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Children as Web portal designers: Where do we start?

Abstract: This paper emerged from a research question concerning the most effective way to introduce children to the role of web portal designer. One approach would be for the team critically to evaluate a variety of existing children's and/or adult web portals to gain ideas before commencing the design process proper. An alternative would be to begin the design process without such a critical evaluation. To resolve this issue, two exploratory studies were undertaken with children between the ages of 10 and 12. In the first study two researchers demonstrated and described the features and functions of seven well-known web portals to a group of four children, who were invited to critique them. In the second study the same two researchers conducted an initial brainstorming session with a group of three different children, discussing the various components and features of web portals, but not actually looking at existing portals. In both studies the children were then asked individually to draw on paper the kind of portal they thought would be helpful to their peers when searching the web for information to complete a class project. The paper presents both the paper designs and a summary of the child-designers' ideas. In both studies the children were able to produce preliminary portal designs. In the second study, however, the children elaborated several novel ideas that are not found in web portals. The studies strongly suggest that children can produce web portal preliminary designs without the need to view exemplars, and that these designs may prove more imaginative (and possibly more effective) than those produced after viewing such exemplars. More generally, they provide further evidence on children's reactions to and opinions about web portals that will help web portal designers.

Résumé: Cet article résulte d'une question de recherche concernant le moyen le plus efficace pour introduire les enfants au rôle de concepteur de portail Web. Une première approche consisterait pour une équipe d'évaluer d'un œil critique une variété de portails Web conçus pour des enfants et des adultes et existant déjà, afin d'obtenir certaines idées avant de commencer la conception proprement dite. Une alternative serait de commencer la conception sans procéder à cette évaluation critique. Pour résoudre ce dilemme, deux études exploratoires ont été entreprises avec des enfants âgés entre 10 et 12 ans. Lors de la première étude, deux chercheurs ont démontré et décrit les caractéristiques et les fonctions de sept portails Web connus à un groupe de quatre enfants qui furent conviés à en faire la critique. Dans la seconde étude, deux chercheurs ont conduit une séance de remue-méninges avec un groupe de trois enfants, en analysant les diverses composantes et caractéristiques des portails Web, sans toutefois examiner des portails déjà existants. Dans le cas des deux études, les enfants furent ensuite invités de façon individuelle à mettre sur papier le type de portail qui serait le plus adapté à leurs camarades de classe lors d'une recherche d'information sur le Web dans le cadre d'un projet scolaire. Cet article présente à la fois la conception papier de ces portails et un résumé des principales idées des enfants-concepteurs. Dans le cas des deux études, les enfants furent capables de concevoir un schéma préliminaire de portail. Cependant, lors de la seconde étude, les enfants furent en mesure d'élaborer de nombreuses idées originales, introuvables dans les portails Web examinés. Les études suggèrent fortement que les enfants peuvent concevoir des modèles préliminaires de portails Web sans examiner auparavant des exemples précis et que ces plans sont probablement plus imaginatifs (et sans doute plus efficaces) que ceux produits à la suite de l'examen d'autres portails. De façon générale, ces schémas, en démontrant davantage les réactions et les opinions des enfants au sujet des portails, aideront beaucoup plus les concepteurs de portails Web.

1. INTRODUCTION

A growing body of evidence is accumulating that children from a young age make use of the Internet for leisure activities but also to support schoolwork. In the US, a Pew (2002) survey conducted in July 2002 reports that 60 per cent of children under 18 go online. The UCLA Center for Communication Policy, based in the Anderson Graduate School of Management, surveyed more than 2000 US households and found that around 64 per cent of students were using the Internet in school (Cole et al, 2001). The *Infoplease Almanac* (2000), quoting National Center for Educational Statistics for 2000, says that 97 per cent of US public elementary schools have Internet connections. In Canada, a nationwide investigation found that 99 per cent of Canadian students aged nine to 17 had used the Internet at some point, and 48 per cent said they used it from home at least one hour every day (Environics Research Group, 2000). Furthermore, 63 per cent reported using the Internet at least once per month to do homework, and 32 per cent at least once per week.

