# Case Study: The Design of CBC4Kids' StoryBuilder

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**ABSTRACT**
This paper describes the design of an online collaborative storytelling environment for children aged 8 – 10. The project balances children's needs to have flexible creative environments [22] with the desire of a public broadcaster to publish quality user-generated content that showcases Canadian stories. This paper outlines five key practices that contributed to the successful design of StoryBuilder. Ninety-five children were involved in the project using a combination of informant-based and user-centred iterative design techniques. Examination and observation of oral storytelling activities and behaviors, technology-based creativity tools and storytelling styles formed the basis for the remaining design practices.

**Keywords**
Children, storytelling, interactive narrative, design methodology, user-centered design

**INTRODUCTION**
In January 2002, a small interdisciplinary team at the Canadian Broadcasting Corporation (CBC) began the redevelopment of the CBC4Kids.ca brand and web site. One component of our vision was an environment where children could collaborate in a storytelling process. We imagined a place where children could create stories reflecting their own voices and at the same time produce quality content that would be of value to the millions of children that view CBC4Kids.ca. The result was StoryBuilder, a comix-style version of the add-a-sentence-to-a-story activity that allows children to create and submit the next page in an ongoing story using pre-existing elements. Children can also use StoryBuilder to create stories individually or with other online friends.


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Despite a short timeline and limited resources, the CBC4Kids.ca project was a success. A summative evaluation of the project showed that StoryBuilder was an effective way to balance the needs of children as storytellers with the needs of CBC as a public broadcaster. The CBC4Kids site received over a million visits during the first three months of its pilot phase. StoryBuilder was the second most visited site area, receiving over 10,000 weekly visits.

This case study describes five practices employed during the design of StoryBuilder to ensure that we designed *with* kids not *for* kids [10]. The first two practices involved children. The remaining three practices involved looking at existing storytelling activities, creativity tools and storytelling styles to inform design.

Foremost to the success of any product is an understanding of the target audience. The first practice achieved this through a combination of techniques derived from contextual inquiry, field research, questionnaires and a series of team "homework" exercises. The second practice addressed ways to involve children throughout the entire development phase. This was critical in ensuring we understood and met their needs. The challenge was how to do this in a meaningful way on an aggressive production schedule with limited resources. We adapted techniques from user-centred and informant-based design. Children were involved as informants at the concept stage, informants and usability testers for critical tasks at the prototyping stage and user testers at the beta stage. They were also involved in the summative evaluation that took place during the pilot phase. Overall, 95 children were involved in the process of design and evaluation over a period of eight months. The third practice was the exploration of story building and telling activities and the determination of those that could be enhanced by the application of online technology. The fourth practice involved examining the possibility of reusing successful, existing applications as one way to meet resource constraints. In the final practice, we looked at existing storytelling styles in hopes of finding a style that was

suitable for an online tool as well as familiar and tangible to children [15].

## BACKGROUND

### The Canadian Broadcasting Corporation

The Canadian Broadcasting Corporation is Canada's largest cultural institution. It has an annual operating budget of $1.32 billion (2001-2002) [6]. As Canada's public broadcaster, CBC's mandate dictates that it is accountable to all Canadians. CBC tells Canadian stories that are reflective of the reality and diversity of Canada. It informs Canadians of news and issues of relevance and interest. It supports Canadian arts and culture and builds bridges among Canadians, across regions and the two linguistic communities of Canada. From its documentary "Canada: A People's History" to the prime time TV show "This Hour Has 22 Minutes" CBC showcases Canadian stories. The creation of a storytelling activity for children was a priority for the redevelopment of CBC4Kids.ca.

### The CBC4Kids Redevelopment Project

At the end of 2001, the existing CBC4Kids.ca (developed five years earlier) was reaching the end of its normal product cycle. The site, having a strong editorial and journalistic focus, was time intensive to maintain and reached only a small number of children (and teachers). Many of the text-based activities were failing to attract children whose expectations of the web had significantly changed.

As the competitive landscape was undergoing rapid redevelopment, broadcasters like CBC realized that new program models would be necessary to reach today's media savvy children. Several people responsible for children's programming at the CBC felt that there was a significant opportunity to position CBC at the forefront of children's media. Key players would emerge in the next 18 months and the CBC wanted to be one of these players.

