first day if you get winded walking around the block! Finish up with a cool-down.
- **Take a buddy.**
It's more fun and a friend can help if you get into trouble.
- **Respect your bod.**
Stay away from the things that trigger your asthma. Help out your airways by breathing through your nose instead of your mouth. Take it easy on days when your asthma symptoms are really bugging you. And stick to the medicine routine that your doctor has set up.
- **Take breaks.**
Treat yourself to rest and drink plenty of water.
- **Mix it up.**
For example, try going inline skating one day and taking a long walk the next.

Feel Good

To feel your best, do the right stuff to control your asthma. And listen to your doctors – they're on your team!

Dr. Asthma says that people with asthma "should expect to live a life that really isn't affected by asthma, except for having to follow the directions." He also says to speak up if you are having symptoms, and remember to "keep a good attitude and keep working to control the disease." ([Wanna read the full disease detective profile?](#))

Appendix C Detail Images CTHP Interface

CTHP Usability Experiment Interface

The screenshot shows the top navigation bar of the CTHP website with links for Home, Diseases, Food and Nutrition, Physical Activity, Your Safety, Your Life, Your Body, and Game Room. A search bar is located on the right. Below the navigation is a banner image featuring three cartoon characters: a girl in a pink tank top, a girl in a green soccer jersey, and a boy in a blue shirt holding a tennis racket. The main heading reads "Asthma Is Not A Barrier To Physical Activity".

Who Has Asthma?
 Asthma — which makes it hard to breathe, and causes coughing and wheezing — affects about five million American kids and teens.

Guess how many teens in your state have asthma


Select Your State:

Enter Number Here:

Physical Activity → Asthma
 Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into your lungs, and causing an asthma attack.

Physical activity can trigger asthma attacks too. Experts don't know why. They suspect that fast breathing through the mouth (like what happens when you get winded) can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels rise later in the day.


Meet The Challenge → Don't Let Asthma Keep You Out Of The Game



CTHP Usability Experiment Interface


Physical Activity → Asthma
 Things like cold or dry air, dust, pollen, pollution, cigarette smoke, or stress can "trigger" asthma. This can make your body pump out chemicals that close off your airways, making it hard for air to get into your lungs, and causing an asthma attack.

Physical activity can trigger asthma attacks too. Experts don't know why. They suspect that fast breathing through the mouth (like what happens when you get winded) can irritate the airways. In addition, when air pollution levels are high, physical activity in the afternoon is harder on the lungs than morning activity — pollution levels rise later in the day.



Meet The Challenge → Don't Let Asthma Keep You Out Of The Game
 Today, more than ever, asthma is not a barrier to physical activity. In fact, if you keep your asthma under control, you can do it all! Well, did you know that:

- ☛ Eight percent of Olympians have asthma.
- ☛ At the 2008 Beijing Olympics, swimmers that had asthma won 30% of the medals.




Asthma didn't hold them back, and it shouldn't hold you back, either!

Get Fit
 So, should you get a doctor's note and skip gym class? Sorry, no. Doctors want their asthma patients to get active, especially in asthma-friendly activities like these: swimming, bicycling, golf, inline skating, and weightlifting.

Why are these good choices if you want to be physically active?

- ☛ They let you control how hard and fast you breathe
- ☛ They let you breathe through your nose at all times
- ☛ They don't dry out your airways
- ☛ They mix short, intense activities with long endurance workouts
- ☛ You can do them in a controlled environment (for example, a gym with air that's not too cold or dry)



CTHP Usability Experiment Interface

Follow These Tips

Just remember to follow these tips. In fact, this is good advice for everyone, not just those with asthma.

✧Ease into it.

Start your workout with a warm-up, and don't overdo it by running five miles on your first day if you get winded walking around the block! Finish up with a cool-down.

✧Take a buddy.

It's more fun and a friend can help if you get into trouble.

✧Respect your body.

Stay away from the things that trigger your asthma. Help out your airways by breathing through your nose instead of your mouth. Take it easy on days when your asthma symptoms are really bugging you. Stick to the medicine routine that your doctor has set up.

✧Take breaks.

Treat yourself to rest and drink plenty of water.

✧Mix it up.

For example, try going inline skating one day and taking a long walk the next.

