Criteria for Children's Web Portals: A Comparison of Two Studies

Critères de conception de portails Web pour enfants : une comparaison de deux études

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Abstract: The article compares the findings from two design studies that investigated design criteria for children's Web portals. In the first study, conducted in 2000, four focus groups, comprising students aged 10 to 13 years evaluated four children's portals (Ask Jeeves for Kids; KidsClick!; Lycos Zone; and Yahooligans!). In the second study, conducted in 2003, an intergenerational team—including students aged 11 and 12 years and three of the authors—designed, over 13 sessions, a prototype children's Web portal. The verbatim discussions from the first study and the verbatim discussions, exit interviews, portal drawings, and prototype portal from the second study are analysed to identify portal design criteria under the following broad categories: *portal objectives*, *visual design*, *information architecture*, *personalization*, *interactivity*, and *multilingualism*. In many instances, the findings from the first study were confirmed by the second study. Divergences between the two studies, when they did occur, were explained by the time lapse between the studies—students in the second study had been exposed longer to the Web—and by methodological differences that gave students in the second study more scope to discuss design and formulate criteria. Overall, both studies confirmed the capability of young Web users to analyse Web portals intended for children and offer insights for improving them.

Résumé : Cet article compare les résultats de deux études qui exploraient les critères de conception de portails Web pour enfants. Lors de la première étude, effectuée en 2000, quatre groupes de discussion comprenant des élèves âgés de 10 à 13 ans ont évalué quatre portails pour enfants (Ask Jeeves for Kids, KidsClick!, Lycos Zone et Yahooligans!). Dans la deuxième étude, réalisée en 2003, une équipe intergénérationnelle incluant des élèves âgés de 11 et 12 ans et trois des auteurs ont conçu à partir de 13 sessions, un prototype de portail Web pour enfants. Le compte-rendu des discussions de la première étude, de même que le compte-rendu des discussions, les entrevues de conclusion, les esquisses du por-

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tail et le prototype du portail de la deuxième étude sont analysés pour identifier les critères de conception de portail selon les grandes catégories suivantes : objectifs du portail, conception visuelle, architecture de l'information, personnalisation, interactivité et multilinguisme. Plusieurs aspects des résultats obtenus lors de la première recherche sont confirmés par la deuxième étude. Les divergences entre les deux études, lorsque c'est le cas, sont expliquées par le laps de temps survenu entre les deux études, les élèves de la deuxième étude ayant été confrontés au Web pendant une plus longue période, et par les différences méthodologiques qui donnaient aux élèves une plus grande possibilité de discuter de la conception et de formuler des critères. Dans l'ensemble, les deux études confirment la capacité des jeunes utilisateurs du Web à analyser les portails Web conçus pour les enfants et offrent des éclaircissements sur leur amélioration.

Background

With the widespread accessibility of the Web in Canadian elementary schools, more and more children are seeking to exploit this information resource. At the same time, previous studies have indicated that they encounter obstacles when searching for information (e.g., Schacter, Chung, and Dorr 1998; Hirsh 1999; Large and Beheshti 2000). In particular, several studies have demonstrated the difficulty that these students experience in using general portals such as Google (http://www.google.com) and Yahoo (http://www.yahoo.com) and their marked reluctance to use Web portals specifically designed for them, such as Ask Jeeves for Kids (http://www.ajkids.com) or Yahooligans! (http://www.yahooligans.com) (Large, Beheshti, and Moukdad 1999; Large, Beheshti, and Rahman 2002; Bilal 2000; 2001; 2002a).

This article presents the views expressed in 2003 by a group of Grade 6 elementary school students (aged 11 years), concerning the features and facilities desirable in a Web portal to be used for finding information in support of school projects. Although the primary objective of the group was to design, within an intergenerational team (also including adults), a prototype Web portal for conducting research on Canadian history, in undertaking this task, the students both critiqued existing Web portals and suggested their own design ideas for the prototype. This was accomplished both verbally and through a series of individual drawings. A detailed discussion of the actual design process and the prototype itself can be found in Large et al. (forthcoming). In this article, the views of the design team students are compared with those gathered by the authors in 2000 from four focus groups, comprising students in Grades 5 through 7

(but mainly from 6) who evaluated four existing children's Web portals as a means to elaborating portal design criteria (Large, Beheshti, and Rahman, 2002). Similarities as well as differences between the two research studies are discussed and conclusions formulated on the design of Web portals for elementary school students.

Related research

Hanna, Risden, and Alexander (1997) are critical of researchers who assume that because they were once children or because they have children at home, they can evaluate the usability of a product for children better than the children themselves. They believe that "[t]he benefits to be gained from gathering data from children as users are unquestionable ... No amount of adult evaluation will find all the issues that children will stumble into as a matter of course" (14). They argue that children in the 11 to 14 years' age group are very easy to involve in usability testing; most will be comfortable with computers and with unfamiliar adults and will enjoy carrying out activities. Agosto (2002) also urges that young users (she herself worked with female students in Grades 9 and 10) should be consulted by designers in order to build better Web sites with increased youth appeal.

Microsoft has devoted considerable attention to developing methodologies for usability testing with children. Hanna, Risden, Czerwinski, and Alexander (1999) believe that usability research has identified ease of use as a critical factor in engagement that "as such is key to every child's product if it is to be a success" (4). In their study, focus groups were employed to assist both in the analysis of users and the analysis of tasks as a precursor to the design of one or more models of a children's Web portal.

Druin (1999) worked with a group of children, rather than individual children, and advocated participant observation by an adult interactor who would talk naturally to the children, becoming a part of the active experience. She found that without an interactor (that is, where children were simply observed using a software product), the children being observed felt uncomfortable, as if they were on a stage; while if the interactor took notes, the children felt uncomfortable and distracted. We followed her recommended technique in our focus group study (see below).