CBC Radio New Media capitalized on this opportunity with the redevelopment of CBC4Kids.ca. The scope of the project included a complete overhaul of the brand and web site as well as the creation of three experimental properties (activities). StoryBuilder was one of these activities. The entire development project lasted only four months, followed by a four month pilot.

## INTERACTIVE STORYTELLING

There is ample evidence that the acquisition of storytelling skills in childhood is critical to a child's development. It is through storytelling that children learn to express themselves and make sense of the world [8]. It is how they enter into and participate with culture [3].

Technology-enabled storytelling for children has recently received attention in both academic and commercial arenas. While there is general agreement on its importance and on the underlying principles at work [5], there much variation in the resulting products.

Recent academic research shows interesting diversity in the application of the seminal work of child-focused psychologists (e.g., Vygotsky, Bruner, Piaget). Most researchers agree that computer-mediated environments that encourage children to explore story construction in a flexible or free play environment are valuable [4,8,13,20]. Other researcher point to the importance of facilitating social interactions through both networked and shoulder-to-shoulder collaboration. Storytelling environments that have resulted from participatory design (i.e., design with children as co-designers) are often flexible and open-ended in their support of storytelling [10]. Other researchers have incorporated technology-mediated artifacts into story-based activities. Artifacts such as stuffed animals (e.g., PETS) [9] and play mats (e.g., StoryMats) [4] are used in an effort to create engagement by using tangible physical objects to support story-listening and retelling. Researchers have created environments that attempt to connect the physical and virtual world in an effort to widen the form of children's narrative constructions (e.g., POGO) [8]. Computer-mediated collaboration has been explored in many Internet-based environments (e.g., MOOSE crossing) [2]. While all these research projects have provided valuable insight into the ways in which technology can be used to facilitate storytelling skills, few have resulted in widely accessible products.

In the commercial arena, there are many new technology-based educational toys that tell stories *to* children (e.g., LeapFrog's LeapPad interactive storybook, The Learning Company's Living Books). Computer-mediated toys and environments that allow children to create their own stories can impose rigid and limiting interactions on users that stifle creativity and imagination [8]. These tools (often CD ROM-based) can restrict children's ability to produce collaborative and co-located stories. Many do not even include the means to share stories with other children. Simple draw and paint programs allow creative flexibility, but they do not explicitly provide the means to structure a story either individually or collaboratively.

There is a need for widely available products that support children as the tellers and creators of stories. There is a need for environments that support both free play type storytelling, where the focus is on story creation, and more structured storytelling, where the focus is on sharing the story product. Networked environments allow children to create in conjunction with others, another valuable skill in the storytelling toolkit. They also allow children to share their stories with others. For networked, collaborative environments to push through simple text-based environments of the past, a balance between open-ended interaction and rigid structure must be found. The design of CBC4Kids's StoryBuilder aimed to find this balance.

## DESIGNING STORYBUILDER

The redevelopment of CBC4Kids.ca started with the idea of finding ways to break through mainstream media. We had a core idea – CBC's relationship with children should be all about children. This approach deviates significantly from many other broadcasters' web sites that are predominantly about marketing shows and characters to children. Since the Internet allows for an unparalleled access to children, we wanted to find ways in which children's ideas, energy and voices could power the brand and site content. However, it's very hard to do this in a way that doesn't result in a site with a lot of poor quality child-generated content. As a public broadcaster, the CBC4Kids site must adhere to CBC values of quality, integrity and uniqueness. Our goal was to find ways for children to power CBC4Kids.ca.

The following sections describe the practices we used to arrive at a design for StoryBuilder that would accomplish this goal.

### Practice 1: Getting to Know the Audience

Our methodology incorporated aspects of user-centred and informant-based design in a number of ways. One of the most influential practices occurred during the first (and formative) stage of design. We hired a dedicated user advocate. She and the development team spent a month getting to know children aged 8 to 12 (the audience for CBC4Kids). As not all of our team had worked in this age range before, it was critical for them to get an understanding of the motor, physical, social, emotional, intellectual and cognitive developmental levels and skills of these children [11].