Despite the confidence with which they seem to search and browse the Web, however, there is also a considerable body of research to suggest that students in elementary and middle school, at any rate, encounter real problems in information seeking (Bilal, 2000, 2001, 2002a; Hirsh, 1999; Kafai & Bates, 1997; Large, Beheshti & Moukdad, 1999; Large & Beheshti, 2000, Wallace et al, 2000). One possible way to ameliorate this situation is to design portals that are better suited to the information-seeking behavior of younger web users. Several portals are available on the Web whose target audience is youngsters between the ages of around five to 12 years old. However, it would seem that this audience all too often opts for "adult" portals and avails itself little of portals intended for young users such as Ask Jeeves for Kids, Kids Click, Lycos Zone and Yahooligans (Bilal, 2002b, Large, Beheshti & Rahman, 2002).

In earlier research we had demonstrated that students around the age of 12 could evaluate critically children's web portals and make suggestions for their improvements (Large, Beheshti & Rahman, 2002). We decided to build upon this foundation by engaging children directly in the design process itself – by creating an inter-generational design team involving students from a grade-six elementary school as well as ourselves to design a web portal. Perhaps a portal designed by children would be more popular with their peers than those designed for them primarily by adults.

2. CHILDREN AND USABILITY

The involvement of adults as users at various stages of software design is hardly revolutionary, but until the 1990s it was very uncommon for children to be consulted in the design of software intended for them. Adults considered that children were too unsophisticated to be involved in the design process, and in any case many adults thought they could speak for children, based either on memories of their own younger years or on observations of their own children. Now, however, a growing band of usability experts is incorporating children into the design process. The degree of involvement varies, but researchers such as Druin in the Human-Computer Interaction Lab at the University of Maryland are working closely with children in software design (Druin, 1999, 2002; Druin et al, 1999).

Bilal (2002b) has already made interesting advances in her study of school students as web portal designers. She worked in June 2001 with 11 middle school children in grade seven. These students were asked to draw on paper the opening screen of a web portal. Then they used Yahooligans! to find information on a topic of interest, and wrote down the features from it that they would like to add to their own drawing. This process was repeated after looking at another children's web portal, Kids Click.

Our approach draws upon several usability theories, but most obviously upon Cooperative Inquiry. It employs a combination of techniques from different design methodologies that have proven useful when working with children. It is grounded in HCI research and theories of cooperative design involving a multidisciplinary partnership with children, field research, and iterative low-tech and high-tech prototyping. A truly cooperative approach, Cooperative Inquiry treats children as full design partners—equals to the professional adult designers on the team. Professional designers and users (children) of the technology are partnered in inter-generational design teams with the understanding that full participation of users requires training and active cooperation. Druin, (1999, p. 593) describes the purpose behind Contextual Inquiry as an attempt to capture the complexity and somewhat "messy" real-life world of the workplace. She believes that children and adults can work together in small groups, brainstorming about what is wrong with the existing "technologies." Gradually the children become comfortable working as critics, designers and inventors (Druin, et al., 1999).

3. THE CONTEXT

The goal of our research project was to design a web portal working together with a team of students drawn from a grade-six class. Session by session we would construct the portal, following a modified schema based upon 51 design characteristics identified by Large, Beheshti and Cole (2002). However, from the outset we were beset by a major dilemma. How should we begin this process?

One approach was to begin by showing the young designers examples of existing web portals. In a sense this was re-visiting the successful methodology employed in our earlier focus groups where the young participants had used and then critiqued a number of portals (Large, Beheshti & Rahman, 2002). By first looking at portals the team members would have a starting point to begin their own design activities. Such an approach, however, risked a major pitfall: we were concerned that the students would be overly influenced by existing models and would not then be able to give free reign to their own ideas (the purpose of the exercise).