Bilal (2000; 2001; 2002a) investigated how Grade 7 students interacted with a children's Web portal, Yahooligans! In three task-based studies, she

asked children to find information using the portal. She offers a number of suggestions to portal designers based on her findings: They should "develop search engines with powerful searching and browsing mechanisms that buil[d] on children's cognitive and physical behaviors to search, browse, navigate and explore information" (Bilal 2000, 662). She proposes more search and browse instructions and examples, as well as context-sensitive help and an on-line tutorial, a natural-language interface, output ranking, simple screen displays, and spellchecking.

Haycock, Dober, and Edwards (2003) evaluated 31 Web portals intended for use by children aged 9 to 14. They relied upon an evaluation checklist developed by themselves, supplemented by "criteria already generally established by teachers and librarians" (15). Each portal also was "evaluated by a team of young people from the target audience" (16), but it is not clear whether this evaluation was done individually or as a group. The authors offer detailed evaluations of the portals, but neither they nor their young collaborators developed their own designs.

In her most recent work, Druin (2002) employed intergenerational teams to design and create children's information technologies. As part of her cooperative inquiry process, she employed a combination of techniques from various participative design methodologies to partner professional designers with child users. Currently (Druin et al. 2003), she is applying cooperative inquiry to design and construct a digital library for young people: the International Children's Digital Library (http://www.icdlbooks.org).

Bilal is investigating how Grade 7 students in middle school might design Web search engine interfaces (Bilal 2002b; 2003). She describes her approach as participatory design, with the participants as full design partners, but unlike Druin (1999; 2002), Bilal does not herself participate in the design process, and the 11 Grade 7 children worked individually, rather than as a design team. In the first stage of the study, Bilal (2002b; 2003) had her participants each draw an interface on paper and on the verso list the purposes of the interface. After a short break, the students used a commercial children's Web portal, Yahooligans! to search for information. They then discussed what they liked and disliked about it and noted the features they would want to add to their original drawings. Bilal interviewed the students individually to discover their rationale for adding these features. She then repeated the same procedure with KidsClick (http://sunsite.berkeley.edu/KidsClick!), another children's Web portal. Bilal (2002b) concludes that "children are able to design screen layouts,

dictate the features they need, and describe how [*sic*] these features should look like" (213). She strongly recommends that designers of children's search engines not only ensure that their engines are "cool" but that they also offer high usability.

Focus group study

Using a modified version of contextual inquiry, we applied a focus group approach to critique existing children's Web portals (Large, Beheshti, and Rahman, 2002). The groups concentrated on the screen design and organization, navigability, and usability of four different existing children's Web portals. In 2000, four focus groups were established, involving 23 students aged between 10 years and 13 years: 12 girls and 11 boys. They were divided into four single-sex focus groups (three with 6 students and one with 5 students), in accordance with published guidelines for running focus groups comprising young people. The students in two of the groups lived in a middle-class suburb of Montreal; a third group was drawn from a middle-class downtown Montreal area, and the fourth group from a small town close to Montreal. The students were all volunteers who had prior experience using Web portals, but none had used portals specifically designed for children. Each group met for approximately one hour, three in the home of one of the children in that group and a fourth at the working place of the mother of one group member. Each group session was attended by a trained moderator and an assistant who took notes. The sessions were audiotaped.

The objective of each focus group was to evaluate four portals designed for children—Ask Jeeves for Kids, KidsClick, Lycos Zone (http://www.lycoszone.com) and Yahooligans!—in terms of first impressions, likes, dislikes, and suggestions for improvement. This was done by using the portals to answer four questions selected from a homework-help Web site. An analysis of these evaluations led to the identification of design criteria for a portal intended to support elementary school students looking for information in support of school projects. For the most part, our results are consistent with Bilal's findings (reported above) concerning children's likes and dislikes about existing children's Web portals. They liked some entertainment on a portal but only so long as it did not distract from the primary, information-finding objective. They appreciated imaginative graphics, animation, and attention-grabbing colours. They wanted quick and direct access to information and short, but meaningful, descriptions of retrieved pages. Neither Help nor Spellchecking was included on their list

of desirable portal features. Finally, portal personalization was appreciated and seen as a way of coping with age and gender differences among users, as well as with individual preferences. We concluded from the focus group studies that children are very capable of evaluating portals and making constructive suggestions as to how they might be improved to facilitate children's information seeking. Further details on this study can be found in Large, Beheshti, and Rahman (2002).

Intergenerational design team study

Using Druin's (1999) cooperative inquiry design theory as our framework and building upon our earlier focus group study, in 2003 we established an intergenerational design team further to explore Web portal design. The design team research took place at an elementary school located in a predominantly English-speaking, middle-class suburb of Montreal. The school's curriculum is that of a French immersion program. In this case, Kindergarten to Grade 2 classes are taught predominately in French; in Grades 3 through 6, half the day is spent in English and half in French.

The eight students on the intergenerational team were randomly selected from the two Grade 6 classes out of those who had volunteered to participate and had received parental permission to do so. Our only criterion for selection was that we wanted equal numbers of boys and girls (in the case of the design team, we followed Druin's example by including children of both sexes in the one team). At the beginning of the project, in January 2003, the oldest student was 12 years and two months and the youngest 11 years and eight months. They all had some level of Web experience, ranging from a minimum of two years to a maximum of six years (by their own estimations). They had used almost exclusively, however, two Web portals—Google and MSN (http://www.msn.com)—and none of them had ever used a Web portal specifically designed for children. The design team also included three adult researchers.

The sessions were held in the art room during the lunch break of 70 minutes' duration. This room was equipped with a high-speed Internet line to which we connected our own laptop computer with a 16-inch screen, detachable keyboard, and wireless mouse, all of which facilitated individual use by the team members when seated around a table. The sessions were held twice weekly for a total of 13 sessions. A typical session involved some or all of the following: discussion of the features and facilities of existing Web portals, brainstorming about Web portal design, individual

drawing of portals, and consensus building. The following portals were viewed on-line and discussed by the team: Alfy (http://www.alfy.com), Alta Vista (http://www.altavista.com), Ask Jeeves (http://www.askjeeves.com), Ask Jeeves for Kids (http://www.ajkids.com/), Fact Monster (http://www.factmonster.com), Google (http://google.com), IPL KidSpace (http://www.ipl.org/div/kidspace), KidsClick (sunsite.berkeley.edu/KidsClick!), Lycos Zone (http://www.keralaonline.com/funzone/design.htm), MSN (www.msn.com), Yahoo (www.yahoo.com), and Yahooligans! (yahooligans.yahoo.com).