The primary technique we used was contextual field research that exposed the design team to children in children's environments (homes and schools). We conducted five sessions with pairs of children in children's homes and two sessions with groups of children in their classrooms following established guidelines [12]. Prior to the sessions we collected demographic information from caregivers (e.g., age, gender, grade, native language etc). We also recorded details on the children's computer experience, interests, family, living arrangements, daily schedules and activities.

During each home session, the pairs of children did a show and tell about their favourite web sites or computer games. We also showed them several sites we had chosen (e.g., www.tuningtheworld.com, www.flashcan.com). They responded with enthusiasm and a myriad of ideas and thoughts. The observer recorded not only the answers to our questions but also the nature and form of children's interactions as they arrived at answers. In many cases, this anecdotal information was more valuable in helping us get to know our users than specific answers.

The field sessions confirmed many things we already knew and opened our eyes to many things we didn't. As one of our designers said, leaving glassy-eyed from the classroom session, "Wow. They are so little ... and so, so smart."

To supplement this face-to-face field research, the team also did a of variety exercises I've invented over the years. The exercises explore children's toys, TV programs and online sites. Staff also went on "guided reconnaissance" trips to Vancouver's Science World, Aquarium, public library and a suburban mall. They reported to the team their findings. As a team we explored online creative tools, children's literature and children's personal diary practices. As a way of amalgamating all of the information we gathered, each member of the team created (and later critiqued) ten imaginary children (whose pictures and profiles we posted on the walls of our offices). Our user advocate on the team also created a five part profile document and a "day-in-the-life" timeline.

### Practice 2: Involving Children in the Design Process

The idea of involving users in the design process is deeply ingrained in the philosophy of HCI practice and supporting literature [19]. However, the integration of HCI practices into commercial product development cycles is still far from standard. According to a recent environmental scan of the children's interactive media sector, most industry experts agree that almost no product development research is being conducted. The overall percentage of a production budget dedicated to child-informed design practices is often less than 5%[16]. In addition, results from child-focused research or ongoing testing are often only implemented when they do not affect the goals of remaining on time and on budget. This precludes any substantial rethinking or redesign once development is well under way.

This was the environment that the CBC4Kids team was faced with. The challenge was how to include children in a fast-paced, low budget development cycle in ways that would result in informative and usable input and feedback. Participatory design and cooperative inquiry are appropriate design methodologies for the creation of open systems that explore ways in which children interact with and respond to technology [9,10]. They are well suited to product research and the creation of products in environments without stringent, externally imposed constraints. However, these approaches require a long-term commitment and resource load that is not possible in many production environments. In addition, the policy issues connected with having children onsite at CBC and included in ongoing design sessions were daunting.

Alternatively, we turned to the work on informant-based design [20] and child-centred usability testing [12,13] and adapted them to our environment. At its most basic, user-centred usability research adapted for use with children has three basic components. The first part is the analysis of the user in order to understand their skills, knowledge, developmental level and expectations. The second part is the analysis of the user's tasks related to the activity the

product supports. The third is the iterative design of the product based on the understanding of the user and their tasks. We loosely followed this sequence and associated techniques (site visits, paper-prototypes, surveys, expert reviews) as we moved through design and pilot phases.

While this type of child-centred usability research (and testing) was not sufficient to ensure we met children's needs in the design of StoryBuilder, it did ensure they could use what we built. Since children's engagement and enjoyment are closely linked to usability [13], we hoped to give StoryBuilder a fighting chance by finding and redesigning features that comprised critical tasks and with which children consistently had trouble.

In order to supplement our design process we added several techniques from informant-based design. By involving children as informants early on in the concept development stage of design (low-tech prototyping, card-sorting exercises) and facilitating direct face time between our developers and children, we created a proactive pathway for information to flow between ourselves and our audience [20].