Feel Good

To feel your best, do the right stuff to control your asthma. And listen to your doctors — they're on your team!

Dr. Asthma says that people with asthma "should expect to live a life that really isn't affected by asthma, except for having to follow the directions."

He also says to speak up if you are having symptoms, and remember to "keep a good attitude and keep working to control the disease." ([Wanna read the full disease detective profile?](#))



So, Get Out There And Get Moving!

With good habits and today's medicines, you can go for the gold — or just join your friends on the basketball court, in the pool, on the dance floor...

Get Out There!



Get Moving!



Dance!



Appendix D Questionnaire and Task List (Informant Design Experiment)

Demographics and Background

1. How old are you?
2. Do you use the Internet?
3. Have you participated in this study before?
4. What is your sex?
5. Are you Hispanic or Latino?
6. What is your race?
7. How long have you been using computers?
8. How long have you been browsing the Web/Internet?
9. On an average DAY, how many hours do you spend on the Web/Internet?
10. Do you access the Web/Internet on a cell phone, tablet or other mobile device, at least occasionally? (You can choose one answer or more than one answer)
11. Have you ever looked for health information on the Web/Internet?
12. Please circle any words, phrases, or answers on this page that are confusing or hard to understand.

COOL Design

The word COOL is often used to describe things as COOL and people as COOL with a COOL attitude, behavior or style.

13. Describe a cool website that you have used, including what was cool about the site.
14. List some things that you think are COOL?
15. List people that you think are COOL?

Task List

- A. Please use the laptop to read the MEETING THE CHALLENGE homepage.
- B. We are interested in your opinions about the homepage, so please stay on this page. Remember, there are no right or wrong answers.
- C. After reading the homepage, please take additional time to explore the homepage and write answers to the questions below as you explore the page.
 5. What is the name of the famous rapper that has asthma?
 6. Write at least one thing that can “trigger” asthma.
 7. What is the boy doing?
 8. Fill in the blank below. Dr. _____ says that people with asthma "should expect to live a life that really isn't affected by asthma, except for having to follow the directions."

COOL Design (continued)

16. Please draw or write an example of how you would change the MEETING THE CHALLENGE homepage to make it COOL?

17. We are interested in understanding how to change the image of the “boy on the bike” to make it COOL.
- a. Please draw or write an example of something that would be more COOL than the “boy on the bike”. Use the space below to draw your suggestion.

Fun/Entertaining Design

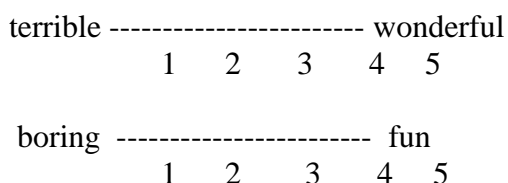
18. Please draw or write an example of what you would change about the MEETING THE CHALLENGE homepage to make it FUN AND ENTERTAINING?
19. What other changes to the MEETING THE CHALLENGE homepage would you suggest?

Likes/Dislikes Design

20. What do you like MOST about the MEETING THE CHALLENGE homepage?
21. What do you liked LEAST about the MEETING THE CHALLENGE homepage?

Usability Instrument

Please provide your overall opinion of the MEETING THE CHALLENGE homepage. Draw a circle around the number.



Please provide your opinions of specific aspects of the MEETING THE CHALLENGE homepage. Draw a circle around the number.

22.	The site has features that are fun, entertaining, and engaging?	Disagree	1	2	3	4	5	Agree
23.	The amount of information displayed is just right.	Disagree	1	2	3	4	5	Agree
24.	The colors in this homepage are pleasant.	Disagree	1	2	3	4	5	Agree
25.	This site organized its information in a way that is easy for me to read.	Disagree	1	2	3	4	5	Agree
26.	The site is attractive.	Disagree	1	2	3	4	5	Agree

27.	It is easy to read.	Disagree	1	2	3	4	5	Agree
28.	The information provided is easy to understand.	Disagree	1	2	3	4	5	Agree
29.	It is easy to find the information I needed.	Disagree	1	2	3	4	5	Agree

30.	I am satisfied with it.	Disagree	1	2	3	4	5	Agree
31.	I would recommend it to a friend if he or she had asthma.	Disagree	1	2	3	4	5	Agree
32.	It is fun to use.	Disagree	1	2	3	4	5	Agree
33.	It is pleasant to use.	Disagree	1	2	3	4	5	Agree

34. Please circle any words or phrases that are confusing or hard to understand in the question wording for numbers 22-35 above

Appendix E Questionnaire and Task List (Usability Experiment)

Teen Website Review Survey

Participant Number: U_____

Website Review Order: **BAM/CTHP** **CTHP/BAM**

Study Date: _____ State: _____

Facility (circle): Home Library Other: YMCA

Lead Researcher: Transfer response for asthma question from consent form.