A questionnaire was completed by the student team members near the end of the sessions to elicit their opinions on the entire process. Judging by their responses, all the students were positive about the experience and said that they would recommend that their friends volunteer for a similar team. A further indicator of their enthusiasm and commitment to the process was the high attendance level during the sessions. The only time any student missed a session, this was due to illness or previously scheduled appointments.

During the sessions data were collected using the following techniques: audio-tapes of the discussions for all sessions, detailed field notes (taken by one of the adults during each session), the students' drawings, the final prototype design, and exit interviews with all the student team members.

One source of information about the students' views on Web portals is the actual prototype portal that the intergenerational team designed; the home page is shown in Figure 1. Reflecting its specific task—to help elementary school students find information about Canadian history—it is called "History Trek: A Canadian History Site" and has for its design motif the Canadian flag. It relies heavily upon the colours of this flag (red and white), although the site title is in blue. The portal mascot, Willy the Web Wonder (that also has the job of soliciting help), is based on a maple leaf, and indeed, maple leaves constitute the background pattern for this screen. Searching for information can be undertaken in several different ways: key words or natural language (question search); alphabetic index; subject directory; and scrolling time-line. Hyperlinks to alternative portals are provided. Interactivity is offered through e-mail and chat facilities. The portal includes a trivia quiz on Canadian history. The team explored the possibility of a 3-D interface to complement this conventional interface, which would be accessed from the "Go Virtual" button on the toolbar (although such a 3-D interface was not designed). Finally, the interface

can be personalized via the "My Site" icon, and its language switched between English and French (using the left-hand button on the toolbar).

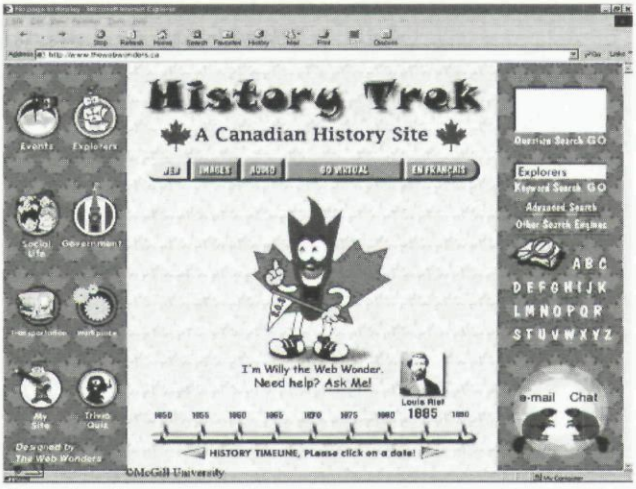

Figure 1— Prototype web portal homepage

Comparison of focus group and intergenerational team portal design criteria

The following comparison of the design criteria that emerged respectively from the four focus groups and from the intergenerational team has been assembled into six major categories. Four of these categories—goals (or objectives), visual design, information architecture, and personalization—were established by us to analyse the data collected in the focus group study (Large, Beheshti, and Rahman, 2002). Two additional categories have been employed to analyse data provided by the intergenerational team that were not relevant to the earlier study: interactivity and multilingualism. None of the four portals evaluated by the focus groups included either interactivity (for example, e-mail and chat) or multilingual translation features, and the students in the focus groups, unlike those in the intergenerational team, did not raise these topics in their discussions.

Portal objectives

A portal can have three possible objectives—to provide information, to provide education, or to provide entertainment—although any one portal can aspire to more than one of these objectives (Rosenfeld and Morville, 1998). While the objective of an entertainment portal is to provide leisure

and fun and the objective of an educational portal is to promote learning, the objective of an information portal, as its name suggests, is to retrieve information; this information might be used to support leisure activities, but in the context of our studies, it has been to support school-based projects and assignments. As Large, Beheshti, and Cole (2002) point out, "[E]ducation places objective facts and events inside a learning context that has an objective structure (i.e., determined outside the user). Information, on the other hand, comprises objective facts and events that are placed within a subjective structure constructed by the individual user (the user's knowledge structure) for some kind of intended use" (p. 3).

Both the focus groups and the design team had the task of elaborating design criteria for an information portal but were asked to comment upon the extent to which they thought this might be furthered by the incorporation of entertainment elements as well. In the focus group study, the children were divided on this question. Although some of them considered that entertainment could offer a welcome temporary diversion from the search for information, others believed that an entertainment option could distract students from the information task at hand. The students in the design team strongly upheld the latter view. They rejected the idea of including games or other such diversionary activities; the furthest they were prepared to go in this respect was a quiz, but even here, one which would be directly related to the portal's informational objective—in their case, a quiz on Canadian history. It is interesting to note, in this respect, that one of the design team drawings includes a person actually asking the (student) user whether his/her homework is completed (see Figure 2). The inference is that users' attention should be focused firmly upon the task in hand.

Visual design

Because the primary objective of the design team was to develop a prototype Web portal, much of the conversation concentrated on aspects of visual design. At the outset of the design process, the students had been very enthusiastic about using Google and MSN to find information. As a team, we looked at many examples on the Web of children's portals, including all four portals that had been considered by the focus groups in 2000. The focus group students had wanted to see lots of colour in both the background and foreground, interesting graphics, and the use of animation. They also appreciated dramatic and eye-catching designs and characterized more conservative designs as "boring." In contrast, the student design team members were more conservative and critical of such

features. They were concerned about the distraction factor here. It must be conceded, though, that in practice their final prototype does reflect a preference for some animation and/or graphics, but not to the extent found in portals such as Yahooligans! which had been praised in the focus groups. The home page of the design team's prototype is shown in Figure 1, and although colour cannot be represented here, it is obvious that the design differs from the likes of Google or MSN.