During the design phase, our user advocate (aided by alternating team members) conducted 12 weekly sessions with 48 children that mixed information gathering with usability testing as required. We used both one-on-one task-oriented techniques and open explorations of our prototype. These sessions exposed issues and design flaws that were impossible to predict ahead of time. By conducting these sessions early in the development cycle (i.e, well before launch), it was possible to focus on fixing errors deemed critical and thus vastly improve the usability of StoryBuilder. It was also valuable for our design team to see children make assumptions about and use StoryBuilder in ways they had never imagined. More than one of our developers had epiphanies that left them humbled and, by far, better designers!

Once we arrived at the beta stage of development, we hired an external quality assurance firm to thoroughly test our product function, content and usability. Rather than rely on the QA group alone, we conducted two group usability sessions with children (10 per group). The information that came out of these sessions helped us prioritize bugs and fix them. Both the QA team's and children's bugs were entered into an online bug tracking database.

Our user advocate also led a summative evaluation (i.e., post launch) of the entire CBC4Kids.ca pilot project. She used a combination of methods: site statistics over four months, 48 one-on-one sessions with children, an online audience survey with 600 respondents, analysis of page submissions and six reviews by children's media experts.

### Practice 3: Enhancing Storytelling Using Online Technologies

Innovation can be seen as the application of new and existing technologies to existing solutions or activities with the aim of improving performance or in this case enriching experience.

According to McLuhan's tetrad concept [18], every new technology goes through four phases as it is introduced: it enhances something; it obsolesces something; it echoes an earlier technology; and it flips into a new and contradictory form. Our design focused on enhancement and left the rest up to time.

Many successful interactive media products for children share the commonality of mirroring or extending established play or activity patterns [16]. For example, children can use LeapFrog's LeapPad interactive storybook in the same way they would read a traditional book. LeapPad does not require that a child be connected to a computer (which violates the way a child and parent read). In order to look to established patterns and techniques of storytelling, much of early concept development for StoryBuilder involved exploring and brainstorming on non-technology mediated storytelling activities (e.g., activities using props, puppets, theatre techniques, songs). For each, we evaluated the benefit of applying online technology to the activity. The question addressed was: Is there a way that being online and using online tools can extend or make better or richer this activity?

To further this exploration, we collected online information about successful activities on the old CBC4Kids.ca site. One activity, called The Neverending Story, was based on the collaborative creation of online stories. It was based on a face-to-face storytelling activity I've seen many times in classrooms and summer camps. In this activity, an individual (typically an adult) begins a story with one or more words or sentences. The children in the group then continue the story, each adding a word or sentence to the ongoing narrative. In the online Neverending Story activity users could email in the next line in an ongoing story that had been begun by a Canadian author. While this provided national coverage and some interesting stories, the format was limited to text and it was operationally heavy in terms of the time required for editing and moderation. Feedback on the old CBC4Kids.ca had told us that children wanted to submit both text and images to the story sequence. In fact, they expected this and were disappointed without it. From this came the idea to create a rich media, interactive storytelling environment.

### Practice 4: Reusing Existing Applications

In an effort to conserve resources we examined two existing applications in order to determine if they could be used to implement new activities on the CBC4Kids site.

FlashCan is a graphical manipulation tool where users can manipulate preset elements of an e-card and send it to a friend. The recipient can make further modifications and send it back (or to another friend).

The Global Sampler (TuningtheWorld.com) allows users to use the keyboard to combine sounds and images into a

personal movie experience. The application has record, playback, edit, save, email to a friend and publish features.

In our field research and our early informant-based sessions, we observed children exploring these applications. We also asked directed questions about the activities we had in mind. When we introduced the idea of a storytelling activity to a group of children by asking them about their desire for creative tools supporting storytelling and personal narratives, we hit one of the limitations of group information gathering. Our observer recorded: "About a fifth of the boys and two-thirds of the girls responded positively to the idea of having a site that offered them creative exploration tools of writing, designing and animation. It was interesting to note that these kids would nod their heads with clear resolve, well aware of the exposure to being teased by their counterparts, at the same time, not overtly showing acknowledgement through a raised hand." We found the one-on-one sessions where pairs of children explored FlashCan and the Global Sampler more useful (as expected).

Based on children's input and our observations, we completely rethought our match between activities and existing applications. By marrying an offline storytelling activity with an existing online graphical manipulation tool, we conceptualized the beginning of a comix-style, collaborative, online environment that was later named StoryBuilder by children.

