

Web Portal Characteristics: Children as Designers and Evaluators

Abstract

Two intergenerational design teams comprising respectively elementary school students from grades six and three, together with three adult researchers, designed two low-tech web portal prototypes specifically targeted at the students' peers. These portals were subsequently converted into working portals that can be used to find information on the Web relating to Canadian history and deemed appropriate for an elementary school audience. This paper presents the evaluations of the two portals conducted by eight focus groups (four from grade-three students and four from grade-six students).

Résumé : Deux équipes intergénérationnelles de conception composées respectivement d'élèves de l'école primaire de sixième et de troisième année, de même que trois adultes chercheurs ont conçu deux prototypes de portails Web de faible technicité spécifiquement destinés à des élèves de cet âge. Ces portails ont été convertis par la suite en portails de travail pouvant être utilisés pour la recherche d'information sur le Web concernant l'Histoire canadienne et ont été jugés appropriés pour des utilisateurs de l'école primaire. Cet article présente les évaluations des deux portails effectuées par huit groupes de discussion (quatre par des élèves de troisième année et quatre par des élèves de sixième année).

1. Introduction

In Winter 2003 two intergenerational design teams comprising adult researchers and elementary school students from grades three and grade six, respectively, designed over a number of sessions two low-level, non-operational, prototype web portals. These two designs during 2003-2004 were converted into high-level, operational web portals, which in turn were subjected to preliminary testing by small groups of students. The English-language interfaces of the two modified portals then were evaluated in Fall 2004 by eight focus groups comprising either grade-three or grade-six students.

The research had several broad objectives:

- to identify the characteristics that would make a web portal more attractive and effective when used by elementary school students as a tool to retrieve information in support of class assignments
- to determine whether different portal design and retrieval features are required for elementary students depending upon their grade level – in our case, when considering grade-three and grade-six students (aged respectively 8-9 years, and 11-12 years)
- to explore intergenerational design teams comprising both children and adults as an appropriate method to design such web portals.

This paper draws upon the findings from the eight focus groups in order to respond at a preliminary stage to the three objectives set out above. Additional focus groups currently are being conducted using the French-language versions of the two web portals. Grade-three and grade-six classes also have used the English-language versions over several weeks to gather information for class projects. The analysis of field observations of such usage as well as of individual post-project interviews with a majority of these students has not yet been completed. Final evaluation of the two portals will be undertaken once all data is available.

2. Portal Design Methodology

In order to design two web portal prototypes appropriate for use by elementary school students the decision was made to involve such students in the design process itself, and not simply to consult them at the testing stage. In this respect we were influenced by the approach utilized by Allison Druin at the University of Maryland, that she has termed Cooperative Inquiry (Druin, 1999). Essentially this involves partnership with children, field research, and iterative low-tech and high-tech prototyping. Children are treated as full design partners alongside the adult designers on the intergenerational team: they are involved from the start to finish of the design process.

In practice, however, in working with two intergenerational design teams we did modify the Cooperative Inquiry approach of Druin, and we prefer to describe our methodology as Bonded Design. It brings together adult experts in interface design and child experts in being children, who work together throughout the design process. Like Cooperative Inquiry, it emphasizes an intergenerational partnership in working towards a common goal. It also shares with it the idea that children should play an active and full role in design rather than merely being evaluators or testers at the end of the design process. It does question, however, the nature of the cooperation between adults and children within the team. In this respect it shares some of Scaife and his colleagues' reservations concerning the extent to which true equality can exist within an intergenerational team (Scaife et al., 1997). At the same time, however, Bonded Design rejects Scaife's view that children are most helpful at suggesting ideas only for motivational and fun aspects.

Bonded Design shares aspects of Learner-Centered Design in that it provides a learning environment for all team members – children and adults alike. Learner-Centered Design assumes that everyone is a learner, whether a professional or a student (Soloway, Guzdial & Hay, 1994). In designing web portals for children, as in Learner-Centered Design, the team's objective was to ensure that the design was adapted to the interests, knowledge and styles of its target users. From Contextual Design we borrowed the ideas of drawing paper prototypes and a similar process to what is termed *work redesign* in our use of a white board to set out a map at the beginning of each session for what we had already accomplished and what remained to be done. Participatory Design gave us the concept of peer co-designers, drawings (low-tech prototyping), hands-on activities and "learning by doing". Informant Design supported our approach of seeking new and creative ideas rather than merely confirming what we (the adults) already knew. We also shared some

of the reservations voiced in Informant Design about the true equality of children alongside adults in a design team. Essentially, then, Bonded Design is situated between Cooperative Inquiry and Informant Design. It shares the former's belief in the ability of children to work as partners in all aspects of the design process, but has reservations about the extent to which full and equal cooperation can occur across the generational divide, and in these respects, therefore, has similarities with the latter.