De-identify response on the consent form by writing over the three selection options.

Has a doctor or nurse ever told you that you have asthma?

- Yes
- No
- Not sure

<p>1. Respondent: Complete this section: How old are you?</p> <ul style="list-style-type: none"> <input type="radio"/> 13 years old <input type="radio"/> 14 years old <input type="radio"/> 15 years old <input type="radio"/> 16 years old <input type="radio"/> 17 years old 	<p>2. Do you use the Internet?</p> <ul style="list-style-type: none"> <input type="radio"/> Yes -> Continue <input type="radio"/> No -> Terminate Interview 	<p>3. Have you participated in this study before?</p> <ul style="list-style-type: none"> <input type="radio"/> Yes -> Terminate Interview <input type="radio"/> No -> Continue 	<p>4. What brand of PHONE are you using for the study?</p> <ul style="list-style-type: none"> <input type="radio"/> Apple (iPhone) <input type="radio"/> Samsung <input type="radio"/> LG <input type="radio"/> Motorola <input type="radio"/> HTC <input type="radio"/> BlackBerry <input type="radio"/> Sony Ericsson <input type="radio"/> Nokia <input type="radio"/> Other Phone (write name) _____ <input type="radio"/> I'm using a tablet (write name) _____
---	--	---	---

Participant Number: U _____

Background Information

Please Circle your Answers.

5. What is your sex?

 Male Female

6. Are you Hispanic or Latino?

 Yes No

7. What is your race?

(You can choose one answer or more than one answer)

 White Black or African American Asian Native Hawaiian or Other Pacific Islander American Indian or Alaska Native

8. Have you been using the Web/Internet for more than one year?

 Yes No

9. On an average WEEKDAY (Monday-Friday), how many hours per day do you spend on the Web/Internet?

Write Number of Hours for WEEKDAY (Monday-Friday): _____

10. On an average WEEKEND day (Saturday/Sunday), how many hours per day do you spend on the Web/Internet?

Write Number of Hours for WEEKEND day (Saturday/Sunday): _____

11. Do you access the Web/Internet on a cell phone, tablet or other mobile device, at least occasionally? *(You can choose one answer or more than one answer)*

 Cell phone Tablet or iPad Other mobile device Do not access the Web/Internet using a cell phone, tablet or other mobile device

12. Have you ever looked for health information on the Web/Internet?

 Yes No

Stop Here. Put pencil down so Researcher will know you finished this section.

Participant Number: U _____

Website: BAM (Body and Mind) <http://www.cdc.gov/bam/activity/challenge-asthma.html>

Google: cdc bam asthma - to quickly find the page

Please read the BAM homepage (stay on this page)

- A. We are interested in your opinions about the BAM homepage, so please stay on this page.
- B. We are interested in your opinions, if you have asthma and even if you don't have asthma.
- C. After reading the BAM homepage, please take additional time to explore it and write answers to the questions below as you explore the page.
- D. There are no right or wrong answers. Please provide your honest opinion.

T1. What is the name of the famous rapper that has asthma?

T2. Write at least one thing that can "trigger" asthma.

T3. What is the boy doing?

T4. Fill in the blank below.

Dr. _____ says that people with asthma "should expect to live a life that really isn't affected by asthma, except for having to follow the directions."

CONTINUE TO NEXT PAGE

Participant Number: U _____

Website: BAM (Body and Mind)

- A. Please take additional time to explore the BAM homepage.
B. Write answers to the questions below.
C. We are interested in your opinions about the BAM homepage, so please stay on this page.
D. Remember, there are no right or wrong answers. Provide your honest opinion.

Please provide your opinions of the BAM homepage.

Circle your Answers.