The alternative was to begin without such a preliminary viewing of existing portals. The potential problem here was that the students then would be unable to commence their design activities; they would lack any sound basis on which to commence. We were reasonably confident that most, and perhaps all, our design team students, who were either 11 or 12 years' old would have prior experience of searching for information on the Web, but would this be enough? After much discussion amongst ourselves we decided to undertake two exploratory

studies with the hope that they would help us resolve this issue. This paper reports the results of these studies.

4. METHODOLOGY

Our intention was to involve students in the two exploratory studies who were similar in age and background to those who would participate later in the actual portal design team. All seven students lived in the same general area of the city as the school in which we would work with the design team, but none actually attended that school. Details on the students are provided in Table 1. The students were all volunteers.

All four students in Study One had previously used the Web, but not extensively, both at home and school. They were familiar with MSN and Google only. The three students in Study Two also had limited experience of the Web and had used Ask Jeeves, Google and HotBot as well as one children's portal – Yahooligans!

Study	Student	Gender	School grade	Age
1	R	F	5	10
1	O	F	7	12
1	C	F	7	12
1	T	M	6	11
2	A	F	7	12
2	E	F	7	12
2	K	F	6	11

Table 1: The seven students involved in Exploratory Study One and Two

Both Studies were conducted in the home of one researcher, where a high-speed Internet connection was available. Each study took approximately two hours to complete. Three of the researchers were present for Study One, and all four for Study Two.

4.1 Procedure: Study One

After a brief overview by one researcher of a typical portal's components and features, seven web portals consecutively were viewed online and discussed. The selected portals comprised the four children's versions used in our earlier focus group research (Large, Beheshti & Rahman, 2002) – Ask Jeeves for Kids, Kids Click, Lycos Zone and Yahooligans! – and the "adult" versions of three of them – Ask Jeeves, Lycos and Yahoo (Kids Click has no adult equivalent). The adult portals were examined first, followed by the children's. The following topics were covered:

- Finding information – keyword search, directory, alphabetic topic search
- Spell checking
- Displaying search hits
- Help features
- Email and chat
- Icons and navigation

- Color and fonts
- Interactivity
- Personalization

The students then were invited to draw the kind of portal they thought would be most useful to help their peers find information to support class assignments and homework. The drawings were made on white paper (11" x 17") using colored pencils and markers.

4.2 Procedure: Study Two

The session began with a discussion about web portals in the context of seeking information for a class project. Unlike in Study One, in this Study no portals were viewed online. Instead, the three students talked in some detail about portals they had used previously – Google, HotBot, Ask Jeeves and Yahooligans! In particular, they were asked about their likes and dislikes regarding web portals, and what they would like to see in a "perfect" portal. Finally, as in Study One, the students drew their own portal on paper.

5. STUDY ONE PORTAL DRAWINGS

Four portal drawings were produced in Study One. Their characteristics are summarized in Table 2. Although they are not included in Table 2, all drawings were colourful and used different "fonts" to good effect. Space limitations allow here the reproduction of just two drawings: one by a grade-six boy – student T in Table 2 (Figure 1) and the other by a grade-seven girl – student O in Table 2 (Figure 2). These were selected because they incorporate the greatest number of portal features.

Characteristic	T	O	C	R
Keyword search	x			x
Directory	x	x	x	x
Alphabetic search				
Spellcheck				
Help	x			
Email	x			
Chat		x		
Images	x	x	x	x
Personalization				
Language selection				
Adverts				

Table 2: Portal Characteristics, Exploratory Group One

As Table 2 indicates, only two characteristics were common to all four portal drawings: the provision of a directory search capability, and the use of images in the interface. Only two drawings provided a keyword search feature, and neither offered spell checking. None offered the option to search alphabetically on the first letter of a word. One drawing included help and email, and one other had chat facilities. The opportunity to personalize a portal interface, or to

change the language of the interface were provided by none of the drawings. Nor did anyone choose to include advertisements.