Figure 2—Drawing from design team member

Portal name

The focus group and the design team were in complete agreement about the importance of the portal's name. It should convey the purpose of the portal to its target audience and, ideally, also be fun; as one design team member put it, "The name has to be cool." The design team had to choose a name for its portal prototype and achieving a consensus on this proved to be one of the most difficult tasks confronting the team, as each student had a different conception of what exactly constituted "cool" (the chosen name, as can be seen in Figure 1, was "History Trek," reflecting the prototype's purpose of finding information on Canadian history).

Colour

Despite the design team student members' initial enthusiasm for Google, like the focus group members, they were attracted by the use of colour in an interface. The children in both studies liked bright colours that immediately caught the user's attention but did not necessarily agree on which colours to apply. However, the design team members were less enthralled by gaudy displays and did not share the focus groups' dislike of white for the background. In both the focus groups and the design team consensus, building on colour combinations was facilitated by the decision to allow interface personalization by which colours might be changed to suit individual user preferences (see below).

Font

We had been surprised, in the case of the focus group students, that they commented at all on the various fonts employed by the four children's portals they were evaluating, especially requesting that fonts be large enough to be read easily. We had not anticipated that young users would notice, let alone have any opinions on, a detail such as font selection. The students in the design team, however, reinforced the focus groups' opinions: They were even more concerned with font selection, although in their case, it was from an aesthetic rather than a visibility perspective. They went on to suggest that font selection should be included in the list of interface characteristics that might be personalized by users.

Graphics

In both studies, the students were favourably disposed to the use of graphic devices in the interface, but in the case of the design team only if they contributed in some way to the overall visual design; graphics for their own sake were not popular. For example, the design team chose two beavers facing each other as if in conversation to represent e-mail and chat facilities in its portal prototype (see Figure 1). The use of cartoon-like figures in several children's portals viewed on the Web, however, invoked disapproval from the team, either because they were considered "childish" or because they were at odds with children's sense of rightness; for example, when viewing the Alfy mascot skateboarding, one design team member commented that he was not wearing a helmet. Cartoons also were seen as being potentially distracting from the portal's objective of finding information (see above under "Portal Objectives"). The focus group, in contrast, only criticized portals in terms of their having insufficient graphics. There was no mention made about the nature of the graphics, regardless of whether or not the animation had any purposeful role to play in the interface.

Animation

As with colour and graphics, the design team was less enthusiastic about animation than the focus groups. The latter seemed to think that the more animation, the better the interface. The design team members were much more parsimonious in their servings of animation. The prototype has only one animation (although it will appear in various sizes on all the interface pages), the portal mascot, which is shaped like a maple leaf holding a flag marked "SOS"; the flagpole will move from left to right and back. The children were quite explicit that they did not want gratuitous animation—the flag waving is intended to draw attention to the mascot's role in representing the portal's help facilities. Their aversion to animation, as with graphics, was a desire to minimize unnecessary distraction from the portal's primary information-finding task. As with graphics, the focus groups' only criticism was that the portals did not contain enough animation.

Icons

We found, with the focus groups, that the children interpreted icons very literally. For example, when shown an icon of a TV set, with the label "Entertainment," they believed that it should only refer to television and not to other aspects of entertainment. The design team engaged in a less literal interpretation of icons. For example, in one of their drawings, the icon of a chessboard is used to represent the generic category "Games" (see Figure 3).

Characterization

Both groups liked the idea of a mascot, as long as they considered it appropriate for their age group and believed that it had a meaningful role to play in the interface. For example, both the focus groups and the design team found the Jeeves character in the Ask Jeeves for Kids portal confusing because none of them understood the relevance of the butler character. They had no idea who he was or what he represented (a manservant who could solve all of his master's many problems). The focus groups were not adverse to the idea of a character as a mascot but offered other suggestions, such as a young boy or a dog, to occupy this role. The design team members chose a mascot for their prototype portal which was very much in character with the overall portal design—a personified maple leaf—with the role of activating help throughout the layers of the portal. This was consistent also with the focus groups' request that any character be used throughout the entire portal rather than appearing only on the home page.

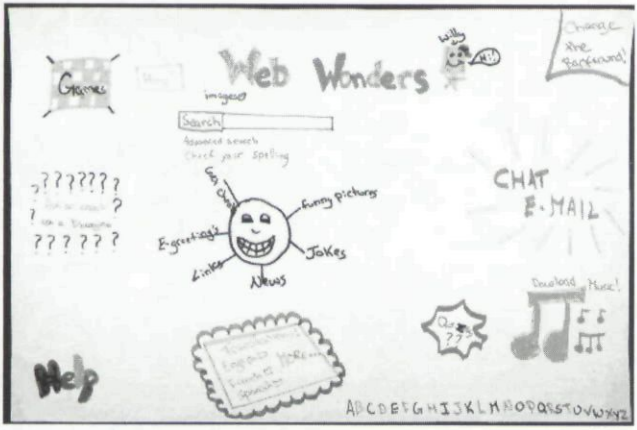

Figure 3—Drawing froma design team member

Vocabulary

The focus groups had little to say regarding vocabulary, although there was agreement that it should be suitable for the target age group. The design team provided concrete examples of this need to employ appropriate vocabulary. For example, although the students were keen to incorporate the concept of interface personalization, they were unfamiliar with this term; finally, they decided upon "My Site," as the best representation that six of them could agree on.

Layout

Both the focus groups and the design team were in agreement that a clear layout is important to ensure that individual features can readily be identified in the interface. For example, one member of the design team indicated that the help button on the MSN portal is too small. Another student suggested that the button should be coloured red to increase its prominence. A third student reported that he had never before noticed the help feature in Google, even though, when it was actually viewed, he thought that "it show[ed] a lot of stuff." The prototype design reflects the students' desire to avoid giving undue prominence to any one of the five searching techniques, and although the interface provides many features, its layout avoids clutter. Another feature classed as useful by the design team members was the repetition of the key word and question search boxes, as well as the subject directory, on the results display screen (see Figure 4). This obviates the need for users to return to the home page each time they wish to initiate a search. One of the team members went

further, in her endorsement of the Ask Jeeves for Kids' toolbar that is displayed at the top of all Web pages (listed as results) visited by the user.