13.	The information provided is easy to understand	Disagree	1	2	3	4	5	Agree
14.	It is easy to find the information I needed	Disagree	1	2	3	4	5	Agree
15.	The amount of information is just right	Disagree	1	2	3	4	5	Agree

16.	It is fun to use	Disagree	1	2	3	4	5	Agree
17.	The colors are pleasant	Disagree	1	2	3	4	5	Agree
18.	It looks great	Disagree	1	2	3	4	5	Agree
19.	Its attractiveness makes we want to go further into the site	Disagree	1	2	3	4	5	Agree

20.	I am satisfied with it	Disagree	1	2	3	4	5	Agree
21.	I would recommend it to a friend if he or she had asthma.	Disagree	1	2	3	4	5	Agree
22.	It is wonderful	Disagree	1	2	3	4	5	Agree
23.	It is pleasant to use	Disagree	1	2	3	4	5	Agree

24.	It is stylish	Disagree	1	2	3	4	5	Agree
25.	It is hip	Disagree	1	2	3	4	5	Agree
26.	It has some cool features	Disagree	1	2	3	4	5	Agree

Stop Here. Put pencil down so Researcher will know you finished this section.

Participant Number: U _____

Website: CTHP (Center for Teen Health and Prevention)

<http://www.auburn.edu/~cmb0028/>

Please read the CTHP homepage (stay on this page)

- A. We are interested in your opinions about the CTHP homepage, so please stay on this page.
- B. We are interested in your opinions, if you have asthma and even if you don't have asthma.
- C. After reading the CTHP homepage, please take additional time to explore it and write answers to the questions below as you explore the page.
- D. There are no right or wrong answers. Please provide your honest opinion.

T1. How many teens in Georgia have asthma?

T2. Can physical activity trigger asthma attacks?

T3. Write one asthma friendly activity.

T4. Fill in the blanks below.

With good habits and today's medicines, you can go for the gold or just join your friends on the _____, in the _____, on the _____.

CONTINUE TO NEXT PAGE

Participant Number: U _____

Website: CTHP (Center for Teen Health and Prevention)

- A. Please take additional time to explore the CTHP homepage.
- B. Write answers to the questions below.
- C. We are interested in your opinions about the CTHP homepage, so please stay on this page.
- D. Remember, there are no right or wrong answers. Provide your honest opinion.

Please provide your opinions of the CTHP homepage.

Circle your Answers.

27.	The information provided is easy to understand	Disagree	1	2	3	4	5	Agree
28.	It is easy to find the information I needed	Disagree	1	2	3	4	5	Agree
29.	The amount of information is just right	Disagree	1	2	3	4	5	Agree

30.	It is fun to use	Disagree	1	2	3	4	5	Agree
31.	The colors are pleasant	Disagree	1	2	3	4	5	Agree
32.	It looks great	Disagree	1	2	3	4	5	Agree
33.	Its attractiveness makes we want to go further into the site	Disagree	1	2	3	4	5	Agree

34.	I am satisfied with it	Disagree	1	2	3	4	5	Agree
35.	I would recommend it to a friend if he or she had asthma.	Disagree	1	2	3	4	5	Agree
36.	It is wonderful	Disagree	1	2	3	4	5	Agree
37.	It is pleasant to use	Disagree	1	2	3	4	5	Agree

38.	It is stylish	Disagree	1	2	3	4	5	Agree
39.	It is hip	Disagree	1	2	3	4	5	Agree
40.	It has some cool features	Disagree	1	2	3	4	5	Agree

Stop Here. Put pencil down so Researcher will know you finished this section.

Appendix F Summary Questionnaire (Usability Experiment)

Participant Number: U _____

Please Circle your Answers.

41. It was useful learning about asthma on a cell phone/mobile device.

Yes	No
-----	----

42. Overall, I enjoyed using my cell phone/mobile device to view the two homepages.

Yes	No
-----	----

43. You just viewed the two asthma homepages below.

The word *COOL* means stylish, chic, trendy, hip and fly.