None of the four students in Study One paid attention to our instruction that they focus attention upon a portal intended primarily to support class projects. Instead they chose entertainment themes: for example, America's Fun Land: For Kids Only (Figure 1) deals primarily with music, but also provides access to information on animals, sports and news, among other topics; Welcome to Music Mania: Music mania for teens and Children (Figure 2), despite its name, also covers news, fashion and dance as well as music itself.

The designer of America's Fun Land provides several information searching approaches: a keyword search box placed in center screen, a series of icons on the right-hand side of the screen, and two directories on the left and center of the screen. In this respect it resembles a conventional portal. Nevertheless, Welcome to Music Mania is not easily associated with the portals initially viewed by the students in Study One. It employs a number of search buttons scattered around the screen (such as "Want totally cool dance moves made easy? We can help! Click here") as well as a directory with entries for News, Games, Jokes and Music clips. Interestingly, it does not include a keyword search box per se. Instead, the designer has located in center screen a box labeled "Need help finding the info you need? Click here for info". It is unclear as to what she intended would happen when a user followed this instruction. Both portals have included fun activities such as jokes or music clips. America's Fun Land includes a Help facility as well as email; Welcome to Music Mania offers a chat feature.

Although the monochrome reproductions here do not reveal them, both portals make full use of color as well as various font types and sizes as well as images. Overall, the portals do suggest young users as their target audience.