Advertisements

The focus group members were unanimous in their dislike of advertisements in children's portals. The design team members were more qualified in their comments. Although they had a strong aversion to "pop-up" advertisements, they were not so troubled by less obtrusive forms of advertising.

Information architecture

Rosenfeld (2000, p. 21) defines information architecture as "the art and science of structuring and organizing information environments to help people achieve their goals." As such, it is central to any discussion of Web portal design. Both the focus groups and design team members devoted a considerable proportion of their time to discussing information architecture issues.

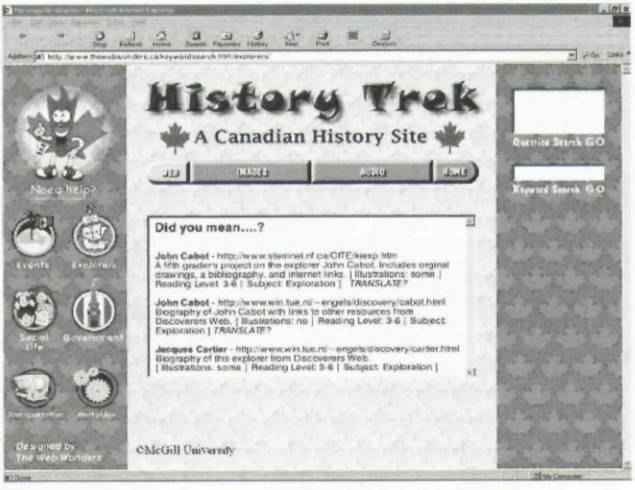

Figure 4—Prototype web portal results display screen

Directness

Whether in the focus groups or the design team, these young students exhibited impatience with finding information; ideally, they wanted to "get in and get out" with as little delay as possible. For this reason, the focus group members disliked the Ask Jeeves for Kids' method of querying

their search terms with a question back to them. The design team members shared this predilection: As one of them said, "[I]f I put in 'llama' I don't want to be asked if I meant 'alpaca.'" They also had little tolerance for depth in hierarchical directories that necessitated their navigating through multiple levels. More on this will be said later, under "Subject Categories."

Key word versus natural-language searching

The focus group members expressed a preference for key word searching over natural-language searching and did not appear to encounter difficulties in selecting key words. At first glance, the design team members appear to have taken a different view, since they included in their prototype both key word and natural-language search features. However, despite their desire to offer users both options, there was no doubt about their own preferences: In practice they shared the focus group members' enthusiasm for key word searching over natural-language searching. At the outset of the sessions, none of the design team members had tried an advanced search option on any portal. However, by the second set of drawings, one student had already included an advanced search, offering Boolean combinations (see Figure 5, where the advanced search is on the left of the screen and the simple search on the right). This idea gained general acceptance, and the prototype portal itself includes an advanced search option.

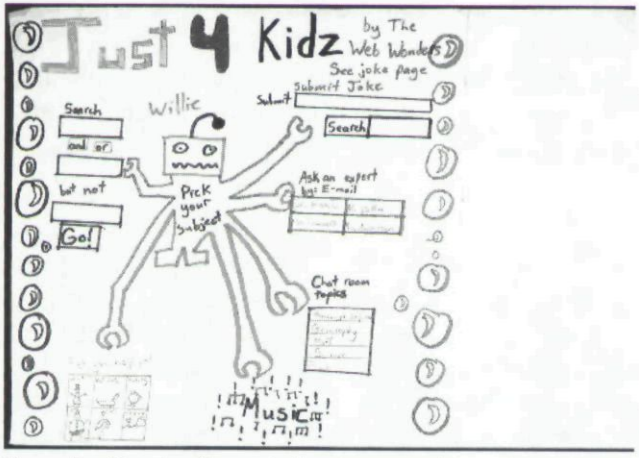

Figure 5—Drawing froma design team member

Subject categories

In the focus groups, subject categories were popular. Indeed, Ask Jeeves for Kids was criticized for its omission of categories. However, this support for subject categories requires qualification. Categories were appreciated only when they mirrored the way that students themselves would represent their own information needs. That is to say, a subject directory was useful if it provided direct access to the subjects currently under study in the students' curriculum. The students had little patience with a structure that required them to navigate multiple hierarchical levels to reach the desired information or with a subject categorization that was at odds with their own.

In the case of the design team, it is interesting to review their first representations of a Web portal's home page. Of the seven students present in the session, three included a subject directory, but their categories were so broad as to cast doubt on their understanding of how such a directory works. For example, one shows a directory featuring five topics: Animals, Sports, Famous People, History, and "Everything"! As with the focus groups, there is little doubt that their preference was for key word searching, rather than subject directories.

In the focus groups, most of the participants liked the ability to click on a letter to search for a concept, and the authors recommended that this feature should be offered alongside a search box and formal categories. The design team members were at least as enthusiastic about alphabetical subject searching, once they had been introduced to it. In their first drawing, only two included this feature, but once they had seen an example of it in KidsClick, in their second drawing, seven out of eight students provided this option. The prototype also incorporates alphabetical subject searching.

Metasearch links

In the focus groups, only the two boys' groups preferred to have links to other search engines included in a portal. The design team's desire to include search links was considerably stronger. Despite the fact that a link to a search engine such as Google or MSN on their own prototype portal would lead users away from it, there was unanimity within the team that such should links be incorporated.

Results display

The focus group students enumerated three criteria to be applied to displaying retrieved information: the number of hits per page (between 10 and 20), the title and summary of the pages (short and informative), and homonym categorization—for example "tigers" the animal should be differentiated from "Tigers" the baseball team. The design team confirmed these criteria and went further, suggesting that search terms should be highlighted within the results display. The design team favoured a restricted number of hits displayed at any one time but with an option to look at more. They appreciated the reading-level display for hits on KidsClick, but at least one of them thought that "it [took] too long to read" the descriptions. One suggestion to address this was to include icons alongside the descriptions that would instantly identify the subject. Because of the students' concerns about response time degradation, however, this idea was abandoned. One student in the design team suggested an area on the screen that would show sites already visited as a kind of search history, but this idea was not taken up by the team as a whole or incorporated into the prototype.