A fuller description of our actual methodology can be found in Large et al (2004). Essentially, one design team comprising six grade-three students and three researchers met in nine sessions spread over several weeks; a second team comprising the same researchers and eight grade-six students met for 13 sessions. All the students were volunteers and had not been specially selected by us for their role. The teams discussed portal design, looked at many examples web portals – those intended for adult users as well as younger users – brainstormed, made paper drawings of various portal features, and interacted with a graphic artist (although the latter was not a member of either team). The outcome from each team was a low-level prototype design of a web portal intended for grade-three and grade-six students respectively, that could be displayed on a computer screen but that was non-operational.

3. Portal Characteristics

The two portal designs emerging from the intergenerational design teams (versions 1.0) were modified somewhat (for example, the communication features of email and chat were abandoned) in building the working portals (versions 2.0) and small modifications (for example, in icon design) were made after preliminary portal testing with small groups of grade-three and grade-six students. The portals (versions 3.0) briefly described below are those evaluated by the focus groups in Fall 2004. A discussion of Version 1.0 can be found in Large et al (2004).

Both portals are intended only to find web-based information about Canadian history – they are not general-purpose portals. They each provide access to the same 2,500 or so web pages in English, French or both these languages that are appropriate in content and language for elementary students and relate to some aspect of Canadian history. This subject focus explains both the names selected by the intergenerational teams for their portals – Kidsearch Canada by the grade three team, and History Trek by the grade-six team – and the visual presentation of both portals on the screen (see Figures 1 and 2). History Trek has adopted the motif of the Canadian flag in its colors, layout and use of the maple leaf symbol; Kidsearch Canada, although based on the metaphor of a child's desk, also includes typical Canadian symbols such as the maple leaf and the moose. The intergenerational design teams had been unenthusiastic about animation. On Kidsearch Canada it was confined to the globe spinning when clicked to change the interface language; on History Trek the mascot, Willy, is holding a flag that moves backwards and forwards.



Figure 1. Kidsearch Canada homepage (Version 3.0)



Figure 2. History Trek (Version 3.0)

Both portals include the following retrieval mechanisms: keyword searching, a hierarchically (to four levels) organized subject directory, and alphabetical word search. History Trek additionally includes natural-language question searching, advanced keyword searching (permitting a search to be restricted to words in the title of a web page, index words assigned from the subject directory to the web page, and phrase searching), and a scrollable timeline.

The portals also included identical help screens (though accessed slightly differently from the homepage), and access to some web-based Canadian history quizzes. Their interfaces can be switched between the English and the French languages, and locate web pages in the language to which the interface is set when the search is conducted. The focus groups evaluations reported here relate only to the English-language versions of Kidsearch Canada and History Trek. Both portals also include some personalization features (accessed from Kidsearch Canada from the “Change Colours” note on the notice board, and from History Trek by the “My Site” icon).

Retrieved descriptions (with hyperlinks) to the actual web pages were displayed identically on both portals, except that the font size used in Kidsearch Canada was larger than that in History Trek. A sample screen from History Trek is shown in Figure 3.



Figure 3. Results display, History Trek (Version 3.0)

4. The Focus Groups

During November-December 2004 eight focus groups (32 students) were used to evaluate Kidsearch Canada and History Trek: four groups of four students drawn from grade three, and four similar groups from grade six. All the students were volunteers; the only requirement was that each group included only males or only females. From grade three we were able to create two groups of boys and two of girls; from grade-six, however, we had three girls' groups and just one boys' group – by chance that particular grade overall included three times as many girls as boys. The students all came from one elementary school situated in the same middle-class suburb of Montreal as the (different) school from which in early 2003 the intergenerational design team students had been selected. All the students had some experience in searching for information on the Web (primarily using Google) but none previously had encountered Kidsearch Canada or History Trek.

Each focus group met on school premises during the lunch break for about one hour. With them were three adults: a facilitator, a note taker and an observer. Almost all the interactions with the group were conducted by the facilitator, with only occasional interventions from the other two adults where clarification was desired. The sessions were audio-taped. Internet access was via a high-speed connection.