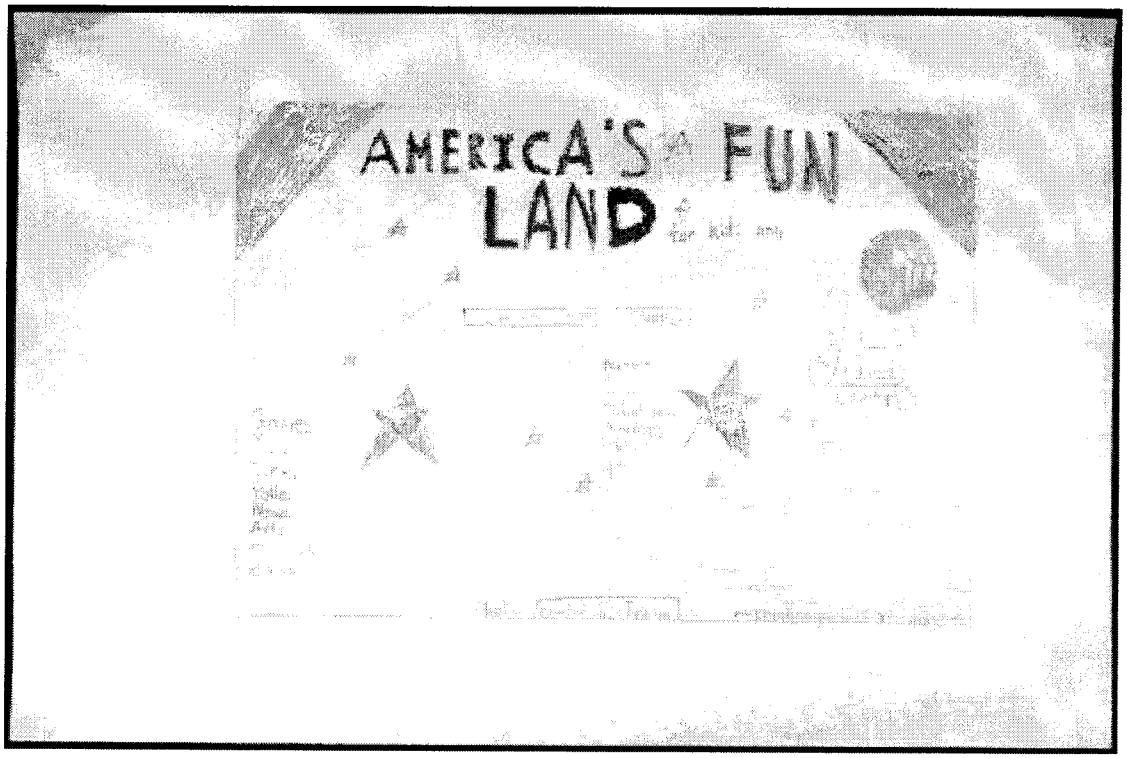

Figure 1: Study 1, Portal T

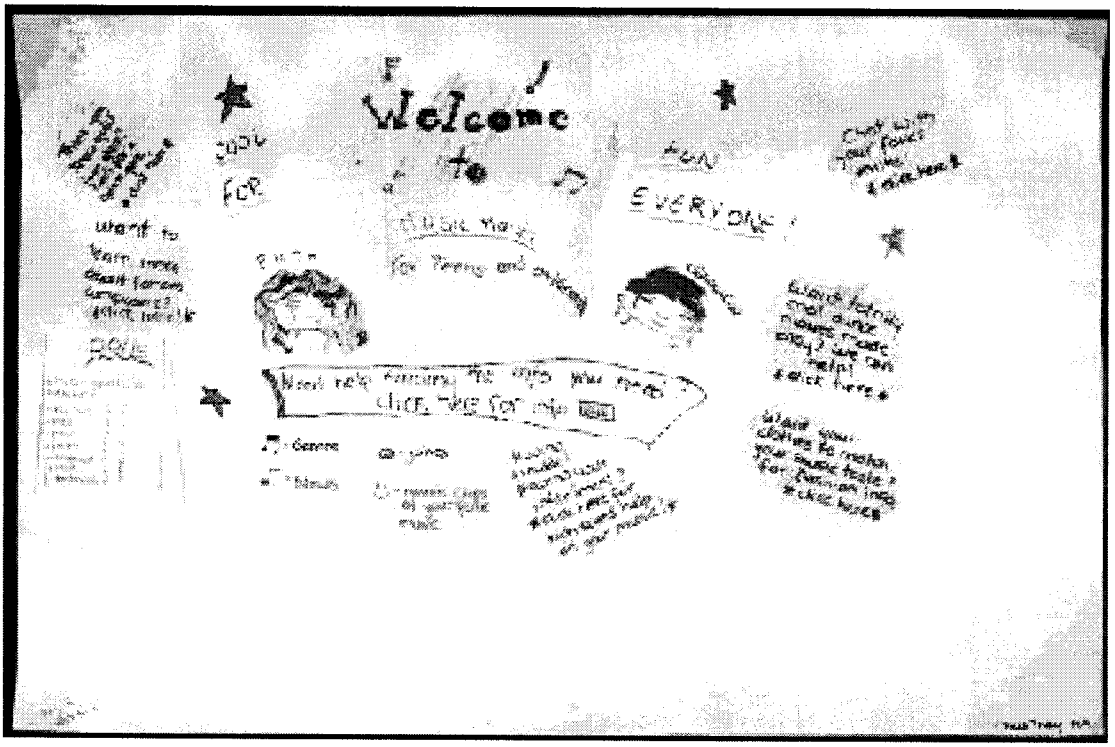

Figure 2: Study 1, Portal O

6. STUDY TWO PORTAL DRAWINGS

Before discussing the drawings made by the students in the second exploratory study it will be useful to summarize the discussion by all three students of their web portal likes and dislikes; this discussion took place immediately before the drawings were undertaken (note that in Study Two no web portals were actually viewed online).

The students expressed several dislikes about the way existing portals with which they were familiar undertook information searches. Two of them did not appreciate it when a query input as a natural language question would prompt the portal to generate in response a question such as "Did you mean...?" rather than an answer (they had in mind here the Ask Jeeves portal). In the case of keyword searching, they said that they encountered problems when they had to enter compound words, it often took a lot of time for them to narrow a search, and too many results typically were produced, many of which proved irrelevant. The descriptions of displayed hits tended to be too brief to permit accurate relevance decisions. They did like, however, the way that some portals categorize their results. In the case of directories, the categories were too general, and sometimes there were too many levels through which to navigate. Nevertheless, they found directories a useful supplement to, but not replacement for, searching. Email is not useful if you are searching for information, and an "Ask a librarian" option would not be helpful as "librarians don't always check their mail"(they probably meant that the reply is not fast enough). Email is useful, however, to ask a friend a question.