### Practice 5: Adapting Existing Styles

In order to determine a style for StoryBuilder we looked to existing narrative techniques and styles. The term "comix-style" refers to the style and visual representation of a story as commonly seen in comic books or the cartoon section of a local newspaper [17]. Comix refers to the mechanism of telling a story through the use of sequential frames containing backgrounds, characters, objects, thought and speech bubbles, and text boxes that represent the narrator's voice. It does not necessarily imply a comic-style illustration as seen in DC and Marvel comics (e.g., Superman, Batman, Spiderman). We tested our concept of adapting a comix-style structure on our informants.

We found that a comix-style storytelling environment was well suited to digital, collaborative storytelling for 8 to 10 years olds for several reasons. First, the conventions used in comic books are well known to most children. While boys may be more familiar with comic books per se, most girls have been exposed to comic strips and understand the basic conventions of comix-style storytelling. An interactive story building tool based on an online comix-style environment will be accessible, tangible and familiar to most children. There are no large conceptual hurtles to overcome. The ability to scan the story-to-date by clicking through previous frames mimics an existing reading pattern. This helps structure the story by enabling the user to see what has been done up to a given point.

Second, a comix-style environment is age and gender appropriate for 8 to 10 year olds. Stories are about a series of events that have taken place in a particular order and involve particular people. A story is composed of details of those events narrated in a particular order (not necessarily the same order as they actually took place) and told from one or more points of view (commonly including a narrator). At about 7 years old, children are able to speak and write not only the voice of their characters, but also the voice of the narrator [1]. The comix-style cartoon allows children to tell their stories using any combination of the voices of their characters and narrators. In addition, the comic style appeals to girls and to boys who might not otherwise be interested in storytelling.

Third, a comix-style environment allows for the flexibility to create both plot-driven and character-driven stories. Comix-style stories utilize sequential frames to represent the story's events. The narrative can be driven by the characters through their thoughts and speech and by the narrator(s). While comix style techniques have traditionally been used to represent plot-driven stories, they are also well suited to depict character development. The representation of both thoughts and spoken words allows children to explore both inner and outer worlds.

## STORYBUILDER

### Overview

StoryBuilder (www.cbc4kids.ca) (as shown in Figure 1) is an online, comix-style rendition of the add-a-sentence-to-a-story activity that allows groups of children to participate in multimedia story creation. Using StoryBuilder, children can create multimedia comix-style stories. They can then save stories to their online personal space (KidSpace), submit them to CBC4Kids for publication in the ongoing story, or email them to friends as a story chain. A guest illustrator begins each story by creating a series of mutable backgrounds, objects, characters and animations. Children can also submit the graphical elements for the next story.

### Interface

The interface uses simple symbols to control page sequences and graphical manipulations (Figure 2). The symbols and their functions were user-tested with children as part of critical task analysis. Icons consistent with other computer applications (e.g., MS Windows O/S) were used for save, submit, email and delete functions. A pop-up help screen was available, although children seldom used it.

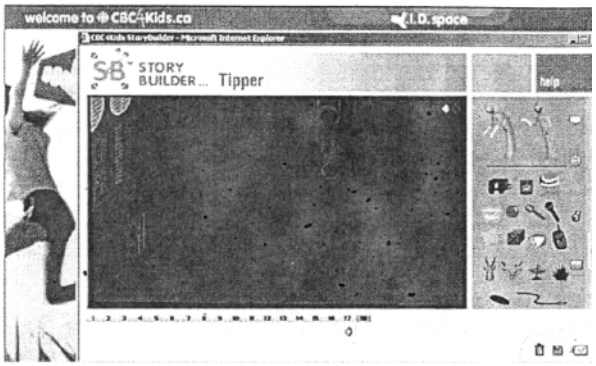


Figure 1. Interface for creating a new page

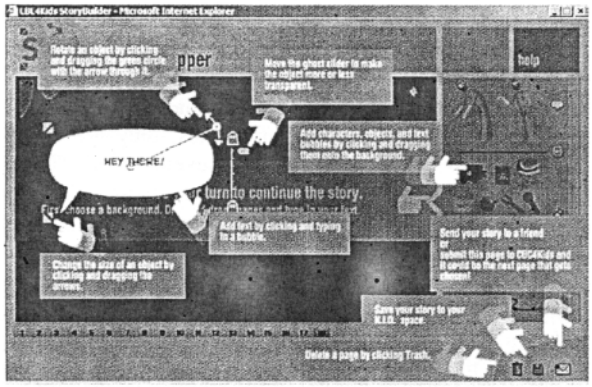


Figure 2. Help interface showing major symbols and icons

Familiar terms such as "page" were used based on user-testing.