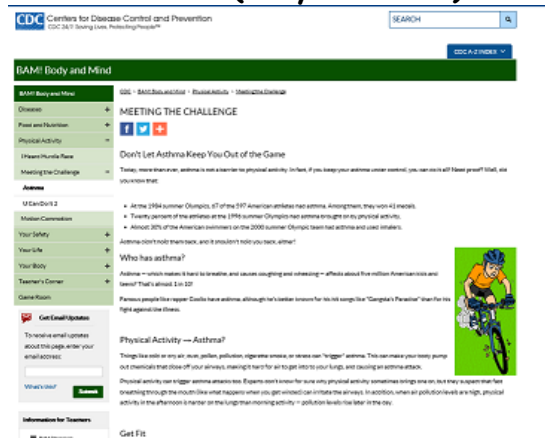
43a. Which homepage is the 'coolest'? Circle your answer. Select only one answer.

<p>BAM (Body and Mind)</p>

<p>CTHP (Center for Teen Health and Prevention)</p>
--

43b. Why?

BAM
(Body and Mind)



CTHP

(Center for Teen Health and Prevention)



Appendix G Questionnaire Sources and Alignment (Usability Experiment)

EASE OF USE Usability Goal (Written Content Design Guidelines)

1. The information provided is easy to understand Disagree 1 2 3 4 5 Agree (CSUQ question # 13)
2. It is easy to find the information I needed Disagree 1 2 3 4 5 Agree (CSUQ question # 12)

Source: Computer System Usability Questionnaire (CSUQ). Based on: Lewis, J. R. (1995) IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use. *International Journal of Human-Computer Interaction*, 7:1, 57-78.

<http://garyperlman.com/quest/quest.cgi?form=CSUQ>

3. The amount of information is just right Disagree 1 2 3 4 5 Agree (question #3 slightly modified)

Source Questions (slightly modified): Xiaoni Zhang, Kellie B. Keeling, and Robert J. Pavur. 2000. Information quality of commercial web site home pages: an explorative analysis. In *Proceedings of the twenty first international conference on Information systems (ICIS '00)*. Association for Information Systems, Atlanta, GA, USA, 164-175.

ENGAGEMENT Usability Goal (Interaction Design Guidelines)

4. It is fun to use. Disagree 1 2 3 4 5 Agree (USE question # 26)

Source: USE Questionnaire: Usefulness, Satisfaction, and Ease of use Lund, A.M. (2001) *Measuring Usability with the USE Questionnaire*. *STC Usability SIG Newsletter*, 8:2. [Abstract] www.acm.org/perlman/question.cgi?form=USE

AESTHETICS Usability Goal (Visual Appeal Design Guidelines)

The colors are pleasant. Disagree 1 2 3 4 5 Agree (question #4 slightly modified)

Source Questions (slightly modified): Xiaoni Zhang, Kellie B. Keeling, and Robert J. Pavur. 2000. Information quality of commercial web site home pages: an explorative analysis. In *Proceedings of the twenty first international conference on Information systems (ICIS '00)*. Association for Information Systems, Atlanta, GA, USA, 164-175.

5. It looks great. Disagree 1 2 3 4 5 Agree (question #3 slightly modified)

Source: S. Shyam Sundar, Daniel J. Tamul, and Mu Wu. 2014. Capturing "cool": Measures for assessing coolness of technological products. *Int. J. Hum.-Comput. Stud.* 72, 2 (February 2014), 169-180. DOI=<http://dx.doi.org/10.1016/j.ijhcs.2013.09.008>

6. Its attractiveness makes we want to go further into the site. (question #6 slightly modified)

Source Questions (slightly modified): Xiaoni Zhang, Kellie B. Keeling, and Robert J. Pavur. 2000. Information quality of commercial web site home pages: an explorative analysis. In Proceedings of the twenty first international conference on Information systems (ICIS '00). Association for Information Systems, Atlanta, GA, USA, 164-175.

SATISFACTION Usability Goal

7. I am satisfied with it. Disagree 1 2 3 4 5 Agree (question #24)
8. I would recommend it to a friend if he or she had asthma. Disagree 1 2 3 4 5 Agree (question #28)
9. It is wonderful. Disagree 1 2 3 4 5 Agree (question #30)
10. It is pleasant to use. Disagree 1 2 3 4 5 Agree (question #25 slightly modified)

Source: USE Questionnaire: Usefulness, Satisfaction, and Ease of use Lund, A.M. (2001) Measuring Usability with the USE Questionnaire. STC Usability SIG Newsletter, 8:2. [Abstract] www.acm.org/perlman/question.cgi?form=USE

MOBILE ASPECTS

11. It was useful learning about asthma on a mobile device.
12. I enjoyed using my cell phone/mobile device to view the two homepages.