Pop-up advertising was especially annoying for the students, but banners can be cool to look at and click, depending on their content. One of the girls considered the inclusion of other search engine text boxes on a portal as advertisements. News items on the portal's opening screen were "cool" and useful, they thought.

The capability to save your information (selected pieces) as you continue to search other web sites was desirable: they referred to this as a "memory log".

As regards visual aspects of the portal interface, they disliked all-white backgrounds. One cited Yahooligans! as an example of a fun and attractive Web portal: "it keeps you awake". The idea of color-coding attracted them; for example, colors within the portal could be representative of a certain topic (e.g. green for nature, brown for mammals, etc.). Animation is fine as long as it is subdued, not too distracting and does not dominate the whole page. They would like the option to eliminate animation if desired.

As for sound, it would be great for a research project if, for example, animal sounds could be reproduced instead of only being described textually, but irrelevant sound could be distracting. Games also could prove too distracting on a portal intended to support schoolwork. But if the games were informational and relevant to the information being researched, that would be good.

The students avoided using help facilities because it didn't help: it only described the web site rather than answering specific questions related to search problems. One student expressed a fear of losing previous work if help was invoked.

The three students also enumerated a "want list". Reflecting their attendance of schools in which half of the curriculum is taught in French, they were very sensitive to language issues. They thought the portal interface should be available in French as well as in English. They requested an option for searching in languages other than English, and a translation option for retrieved documents. For any language they thought a spell check device useful when entering search terms. As regards directories, they thought general categories should be supplemented with sub-categories (they called them 'subtitles') to help narrow the search more quickly. The entries should be more specific (one girl likened it to a funnel.). They liked the concept of alphabetic searching as a quick way to find the appropriate (and fairly specific) subject heading. A means to display previous search steps and a "memory log" or storage area for discrete pieces of information selected by the user were other "wants". Hits should be categorized, with a brief but good description.

Help should be written so as to be intelligible to young users; if you can't understand the way the help is written, it doesn't help! The kind of help being offered (and not offered) also should be clearly stated.

These comments overall were consistent with the responses we had gathered previously from students of a similar age in four focus groups (Large, Beheshti & Rahman, 2002). It says something about the current use of the Web by elementary school students that these three girls, at any rate, could offer such incisive and informed evaluations of web portals without the need to view and use them online (our focus group participants had looked at portals online as they evaluated).

To what extent were these likes, dislikes and wants reflected in the portal drawings themselves? Table 3 summarizes their characteristics.

Characteristics	K	A	E
Keyword search	x	x	x
Directory	x	x	
Alphabetic search	x		
Spell check		x	x
Help	x	x	x
Email		x	
Chat		x	x
Images	x	x	x
Personalization			
Language selection		x	
Adverts	x		

Table 3: Portal Characteristics, Exploratory Study Two

A comparison of Tables 2 and 3 clearly reveals that the drawings in Study Two were richer in features than those in Study One. All three students provided keyword searching, two along with spell checking. Two also provided directories, and one offered alphabetic searching. All three provided help. Two portals provided chat facilities, and one of these also had email. As in Study

One, all the portals used images. One student offered the opportunity to change the language of the interface, and one actually included advertisements.

Two of the three drawings completed in Exploratory Study two are reproduced here: Figure 3 is K's portal and Figure 4 is A's portal. As in Study One, these two were selected because they incorporate the greatest number of portal features (see table 3). Both portals incorporate a keyword search box; one offers in fact two boxes to encourage users to combine (AND/OR) two terms, while the other incorporates a spell check. Both also have a directory, and Portal K offers an alphabetic search option. Portal K includes links to other portals (none of them specifically designed for children)

Portal A shows how hits would be displayed, and includes a color-coding scheme to classify hits according to content. Portal K has a memory Box in which the user can store useful pages during the search session.