In order to encourage evaluation of the portals, the four students in each group were asked to answer four questions about Canadian history. Although one student for each question controlled the mouse and keyboard, the other three were encouraged to participate with advice on the search strategy and critical comments on the portals. Each group answered two questions on Kidsearch Canada and then two on History Trek, or visa versa (the sequence was varied to ensure that each portal was used equally in first or second position by the grade-three groups and by the grade-six groups). Two open and two closed questions were chosen by the researchers; all the questions were about Canadian history and could be answered by linking to web pages accessible from the two portals:

- When did Jacques Cartier discover the St Lawrence River?
- What was life like for an aboriginal person?
- Who discovered insulin?
- What can you find out about the fur trade in New France?

The questions were rotated so that each was answered an equal number of times in first, second, third and fourth positions on each of the portals (however, this did mean that some questions were answered more often by focus groups from one grade than from another).

These focus groups benefited from the experience we had gained in summer 2000 when we organized four similar groups with students aged 10 to 13 in order to evaluate four portals then accessible on the Web and targeted at children (Large, Beheshti & Rahman, 2002).

5. The Portal Evaluations

We were not surprised that the grade-six focus groups were able very effectively to critique web portals; we had worked quite extensively for many years with students in this grade. It was reassuring to find that the younger students in grade three, with whom we had less experience, also could express clearly their likes and dislikes about web portals. In neither grade were there noticeable differences in reactions to the two portals by the girls as compared to the boys, and therefore in the following discussion gender is ignored.

First Impressions

As many observers have pointed out (perhaps most noticeably, Nielsen (2002)) first impressions matter especially with web sites, as it is so easy to abandon one for another. This is as true for web-based portals as for other kinds of sites, and therefore the students first impressions of the two portals are of importance to us.

First impressions of both Kidsearch Canada and History Trek generally were very positive. Not surprisingly, the students focused upon the visual attributes of the portals. Both portals garnered comments like “wow” and “cool” when first seen. The students liked especially the mouse in Kidsearch Canada (“I like the mouse”, “There’s a mouse saying ‘hi’, “It’s cute with the mouse”) followed by the books on the shelf. One boy pointed out immediately that the portal “looks like what I have”, meaning his desk in his bedroom at home. A girl really liked the moose. This portal overall was considered “very visual”

In the case of History Trek, the students especially liked Willy (the portal mascot located in the middle of the screen and based upon a maple leaf), and the interface’s resemblance in layout, colors and symbols to the Canadian flag. Typically reactions from both grades were, “really attractive”, “I like the Canadian flag” and “I like the little dude in the middle”, with reference to the Willy.

Only in the case of one focus group – the grade-six boys – were first impressions negative. They did not like Kidsearch Canada, and greeted it initially in total silence. It is interesting, however, to hear their reason for such a negative reaction – because in their opinion Kidsearch Canada was for adults. They liked History Trek (which they had already seen) just because they considered it “was for kids”. The irony, of course, is that Kidsearch Canada had been designed by the team including the younger grade-three students, while History Trek had been designed by the older students!

Some first impressions focused a little more upon the portals’ functionality. Comments were made about the availability of help features on both portals. In Kidsearch Canada students pointed out that “There’s different subjects on the books”, as well as liking the Quiz and, in the case of a boys’ group, the inclusion of a ‘book’ (that is, a subject directory entry) on “Wars”. As for History Trek, it was noted that “you can choose French” (available, but not as prominently displayed, also on Kidsearch Canada), and “You can type in a question”.

Retrieval

Although the grade-three students typed with greater difficulty than the grade-six students (in terms of speed and accuracy) and found it more difficult to decide upon a retrieval strategy, overall both sets of students adopted very similar retrieval approaches when answering our four questions. The results from all eight focus groups therefore have been aggregated in Tables 1 to 4 below. These tables, for each portal, show which retrieval approach (from the three offered by Kidsearch Canada and the six offered by History Trek) was first chosen to answer each question, and the total number of retrieval moves made in answering each question.

When using Kidsearch Canada, the Subject Directory was the most frequently used first approach. Overall, it accounted for 75% of first moves. Table 1 shows that it was especially popular when answering questions 2 and 3. In contrast, Keyword searching was relatively unpopular as an opening move, and alphabetical searching almost entirely ignored.

	Directory	Alphabetic	Keyword
Question 1	3	1	
Question 2	4		
Question 3	3		1
Question 4	2		2
Total steps	12	1	3

Table 1. First retrieval step, Kidsearch Canada

Table 2 shows the total number of moves made by the four groups to answer each question. A score of four (one move only by each group) is the minimum that can be obtained for each question. The Subject Directory was the most frequently employed, with Alphabetical Search and Keyword search being equally used. Question 2 required the fewest moves (5) and question three the most moves (8).