COOL Design Goal (Attractiveness)

13. It is stylish
14. It is hip

COOL Design Goal (Holistic)

15. It has some cool features

Source for cool Q13-Q15 questions:

S. Shyam Sundar, Daniel J. Tamul, and Mu Wu. 2014. Capturing "cool": Measures for assessing coolness of technological products. *Int. J. Hum.-Comput. Stud.* 72, 2 (February 2014), 169-180. DOI=<http://dx.doi.org/10.1016/j.ijhcs.2013.09.008>

Appendix H Recruitment Script (Informant Design Experiment)

RECRUITMENT SCRIPT Phase One (Informant Design)
for a Research Study entitled
Interface Design Guidelines to Improve Usability of Websites for Teenagers

I am Cathy Bailey, a graduate student in the Department of Computer Science and Software Engineering at Auburn University. I would like to invite your son/daughter to participate in my research study to help us understand how to design websites for teenagers (ages 13-17). He/She may participate if he/she is 13-17 years old.

As a participant, he/she will be asked to review health websites and provide opinions about the websites. His/her time commitment will be approximately 1-2 hours.

There are no anticipated risks associated with participating in this study. If he/she participates in this study, you can expect him/her to have improved understanding of health information and motivation to access health information for informal learning. We cannot promise you that he/she will receive any or all of the benefits described. There are no costs associated with participating. We are able to offer \$5 compensation for participating.

If you have questions, please contact me at (404) 580-0991 or you may contact my advisor, Dr. Cheryl Scals, at (334) 844-6319.

Appendix I Recruitment Script (Usability Experiment)

RECRUITMENT SCRIPT (Usability Phase)
for a Research Study entitled
Interface Design Guidelines to Improve Usability of Websites for Teenagers

I am Cathy Bailey, a graduate student in the Department of Computer Science and Software Engineering at Auburn University. I would like to invite your son/daughter to participate in my research study to help us understand how to design websites for teenagers (ages 13-17). He/She may participate if he/she is 13-17 years old.

As a participant, he/she will be asked to review health websites and provide opinions about the websites. His/her time commitment will be approximately 1-2 hours.

There are no anticipated risks associated with participating in this study. If he/she participates in this study, you can expect him/her to have improved understanding of health information and motivation to access health information for informal learning. We cannot promise you that he/she will receive any or all of the benefits described. There are no costs associated with participating. We are able to offer \$5 compensation for participating.

If you have questions, please contact me at (404) 580-0991 or you may contact my advisor, Dr. Cheryl Seals, at (334) 844-6319.

Appendix J Parental Permission/Child Assent (Informant Design Experiment)



AUBURN UNIVERSITY
SAMUEL GINN COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

PARENTAL PERMISSION/CONSENT for a Research Study entitled

Interface Design Guidelines to Improve Usability of Websites for Teenagers

Your son or daughter is invited to participate in a research study to help us understand how to design websites for teenagers (aged 13-17). Participants will explore a health website on asthma and will be asked to provide opinions about the website. The study is being conducted by Cathy Bailey, PhD Candidate at Auburn University, under the direction of Dr. Cheryl Seals, Associate Professor in the Auburn University Department of Computer Science and Software Engineering. Your son/daughter is invited to participate because he/she is a teenager (aged 13-17) or will be in this age range on the day of the study. Since he/she is age 18 or younger we must have your permission to include him/her in the study.

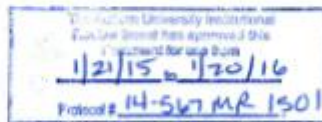
What will be involved if he or she participates? We are interested in teenagers (aged 13-17). If you decide to allow him or her to participate in this research study, he or she will be asked to review a health website on asthma and provide survey responses to capture demographic information, computer experience, and opinions about the asthma website and using a mobile device to review it. We are interested in his/her opinions even if he/she does not have asthma. Your son/daughter's total time commitment will be approximately 1-2 hours.

Are there any risks or discomforts? There are no anticipated risks associated with participating in this study.