The focus groups did not have the opportunity, in the four children's portals they used, to see visual display techniques. The members of the design team, however, were introduced to two portals that employed visualization: Web Brain (http://www.webbrain.com) and PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi). In neither case did they express any enthusiasm for this technique, claiming that "it looks really adult" and "it has too much that you don't need." It would be unwise to conclude from these negative reactions, however, that visualization has no merit in a children's portal. The students found it difficult to separate design from content; the fact that these two portals presented complex concepts and complex relationships among concepts may have influenced negatively the children's appreciation of the underlying design approach.

On-screen help

The focus groups did not raise the issue of on-line help. In contrast, all but one of the students in the design team believed that help facilities in a portal are important for children, but they all agreed that none of the portals they had examined—whether adult or children—offered satisfactory on-screen help. In many cases, they considered that the links/icons leading to help were confusing; for example, they did not think that the term "search tools," used by KidsClick, would suggest to a user that help was

being offered: "[N]o-one would go to 'search tools' because they don't know what it is ... it's hidden."

They also wanted the specific kind of help that would enable them to turn a failed search into a successful search, help that took the form, for example, of alternative key words or subject categories rather than merely generalized searching tips. If generalized searching tips were to be given, however, at least they should be done in a child-friendly fashion; one boy suggested, for example, that help be given through a movie that showed someone searching (rather like the technique used in some computer games). The members of the design team criticized the help features available from several children's portals. For example, they stated that help on Yahooligans! did not offer anything useful and had "nothing on searching." Lycos Zone suggested search terms but did not offer to implement alternatives automatically. The students believed that children would not understand what was meant by KidsClick's "search tools" or IPL KidSpace's "searching tools," and as a result, would likely ignore them. According to one student, "Help should not be made too complicated." Their stress on the importance of good help is reflected in their own design. Figure 6 shows the History Trek help screen. It comprises four help components: an explanation of how the site works, information about the design team (the 'Web Wonders'), an opportunity to contact a subject expert, and finally, the most important element for them, "Help with my search," which they intend should do exactly that—offer specific guidance on the search in hand.

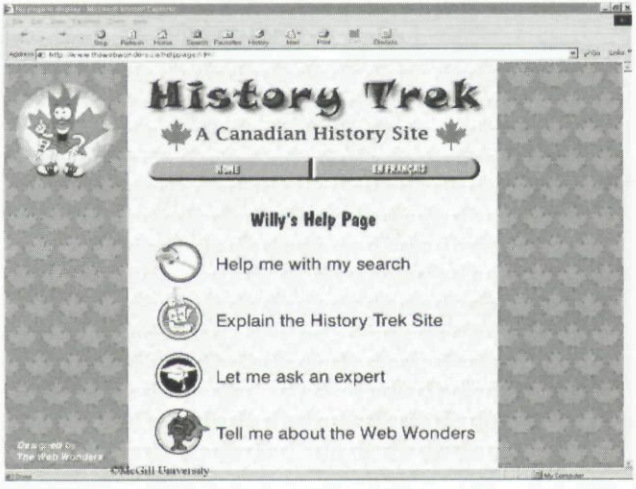

Figure 6—Prototype web portal help screen

Spellchecking

The students in the focus groups encountered relatively few problems when entering key words or sentences—this may have been because they worked as a group and one student's mistake could be corrected by another. The students in the design team, in contrast, were very conscious both of elementary school students' spelling shortcomings and of the problems that could result from these mistakes. They insisted that their prototype include some form of spellchecking. Ideally, they wanted the portal to correct their spelling automatically and find what they wanted, without any intermediate steps. When it was pointed out by the adults on the team that, in practice, this is extremely difficult to achieve, they opted for a fallback position: The portal would respond to a misspelling by presenting them with an array of alternatives, prefaced by "Did you mean ...?"

Personalization

The issue of personalization was not discussed explicitly in the focus groups. The differences in opinion among the students, particularly regarding colour schemes, led the researchers, however, to suggest personalization as a useful addition to children's portals. The design team considered personalization more carefully, again seeing it very much as a way of achieving consensus on colour but also seeing it as a way of addressing font and design issues. For example, they proposed that the user should be able to change the appearance of the portal mascot.

Interactivity

The four children's portals critiqued by the focus groups did not include interactive elements, such as e-mail or chat, and none of the students suggested the need for such features. Initially, none of the students in the design team proposed their inclusion either, and indeed, the students were sceptical when presented with the idea. They were well informed both from school and from home about the potential personal harm that could result from such interactivity. After some discussion, however, they could appreciate the value of interchanging information and ideas with fellow students, teachers, librarians, and other subject experts. Even then, though, they only consented to include e-mail and chat on their own prototype if security provisions, such as access authentication, could be implemented.

The other element of interactivity in the prototype portal is the trivia quiz. The students were happy to include such an interactive quiz, but only so long as it played an educational role and was relevant to the portal's objective (in this case, Canadian history).

Multilingualism

Only the design team members raised the issue of multilingualism as a component within the portal. This took two forms: interface conversion and results translation. All the students wanted the option of converting the interface, at a minimum, from English into French and vice versa, and several students suggested a longer list of language possibilities, with Spanish being the most popular. As for the results display, ideally, they wanted machine translation from English into French and French into English. One student also suggested the inclusion of chat rooms in different languages.

Discussion

The broad objective of the focus group study and the design team study was to identify design criteria for children's Web portals. Earlier studies have shown that children rarely or never employ existing portals that have been designed specifically for their age group (Bilal 2000; 2002b). Rather, they turn to "adult" portals. Indeed, none of the 31 children involved in our focus groups and design team had ever used a children's portal on the Web. How, if at all, might such portals be designed to make them attractive, as well as effective for children to use in seeking information? Both the focus groups and the design team shed light on this question, but to what extent did their ideas coincide? Three major factors differentiated the two studies: the methodology, the date on which the studies were conducted, and the students themselves. In the light of these differences, any agreement on design criteria between the two studies strengthens the reliability of the findings from either one of the studies taken individually. It is also illuminating to explore the reasons for any divergence between the findings of the two studies.