To add a new page to an existing story, a child uses arrow keys to review the previous frames of the story. This formed one of our critical tasks and by beta, our testers zipped through the task without problems. One surprise came from our summative one-on-one sessions where we observed that children often read the entire sequence (as many as 15 pages) without being prompted. A child can create a new page in the story by selecting and manipulating the frame layouts, backgrounds, objects, characters and animations. They can add text to their creation by using thought and speech bubbles and narrative boxes. Object manipulation includes: horizontal, vertical and diagonal resizing, relocation, desaturation (e.g., use ghost slider to make a fish in water more transparent than a fish on dry land) and rotation. Although using pre-existing elements has been harshly criticized for limiting a child's imagination [8], we opted to use graphical content created by young Canadian visual artists. We worked closely with illustrators to ensure the content was original, wacky and deep enough to allow for varied story constructions. Review of child-generated content on other sites (e.g., www.pbskids.org, www.backyardjungle.org) and observations of children's online drawing from focus groups led us to believe that preset content would best serve our purposes. Our summative evaluation bore this out. Children liked the preset elements and many were happy not to have to draw or create their own.

### Interaction Modes

Using StoryBuilder, children can participate in story building in one of three primary modes. The first mode was the original concept for StoryBuilder. As a result of our observations of children's diverse needs and our informants' expectations we added in two exploratory modes.

In the first and most structured mode, children can participate in the posted story by creating their version of the next page in the ongoing story and submitting it to CBC. During the pilot, page submissions were evaluated using an online submission management tool (developed as part of the project to reduce moderation time). The tool allowed submitted pages to be viewed, selected for consideration, deleted and posted. Figure 3 shows an example of a typical moderated and posted page. Based on feedback from children (online survey), we posted a new page in the story three times a week.

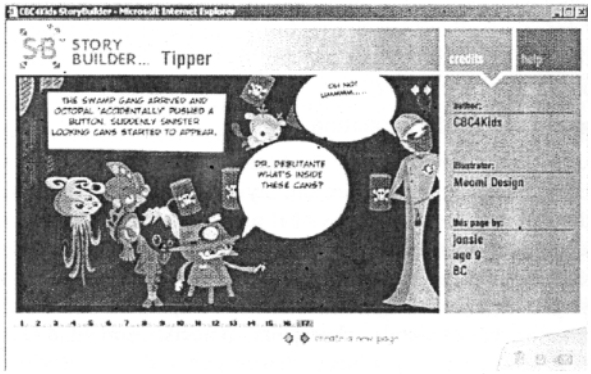


Figure 3. Example of a moderated story page

In the second mode, children can create story sequences themselves (from scratch but using pre-existing elements). If they register and login to CBC4Kids, creations can be saved to their personal online KidSpace folder or emailed to a friend. They can also store and restart a work in progress through KidSpace (Figure 4).

In the third mode, by using the email to a friend function, children can initiate and contribute page by page to an ongoing story that they have created with their friends. StoryBuilder allows a child to edit pages received and to add pages before emailing the story onwards to the same or another friend.

By allowing children the flexibility to participate individually or collaboratively, in structured or exploratory modes, we hoped to take a step towards meeting their diverse needs and expectations.