Help is provided by both portals (in the case of Portal A, under the heading "How To". Portal A allows the interface language to be changed. It also offers email and chat

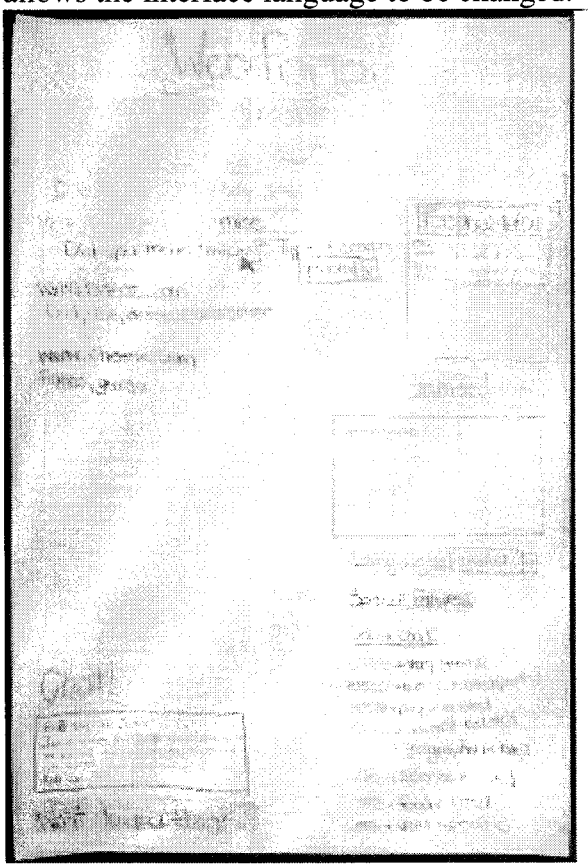

Figure 3: Study 2, Student K

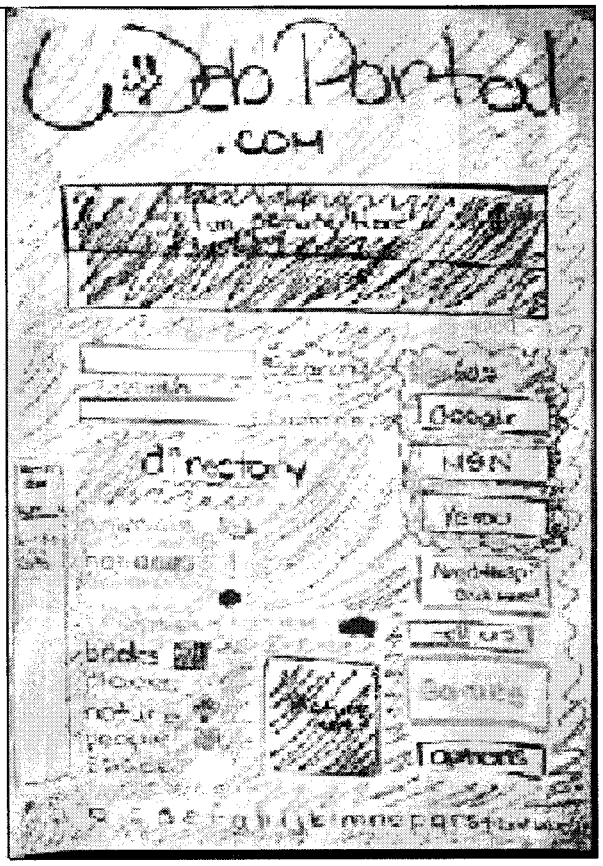

Figure 4: Study 2, Student A

facilities. An interesting feature in both portals is the invitation to users to respond to the designers with their feedback: "tell us" about the portal, and "What do you think?"

Both portals are colorful, but not overwhelmed by images. The two designers have decided to include a link to games despite their reservations about the distraction factor.