A Web portal can have more than one objective. The primary focus of our research, in both studies, was an information portal in an educational context. Existing children's portals typically incorporate entertainment features, such as animation, games, jokes, polls, and so on, alongside their information retrieval capabilities. We found a large measure of agreement between both studies that Web portals should specialize, and that one

intended for finding information should not simultaneously incorporate entertainment features that are likely to distract users from their primary task. Kuntz (2000), from the perspective of a professional children's portal designer (KidsClick), has also emphasized the potential conflict between design attractiveness and user distraction.

Despite the fact that they are unenthusiastic about the efficacy of entertainment features in an information portal, when it came to designing a children's portal, the students opted for a very different approach from that to be found in "adult" portals such as Google, with its rather utilitarian interface design, incorporating no frills of any kind. In both the studies, the participants were in favour of bright colours, graphics, and animation. However, an important difference can be noted between the two studies. The design team students were more conservative than the focus groups in their appraisal of such design techniques, mainly because they feared their ability to distract (but also because of a concern that response times would be degraded, particularly in the case of animation). An examination of their portal (see Figure 1) shows how focused it is upon one objective—finding information. The only exception might be considered the quiz, but even it has an educational objective. We hypothesize that, in the three years separating the design team task from the focus group task, children have become more blasé about graphics and animation, due to their much greater and more prolonged exposure to them.

In other visual design respects, there was a large measure of agreement between the two studies on what was important: the portal's name, the selection of fonts, characterization through the use of a mascot (as long as the mascot had a well-defined purpose and was not simply used as a decoration on the opening page), and a clear lay-out. Personalization would appear to be a good way to deal with individual differences in opinion on such matters as colour schemes, mascot characterization, and fonts. In regards to advertising, the design team was less hostile, except in the case of pop-up advertisements. This could be accounted for by their greater familiarity with the Web and its ubiquitous use of advertising. In order to irritate the design team students, the advertisements had to be literally "in your face."

The students in the design team study confirmed the findings from the students in the focus group study concerning elementary students' desire to retrieve relevant information with the least possible effort and time. A portal must support efficient information retrieval for the school student as much as for the business executive. Indeed, this is a major explanation

for the students' unwillingness to mix play with work on a portal. The preferred way to find information is by key word searching. This takes precedence over the use of complete sentence queries, although whether this is because of a preference for the brevity of key words or because of bad experiences on Web portals with natural-language searches (especially when employed with a search engine that is designed to receive only key words) remains unclear. The focus groups showed little familiarity with advanced searching techniques, such as key word combinations using Boolean operators. The design team favoured the inclusion of such advanced search features alongside a simple search, but this was probably explained by methodological differences between the two studies. The design team was able to devote approximately 15 hours, over 13 sessions, to viewing, discussing, and designing (on paper) portals, during which time, its members had an opportunity to appreciate the virtues of more sophisticated search algorithms (initially, only one or two of the students were aware of their existence). The focus groups, restricted to just one hour's use and discussion of portals, never had an opportunity to explore their potential for improving search precision.

Students are happy to use subject categories rather than key word or natural-language searches to find information, but only under two conditions: The categories should lead as directly as possible to the information sought, rather than involving repeated choices among options in a deep hierarchical structure; and the selection of the correct categories should be straightforward and unambiguous. In practice, this means that the subject categories must be synchronized with the students' task. In the case of the portal prototype designed in our second study, the students were able to identify appropriate categories because not only is the portal being designed specifically for Grade 6 students, but it is also intended for finding information on one specific topic—Canadian history. When faced with a portal whose subject categories are intended to encompass the entire universe of knowledge, children are much less likely to appreciate subject categories as a simpler entry point than key words. The cognitive effort required to select the correct subject at each hierarchical level is likely to prove more demanding than thinking of key words, and probably will lead to poorer results. Alphabetic searching on subjects avoids the problem of hierarchies and was popular with students, but again its efficacy depends upon the extent to which it provides direct access to the kinds of information being sought by students.

Only one of the focus groups—that including the slightly older boys—thought of including links from the children's portal to other portals; they realized that the indexing coverage of the Web varied from portal to portal and that information that one portal missed, another might find. The design-team study students, as a whole, were more aware of this reality and strongly supported the idea of such links. This may well be accounted for by the greater familiarity with the Web of students in 2003, compared with those in 2000.

In terms of displaying retrieved results, there was agreement: It should be possible quickly and easily to identify relevant items from short and informative descriptions written in child-friendly language. As Kafai and Bates (1997) pointed out, sometimes titles and descriptions returned by portals can be misleading and difficult for elementary school students to evaluate. Homonyms created problems in retrieval for the students in both studies, and they would like to tackle this problem if possible by categorizing results by each homonym's individual definitions.

Previous investigations of children's information-seeking behaviour have demonstrated a marked reluctance on the part of these users to avail themselves of any help facilities on a portal (Large, Beheshti, and Moukdad, 1999; Large and Beheshti, 2000). The focus groups also ignored on-line help. The design team study sheds light on why users who encounter problems in finding information do not request help from the portal. They told us that in their various experiences with help features on portals or other technologies too often they were provided with general information rather than a targeted answer to their specific problem. It became clear as we worked with them on their designs that they were very open to the concept of help so long as it really did help them surmount their problem. This often meant that any help should automatically modify their search strategy or provide an alternative key word. Spellchecking was universally popular and might seem an obvious thing to include on a children's portal. Unfortunately, the level of misspellings likely to be encountered might prove a daunting challenge for any spellchecking algorithm.

In contrast to their limited knowledge of non-technical matters such as plagiarism, authority, and evaluation of sources, the design team students were very savvy regarding on-line security. This reflects the importance attached to it by their teachers and parents, who had obviously devoted time to in-depth discussion of this topic. Although they appreciated the educational role that both e-mail and chat could play, in their minds, this had to be very much subordinated to personal security issues.