Figure 4. CBC4Kids KidSpace

### Technical Environment

To support a brand about children, the new CBC4Kids.ca used a model of interaction that is customizable (by each child), structured and highly interactive. The main CBC4Kids site maintains and manages a personal space for each registered user. Separate flash-based web sites are used to implement new activities. Preferences and output from each activity are passed back to the main site to allow for an integrated experience. This extensible architecture allows for the distribution of content sources, development teams and hosting situations. StoryBuilder was one of three activities we created using this interactive model. We implemented the three activities according to a set of application program interface (API) standards we developed in-house. This allowed us to integrate three separate web sites transparently into the main CBC4Kids site. Development tools included HTML and Flash MX integrated into a Windows NT Cold Fusion/SQL database environment. This overall approach to CBC4Kids.ca was challenging to implement but provided a seamless integration of the different activities found on CBC4Kids.ca.

## RESULTS

A complete discussion of all of the results of our child-centred design practices is beyond the scope of this paper. However, key results in four areas that either steered the course of our design or are relevant for further research are discussed below.

### Concept

During the early concept stage, we used field research to observe how children responded to several existing activities. We considered adapting CBC Radio 3's Global Sampler into a story telling activity. We also considered using FlashCan.com e-cards on the CBC4Kids site. Our observations of children using these two activities led us to change our direction dramatically. We ruled out the Global Sampler early on because children didn't respond well to the idea of using the keyboard to combine images and sounds as a means of storytelling. My observation of two girls making up stories about the FlashCan characters (as they giggled and manipulated the graphical elements) led us to the idea of adapting FlashCan for story-telling.

In our original StoryBuilder concept, we imagined that children would submit several pages to add to the ongoing story. During early prototype testing, we found that children expected to only add one page at a time. While we thought that this would not be engaging enough nor provide enough "room" to explore the next segment of a story, children surprised us. They wanted to spend their time on perfecting their one page, rather than making several pages. The average time on task for a single page was upwards of ten minutes. This led us to simplify the story submission process by limiting it to one page per submission.

### Interface

Usability testing of critical tasks was implemented as the interface was being developed. One task chain involved children using the navigation elements to construct and submit a story segment. While we found few problems with the navigational elements, the usability testing did reveal other barriers to usage. We found that at a screen resolution of 800 x 600 pixels both the bottom and right side navigation bars disappeared leaving no clues that the bars were there. We also found that children did not understand the concept of frames within story pages. Lack of understanding about how frames worked affected other tasks such as page deletion (i.e., delete meant delete page not frame) and selection of backgrounds (e.g., a two frame background meant two pages not two frames per page). In the final version, we simplified the design so that a page was treated as a single entity, regardless of how many frames it contained.

### Interaction Mode

Email to a friend is an important viral marketing tool and was included in all the CBC4Kids activities. During an informant session, two girls brought up the idea of emailing the story back and forth to each other (rather than submitting a page to CBC for consideration as the next page in the story). We deemed this functionality to be important enough to add it part way through the development cycle as a third mode of interaction. However, due to time constraints we did not highlight it or provide adequate instructions on how to use it. Not surprisingly, in the summative evaluation we found that many children didn't realize they could create a story collaboratively with their friends. In hindsight, this is probably the most appealing aspect of StoryBuilder and warrants not only further development but further research into its use.

The analysis of page submissions during the summative evaluation showed that the story segments created were

quite different from stories created using pen and paper. Pen and paper stories created by children in this age group are often lengthy and do not often contain stimulating or different ideas [7]. The story segments created using StoryBuilder, while often short, contained a large variation in representations of time, space and narrative logic. This theme warrants further research.

### Technical

The integration of StoryBuilder into CBC4Kids' KidSpace proved difficult both technically and from a usability point of view. Although three rounds of usability testing simplified the log in process (e.g., as a result of children's feedback we added more back-out points and changed labeling), children were still resistant to the added burden of having to sign up and log in. As a solution, we modified the design so that children were only prompted to log in once they had reached a submission point. This allowed children to use the StoryBuilder environment to experiment and create stories without logging in. The technical implementation of this functionality required some major changes to the application program interface that connects StoryBuilder to the CBC4Kids backend system and to the code within the StoryBuilder flash program. Our design decision paid off as summative usage data showed us that of the thousands of children that spent time on StoryBuilder each week, only 100 or so submitted the next page to the story (each week). Again, this data begs more research into what exactly children were doing with StoryBuilder if not creating stories to be submitted into the ongoing story chain.