How do the four portals presented here and drawn by grade-six Quebec students compare with the four portals drawn by grade-seven students from Tennessee in the study by Bilal (2002b)? The Canadian students more commonly incorporated interactivity in terms of email and chat facilities. Unlike the Americans, one Canadian student included alphabet-based searching as well as directories and keywords as a means of searching (and all of them favored this in the earlier discussion session). One of the American students proposed natural language as well as keyword search options (as in fact did subsequently our actual grade-six design team). More text is found on the Tennessee portals and than the Canadian portals. In many respects, however, similarities can be found: for example, the presence of keyword searching and directories, the incorporation of help facilities, and the general look of a children's rather than an adult portal.

In the initial discussion period the Canadian students, without any prompting on our part, suggested that portals should include the option to switch the interface into other languages – as a minimum, French – as well as providing two-way translation options between English and French for retrieved documents. This reflects, of course, the Quebec students' bilingual educational reality, one not shared by their American counterparts. In their drawings, however, only one student incorporated a translation capability.

7. CONCLUSIONS

At the outset it should be re-stressed that these two exploratory studies involved very small numbers of students: four in Study One and three in Study Two. Care must therefore be employed in any generalizations. The studies primarily were undertaken to help us decide how best to begin work with inter-generational design teams incorporating grade-six students as well as ourselves. Should we at the outset let the students look at and discuss existing web portals in order to provide a basis for their work, even though this might influence them unduly in their ideas? Or should we begin by discussing more abstractly portals without actually looking at them or using them, so as not to influence the students, even though we thereby risked starting our work with no clear sense in the students' minds of the task ahead? Of course, we knew that some, if not all, the design team members would have at least a little experience of finding information on the Web, but we were not certain if this would suffice for our purposes.

The results from our exploratory studies were not quite as we had expected. In the case of Study One, the students were able to draw their own opening screen to a portal. However, they did not seem to be unduly influenced by the web portals they had viewed immediately beforehand. So perhaps our fears of influencing their minds had been misplaced, or at least exaggerated. In the case of Study Two, our concerns that the students would not know where to begin their drawings in the absence of prior web portal viewing also were not borne out. The most significant finding for us, however, was that in practice the drawings following an analytical discussion rather than

a viewing produced the more imaginative and inventive portal drawings. Of course, this could have been the accidental fact of the individual students involved respectively in the two separate Studies, but we are inclined to conclude otherwise. Indeed, when we began the design process proper with our eight grade-six students (not discussed in this paper) we chose to follow the Exploratory Study Two approach, and with no subsequent regrets.

It is interesting to note that after completing portal design with the grade-six team we are now working with a design team of grade-three students who are eight and nine years' old. As a preliminary we planned two exploratory studies with them, again to determine how to start the design process proper. After Study One with these younger students we decided there was no point in moving on to Study two: the different experiences and abilities of grade-three compared with grade-six students convinced us that for them we should have to begin the design process by looking at, using and talking about various web portals.

As in our earlier focus group work, we were impressed with the sophistication of our grade-six students in relation to web portal evaluation. They may not employ the same terminology as ourselves, but they are capable not only of expressing incisively their likes and dislikes, but of advancing their own suggestions for improvements in a web portal intended for use by their peers. This was comforting reassurance as we began to work with our inter-generational web portal design team.

What did we learn from the seven drawings (four of which are incorporated in this paper)? Despite the fact that the students mainly or exclusively use "adult" web portals both for schoolwork and pleasure, their drawings do not greatly resemble these portals. The most casual viewing of the drawings, even taking into account the youthfulness of the artists, shows that they want portals not only with a different visual look but also with different features that are targeted, as they perceive it, at their age group. Examples include color coding hits to indicate subject content, a memory box in which to store relevant retrieved pages, access to games, and chat facilities. They favor a variety of search approaches: keyword entry, directories, icons and alphabetic access. Directory entries should be precise and direct, tailored to the informational needs of elementary school students. Advertisements should be excluded. Help is good, but only if it really does help users to find what they are looking for. And for Quebec students, at any rate, unilingual English interfaces and search facilities are insufficient.

ACKNOWLEDGMENTS

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