	Directory	Alphabetic	Keyword	Total steps
Question 1	3	4		7
Question 2	5			5
Question 3	5	1	2	8
Question 4	2	1	4	7
Total steps	15	6	6	27

Table 2. Total number of retrieval steps, Kidsearch Canada

As Table 3 shows, the Subject Directory was the most popular first move also in the case of History Trek (50%). Question search was second in popularity (31.25%), and when the first moves using either Question Search or Keyword search are combined, searching accounts for 37.5%. In answering Question 2, the Subject Directory was always the first move, and it was used in 3 of 4 searches for Question 3.

	Directory	Alphabetic	Question	Keyword	Advanced	Timeline
Question 1		1	3			
Question 2	4					
Question 3	3		1			
Question 4	1	1	1	1		
Total steps	8	2	5	1	0	0

Table 3. First retrieval step, History Trek

In the case of total retrieval moves (Table 4), the Subject Directory was most popular (46%), followed by Alphabetical Search (23%), although Question Search and Keyword Search combined accounted for 31% of all moves.

	Directory	Alphabetic	Question	Keyword	Adv.	TL	Total steps
Question 1	2	1	3				6
Question 2	5	1					6
Question 3	3	1	1				5
Question 4	2	3	1	3			9
Total steps	12	6	5	3	0	0	26

Table 4. Total number of retrieval steps, History Trek

Neither the Advanced Search nor the Timeline were used by any focus group in attempting to answer any question.

What factors motivated the students' choice of retrieval approach when using the two portals? We offer the following commentary. It is simplistic to say that the students preferred either browsing or searching. It also seems erroneous to relate their strategies to whether a question was open or closed. The students chose the line of least resistance. When it was straightforward for them to identify the correct entry point in the Subject Directory they almost always opted for this approach. This was especially noticeable with Question 2, where "Aboriginal Peoples" presented the obvious place to begin a search. In the case of Question 3, the wording of the question did not point directly to the correct entry point, but the students quickly realized that a search for "insulin" could begin only in 'Science and Technology'. With questions 1 and 4, in contrast, it was less clear how to begin a Subject Directory search, and therefore the students were more likely to opt for a keyword or a question search. This finding appears to support the principle of least effort as expounded by Lindauer (1990).

Correct selection of the best entry point in the Subject Directory did not necessarily mean that retrieval problems were eliminated. For example, in answering Question 2 some students correctly selected "Aboriginal Peoples" but then failed to choose the most appropriate second-level heading, "Everyday Living" (even though there are only three

choices, and in terms of the question asked the correct choice to make may seem relatively straightforward to make).

When Keyword search was used, typically students would enter the complete search question as it had been presented to them, word for word (in some cases even including the final question mark). The grade-six boys did not understand what “keyword” meant on History Trek. The spell checking routines available from both portals were invaluable to correct spelling errors.

Alphabetical searching was less popular than might have been assumed because, in all probability, the students could not decide in a multi-concept question exactly which concept to select for the search. Alphabetic search caused problems when searching on personal names, as more often than not the students, for example, would look for “Jacques Cartier” under the letter ‘J’ rather than ‘C’. One grade-three group also chose the letter ‘L’ to look for the St Lawrence River, and more surprisingly, under the letter ‘W’ for ‘When’ to answer the question “When did Jacques Cartier...?”

As none of the four questions presented a date as a starting point for a search it is unsurprising that the students did not use the Timeline to answer any of the questions on History Trek. One student suggested that it be made clearer that the Timeline could be scrolled.

Display Features

Apart from the larger font size in the case of Kidsearch Canada, the display of retrieved records was identical on the two portals. The students’ reactions here were mixed. They appreciated, when they read them, the clear and informative descriptions of the web pages to which links had been retrieved. These descriptions had been written specially for the portals by research assistants and were intended to capture the essence of each site in vocabulary and syntax appropriate for elementary school students. However, the students demonstrated some reluctance to read displayed information on the screen, a tendency noted in our earlier research with children (for example, Large & Beheshti, 2000). Overall, the display in the records of the hyperlinked Topic (the appropriate top-level heading in the Subject Directory) and Subjects (the other appropriate levels from the Subject Directory) were neither used nor intuitively understood by the students, and perhaps even obscured the useful description by increasing the amount of text displayed per record. The same comment can be made about the authorship statement (“Made by”) which was considered quite unimportant by the students, and not even understood by one group of grade-six girls.