Are there any benefits to your son/daughter or others? If he/she participates in this study, he/she can expect to have improved understanding of asthma and the motivation to access health information for informal learning. We cannot promise you that he/she will receive any or all of the benefits described.

Will you or your son/daughter receive compensation for participating? To thank him/her for participating, we are able to offer \$5 compensation.

Parent/Guardian Initials _____



Page 1 of 3



Are there any costs? If you decide to allow your son/daughter to participate, you/he/she will not be responsible for any costs associated with participating.

If you (or your son/daughter) change your mind about his/her participation, he/she can be withdrawn from the study at any time. Your son's/daughter's participation is completely voluntary. If you choose to withdraw him/her, your son's/daughter's data can be withdrawn as long as it is identifiable. Your decision about whether or not to allow your son/daughter to participate or to stop participating will not jeopardize your or his/her future relations with Auburn University, the Department of Computer Science and Software Engineering.

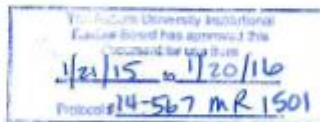
Your son's/daughter's privacy will be protected. Any information obtained in connection with this study will remain anonymous. The data collected will be protected by not including it in our data. Information obtained through his/her participation may be published in professional journals and presented at professional meetings and conferences.

If you (or your son/daughter) have questions about this study, please contact Cathy Bailey at (404) 580-0991.

If you have questions about your son's/daughter's rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBAdmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH FOR YOUR SON OR DAUGHTER TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO ALLOW HIM OR HER TO PARTICIPATE.

Parent/Guardian Initials _____



Page 2 of 3



We are interested in having him/her help us understand how to design websites for teenagers, even if he/she does not have asthma.

Does this son/daughter have asthma?

- 1 Yes
- 2 No
- 7 Don't know / Not sure
- 9 Refused

 Parent/Guardian Signature

 Investigator obtaining consent Date

 Printed Name

 Printed Name

 Date

 Minor's name



Appendix K Usability Experiment Parental Permission/Child Assent



AUBURN UNIVERSITY
SAMUEL GINN COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

PARENTAL PERMISSION/CHILD ASSENT for a Research Study entitled *Interface Design Guidelines to Improve Usability of Websites for Teenagers*

Your son or daughter is invited to participate in a research study to help us understand how to design websites for teenagers (aged 13-17). The study is being conducted by Cathy Bailey, PhD Candidate at Auburn University, under the direction of Dr. Cheryl Seals, Associate Professor in the Auburn University Department of Computer Science and Software Engineering. Your son or daughter is invited to participate because he or she is a teenager (aged 13-17) or will be in this age range on the day of the study. Since he/she is age 18 or younger we must have your permission to include him/her in the study.

What will be involved if your son/daughter participates? We are interested in working with teenagers (aged 13-17). If you decide to allow him/her to participate in this research study, he/she will be asked to review two health websites on asthma and provide survey responses to capture demographic information, computer experience, and opinions about the asthma websites. We are interested in his/her opinions even if he/she does not have asthma. Your son's/daughter's total time commitment will be approximately 1-2 hours.

Are there any risks or discomforts? There are no anticipated risks associated with participating in this study.

Are there any benefits to your son/daughter or others? If he/she participates in this study, he/she can expect to have improved understanding of asthma and the motivation to access health information for informal learning. We/I cannot promise you that your son/daughter will receive any or all of the benefits described.

Will there be compensation for participating? To thank your son or daughter for participating, \$5 compensation will be offered.

Parent/Guardian Initials _____
Participant Initials _____

Page 1 of 3

Shelby Center for Engineering Technology, Suite 5101 * Auburn, Alabama 36849
Phone: 334.844.6300 * Fax: 334.844.6329 * www.eng.auburn.edu/cssc/

The Auburn University Institutional
Review Board has approved this
Document for use from
01/05/2016 to 01/20/2017
Protocol # 14-567 MR 1501



AUBURN UNIVERSITY
SAMUEL GINN COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

Are there any costs? If you decide to allow your son/daughter to participate, you will not be responsible for any costs associated with participating.