Children, as opposed to adults, often are characterized as active and busy learners with a preference for hands-on experiences rather than passive information absorption. In some respects, the students on the design team contradicted this characterization. Their focused attention on finding information as quickly as possible, with the least distraction possible, speaks to their reluctance to devote time to discovery and knowledge-building activities. It is true that, when working in the design team, the students were not seeking information to support class assignments, and that their self-generated queries were employed as no more than a means to try out various existing Web portals. It might, then, be argued that they had little incentive or even opportunity to spend a long time on a search. Yet, they told us very clearly, as had the students in the earlier focus groups, that even when they were searching for information for school assignments, they preferred to be as efficient as possible. At the same time, their preference for interactive feedback from help facilities and their acceptance of the positive roles that e-mail and chat can play (despite a realization of their potentially harmful effects) suggest that any reluctance about interactivity should not be exaggerated. The role that interactivity might play in a Web portal for Grade 6 students, designed with an informational objective, and the most effective means to fulfil that role, merit further research.

All the children in both studies lived in and around Montreal and, between home and school, operated in at least English and French. In this particular environment, it is perhaps more unusual that the students in the focus groups did not comment on language than that the students in the design team did. At any rate, the design team attached considerable importance to language aspects of the portal. In particular, they thought it essential that users should be able to function via the interface either in English or French and that any results retrieved by the portal should be translated, if the user so wished, from one language to the other. It is difficult to know to what extent children in other environments would be sensitive to language issues.

The focus groups were intended primarily to gather opinions about four specific children's portals in order to elucidate design criteria for such portals. This method inevitably focused attention upon the individual strengths and weaknesses of these portals as perceived by the focus groups and proved successful in highlighting those weaknesses and strengths. It was likely to be less successful at eliciting suggestions for new ideas to incorporate into the portals, although the students were asked to suggest

what they liked and did come up with some ideas, such as the grouping of displayed search results according to the different meanings assigned to the key words used (homonym categorization). The design team not only looked critically at many examples of Web portals but also had the primary objective of designing from scratch a portal to incorporate whatever ideas they were capable of generating. The sessions also were used by the adults on the team to introduce more complex explanations about how elements of a Web portal work. This gave the design team students a sounder basis upon which to construct their design ideas and provided more scope for invention and innovation. Nevertheless, the design team students found it difficult to conceptualize abstract ideas in the absence of concrete examples. For example, attempts to expose them to new interface designs only worked when the examples shown them were suitable for children. Showing them, for example, portals such as WebBrain or PubMed had little effect because the students could not separate the adult information content from the interface structure and therefore could not see how that same structural design might be made to work with children's information.

Nielsen (2002), in his work with children and usability, commented on the keen awareness that children have about their age relative to that of children even slightly younger or older than themselves. Both our studies support this observation. In the focus groups, it was especially apparent among the group containing students who were slightly older than the average age across the four groups. These students often commented that a particular feature might be suitable for "younger kids" but less so for them. The design team also, on a number of occasions, expressed similar views. For example, the Alfy portal, with its bright colours and cartoonish presentations, was immediately dismissed by these Grade 6 students as being too "kiddy."

Conclusion

The purpose of this article has been to compare two studies to identify design criteria for children's Web portals, undertaken by the authors, with a separation interval of three years. An analysis of the students' recommendations from the two studies reveals a marked degree of agreement concerning many design criteria. The fact that two different methodologies have generated such similarities lends greater credence to the conclusions drawn in each study. Furthermore, neither study produced findings that were flatly contradicted by the other. The findings from the two studies diverged in two respects. Firstly, some points were raised in one study but

not mentioned at all in the other. In all cases, it was the focus groups that omitted to mention these points. In our opinion, the explanation for this lies in the fact that the design team experience was much longer and more intensive, giving the students much greater opportunities to consider the widest range of portal-design criteria. The design team also, ultimately, had the opportunity to produce its own prototype design. The focus groups, in contrast, met only once rather than 13 times and, in any case, very much concentrated on the critique of four existing children's portals. An example of such omissions would be on-line help and multilingualism; neither was discussed in the focus groups. Secondly, there were instances when the two studies placed different degrees of emphasis on particular points. Examples are provided by the reaction of the students to the use of animation and advertising. The design team was more restrained in its approach to animation and less hostile to the inclusion of advertising than were the focus groups. There are two possible explanations for such differences in emphasis. One is the same explanation as given for omissions: one methodology gave the students (the design team) more time to explore issues in depth and this may have led them to a more considered opinion. A more likely explanation, however, is the shift in collective student experience with the Web between when the focus groups were conducted (2000) and when the design team that met (2003). The design team students were that much more familiar with the Web environment, both at school and at home.

One obvious difference between the focus group study and the design team study was the active presence in the latter of adults as well as students. Did this have an influence on the outcomes? Our involvement as fellow team members and information professionals certainly helped the design team students to become better informed about Web portals, enabling them to go beyond passive evaluation of portals to the design of their own portal. But the design principles elaborated by the design team do not appear to have been unduly affected by the adult presence.

Both these studies concur on one important point: Children as young as elementary school level are capable of critiquing information technologies such as Web portals in order to produce more effective information search tools for their own use. Each of the two methodologies employed in the studies has its role to play in illuminating design criteria, and the focus group and design team approaches are best viewed as being complementary, rather than rival, methodologies. The focus group approach proved very successful in evaluating existing portals, and the four sessions could

be completed relatively quickly and easily once the student volunteers had been assembled. For us, it also was a necessary first step to prove that children really could give valuable feedback on portal design. The design team approach, although requiring much more time and effort on our part, as well as involving fewer children, gave us the opportunity to work more intimately with the students and to move from evaluation to actual design. We intend once again to create focus groups to evaluate the prototype portal designed by the Grade 6 team (as well as one also designed by a Grade 3 team) alongside the two children's portals that were most highly rated by the original focus groups (Lycos Zone and Yahooligans!). By working alongside these users, we believe that adults can gain an insight into children's thinking that is an invaluable prerequisite for effective Web portal design and thus for improved information seeking in our elementary schools.

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