## PRACTICAL GUIDELINES

Based on the observations and experiences gathered during the design phase, some of the practices we applied can be generalized to the design of interactive media products for children.

Having a dedicated user advocate and involving our team directly with children up front and through the ongoing sessions was invaluable. The combination of visits into children's home and school, emersion in children's media, customized homework and reconnaissance assignments, allowed our team to enter children's worlds. The level of sophistication of today's children and their media habits was startling to all of the team members.

Using techniques from informant-based design combined with general practices from user-centred design allowed us to involve children when and where they could be most valuable. We also found that some information enthusiastically put forward by our informants was either out of context or unfeasible due to our resource constraints and timelines. Overall, the combination of proactive and reactive techniques provided the team with confirmation of what they had learned earlier as well as marvelous discoveries of things they did not know. The following are some quotes from the team after informant and usability sessions.

"We don't think like 9-10 year olds. You have to be there to hear the insights that come out of nowhere. They think out-of-the-box."

"I need to see to believe. It's not as convincing when someone else tells me what it's like or what's not working."

"Kids as individuals ... expected but still startling."

We also learned that despite our efforts, lots of good information came too late in the process to be implemented. This is one of the drawbacks of a fast prototype development cycle. We recorded insights for future design cycles.

Looking to various storytelling techniques helped us to keep children's storytelling patterns and behaviors in mind we as designed. Exposing the team to non-computer mediated storytelling and story creation also helped the team brainstorm about appropriate and innovative applications of online technology to storytelling.

By observing our child informants exploring existing applications, we quickly learned what worked and what didn't. We decided to adapt the graphical object manipulation functionality of FlashCan into a storytelling environment. By reusing an existing graphical manipulation tool, we were able to focus on the story creation aspect of the environment (rather than object manipulation component).

Implementing existing comix-style conventions limited the scope of creativity but also made StoryBuilder quickly accessible to almost all of our testers and provided a familiar structure for distributed storytelling.

## CONCLUSION

This paper describes a case study of the design of an online storytelling environment for children. It outlines a combination of child-centred and team-based practices that can be used to enhance the design of interactive activities for children. Our results reinforce the importance of HCI practices and show that they can be incorporated into the type of aggressive schedule commonly found in commercial development environments.

During development and the pilot phases, 95 children provided feedback on all aspects of the project: brand, values, interactivity, usability, technical robustness and fun factor. We spent time in children's worlds early on. We used a combination of informant-based and critical task usability techniques when and where they could have the most impact. When we could not have direct access to children we tried to fill our minds and offices with artifacts that would keep us close to our target audience. While we could not be as rigorous in our implementation of HCI techniques as we might have liked, we received much

valuable direction from our children. Based on their feedback we changed (and re-tested) everything from our early concepts to minor button labels. We learned that children are ruthless evaluators and we thanked them for it. These children were also our ambassadors. The results of the summative sessions were overwhelmingly positive, indicating that the new site hit home with children. Of course, there's always room for improvement and we collected much information that can be used to set the direction for future research and development.

The Internet allowed children unparalleled access to the StoryBuilder environment. In the four months of our pilot it received over 150,000 visits and 2200 page submissions. Our summative evaluation showed that the combination of wacky content, flexible manipulation of objects and simple comix-style story construction with an online environment that supports both shoulder-to-shoulder and online collaboration was a winner. Our peers also recognized our innovation in design and technical implementation with a Flash Forward nomination. By designing this project with kids and in a publicly supported environment, StoryBuilder provided children with a widely accessible avenue for the acquisition and development of critical childhood skills.

In terms of our original goal, StoryBuilder supported CBC's mandate by providing an environment where thousands of children created stories. Unlike informal story building applications designed to encourage free creativity, StoryBuilder provided a balance between creative, interactive story building and a more formal, structured approach to creating stories. It can be seen as a precursor to a child's entrance into a more formal world of publishing and creating content for public viewing. In this it has a different kind of educational value from environments that are more open-ended and exploratory in nature. That said many children used StoryBuilder for their own individual explorations of narrative and art.

The future of this project at CBC is undetermined at this time. I hope to carry on threads of this research in my ongoing industry-based and academic work.


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