If you (or your son/daughter) change your mind about his/her participation, he/she can be withdrawn from the study at any time. His/her participation is completely voluntary. If you choose to withdraw your son/daughter, his/her data can be withdrawn as long as it is identifiable. Your decision about whether or not to allow your son/daughter to participate or to stop participating will not jeopardize your or his/her future relations with Auburn University, the Department of Computer Science and Software Engineering.

Your son's/daughter's privacy will be protected. Any information obtained in connection with this study will remain anonymous. The data collected will be protected by not coding any direct link of who participated in the study. Hard copy documents will be stored in a locked file cabinet. Information obtained through his/her participation may be used to fulfill an educational requirement, published in a professional journal, or presented at professional meetings.

If you (or your son/daughter) have questions about this study, please ask them now or contact Cathy Bailey at (404) 580-0991. A copy of this document will be given to you to keep.

If you have questions about your child's rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH FOR YOUR SON OR DAUGHTER TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO ALLOW HIM OR HER TO PARTICIPATE. YOUR SON'S/DAUGHTER'S SIGNATURE INDICATES HIS/HER WILLINGNESS TO PARTICIPATE.

Parent/Guardian Initials_____

Participant Initials_____

Page 2 of 3

Shelby Center for Engineering Technology, Suite 3101 * Auburn, Alabama 36849
 Phone: 334.844.6300 * Fax: 334.844.6329 * www.eng.auburn.edu/csse/

<p>The Auburn University Institutional Review Board has approved this Document for use from <u>01/05/2016</u> to <u>01/20/2017</u> Protocol # <u>14-567 MR 1501</u></p>



We are interested in having him/her help us understand how to design websites for teenagers, even if he/she does not have asthma.

Does this son/daughter have asthma?

- 1 Yes
- 2 No
- 7 Don't know / Not sure
- 9 Refused

 Participant's signature Date

 Investigator obtaining consent Date

 Printed Name

 Printed Name

 Parent/Guardian Signature Date

 Printed Name

The Auburn University Institutional
 Review Board has approved this
 Document for use from
01/05/2016 to 01/20/2017
 Protocol # 14-567 MR 1501

Appendix L Debriefing Sheet (Informant Design Experiment)

MEETING THE CHALLENGE Homepage Debriefing Sheet

Dear Participant;

During this study, you were asked to review the MEETING THE CHALLENGE homepage and provide survey responses to capture demographic information (e.g., age, sex, race/ethnicity) and opinions about the homepage. You were told that the purpose of the study was to help us understand how to design websites for teenagers (ages 13-17).

If you have any concerns about your participation or the data you provided please discuss this with us. We will be happy to provide any information we can to help answer questions you have about this study.

If your concerns are such that you would now like to have your data withdrawn, we will do so. Your participation is completely voluntary. If you choose to withdraw your data, it can be withdrawn as long as it is identifiable.

If you have questions about your participation in the study, please contact me at (404) 580-0991 or my faculty advisor, Dr. Cheryl Seals, (334) 844-6319.

If you have questions about your rights as a research participant, you may contact the Office of Research Compliance (334-844-5966, IRBAdmin@auburn.edu) or an Auburn University Institutional Review Board (IRBChair@auburn.edu).

Please again accept our appreciation for your participation in this study.

Name _____ Date _____⁷

Appendix M Debriefing Sheet (Usability Experiment)

For the Study

Interface Design Guidelines to Improve Usability of Websites for Teenagers Debriefing Sheet

Dear Participant;

During this study, you were asked to review two homepages and provide survey responses to capture demographic information (e.g., age, sex, race/ethnicity) and opinions about each homepage. You were told that the purpose of the study was to help us understand how to design websites for teenagers (ages 13-17).

If you have any concerns about your participation or the data you provided please discuss this with us. We will be happy to provide any information we can to help answer questions you have about this study.

If your concerns are such that you would now like to have your data withdrawn, we will do so. Your participation is completely voluntary. If you choose to withdraw your data, it can be withdrawn as long as it is identifiable.

If you have questions about your participation in the study, please contact me at (404) 580-0991 or my faculty advisor, Dr. Cheryl Seals, (334) 844-6319.

If you have questions about your rights as a research participant, you may contact the Office of Research Compliance (334-844-5966, IRBadmin@auburn.edu) or an Auburn University Institutional Review Board (IRBChair@auburn.edu).

Please again accept our appreciation for your participation in this study.

Name _____ Date _____