More disconcertingly, there was a tendency on the students’ part to think that the results display was the final step in finding information rather than an intermediary stage between the search and the actual websites. As a consequence, left to their own devices they might not have accessed the websites, even though the hyperlinked titles were followed by the instruction “Click here to see website”.

Other Portal Facilities

The students liked the ability to personalize the portal by changing the look of the mascot on History Trek (at the time of the focus groups personalization was not working on Kidsearch Canada), but didn't necessarily understand that it was indicated by the "My Site" icon – a suggestion was made to call it "My mascot".

Generally the students did not notice the icon linking to several web-based history quizzes, but once pointed out to them they did like this idea, and unlike the design teams thought that the inclusion of more games would have been a good thing, and not distracting from the information-seeking task in hand.

Help on both portals was confined to explanations of their various retrieval features, with examples of how to use them. The students in the intergenerational design teams had wanted help to be more interactive and to offer useful suggestions on how best to undertake any particular search. This task proved beyond our means, and as a consequence the help features were largely ignored.

6. Portal Comparisons

Which of the two portals did the students prefer: Kidsearch Canada designed by grade-three students, or History Trek designed by grade-six students?

There was no unanimity among the grade-six students as to their preferred portal, but overall they were more impressed by History Trek than Kidsearch Canada. In particular they liked the greater number of retrieval options offered by the former, considering that this made it easier to find information. One girl, however, judged that Kidsearch Canada was easier to use just because it had fewer retrieval options. Ironically, the grade-six boys reasoned that History Trek was for "kids" whereas Kidsearch Canada was for adults. In general the grade-six students found Kidsearch Canada visually to be the more appealing portal, but as we had found in earlier research (Large, Beheshti & Breuleux, 1998), functionality weighed more heavily than presentation in their evaluations.

As for the grade-three students, they were divided in their preference for Kidsearch Canada and History Trek. Some preferred the Kidsearch Canada, both because it was less complicated (that is, had fewer retrieval options) and because of its more attractive design, while others preferred History Trek for its icons and its mascot.

7. Conclusions

The focus group students responded positively to the designs of both portals. Their first reactions when shown the portals were to enthuse about the Canadian flag motif of History Trek and the desk top metaphor of Kidsearch Canada. The intergenerational teams appear to have created designs that elementary students can relate to and appreciate.

The focus group students also liked the variety of retrieval approaches offered by the two portals. In particular, they were not generally confused by the wide range of retrieval

options available on History Trek (which the children on the grade-six design team had strongly argued to include). Nevertheless, the focus groups from both grades did encounter some problems in retrieval, especially when answering questions incorporating multiple concepts (see also our earlier work on this matter: Large et al, 1995).

An interesting finding was that the choice between browsing and searching strategies seems to be based upon the lexical relationship between the terms in the search query and the terms used in the displayed (in our case, the top level) subject index. When the students could easily match query terms to subject directory terms they opted for this retrieval approach; when they could not do so they typically decided upon a question/keyword search. The alphabetical option was relatively little used, even though it might be considered the most straightforward option for a child to take. Most probably the reason for this contradiction is that the students could not decide which term in the query to select as the entry point when the query contained multiple terms (concepts) - none of the four queries was restricted to only one concept.

Despite attempts to present retrieved records on the screen so that they could be read easily in language deemed appropriate for young students, in fact many students were reluctant to read from the screen. Ironically, the clear descriptions of the sites that are provided in the records encouraged many students to think that their search was completed at this stage – they would not have known to click on the title of any given record in order to be hyperlinked to the actual web site. This problem, first identified in our preliminary testing of the portals, continued despite the fact that we had added the phrase “Click here to see website” after each title.

The focus groups provided no support for the contention that grade-three students would prefer a portal designed by a team including students of their age, and that grade-six students would prefer a portal designed by their peers. Indeed, some students thought that the portal designed by the team including the younger students (Kidsearch Canada) was more appropriate for older students, and visa versa.

Finally, the preliminary findings reported here to lend credibility to the assertion that working with intergenerational teams and employing our Bonded Design technique is an effective way to design portals for use by elementary school students.

8. Acknowledgments

We are indebted to the 32 young students in our focus groups, as well as the students with whom we worked earlier in the two intergenerational design teams. The school principal, through her interest and assistance, greatly facilitated the smooth organization of the focus groups. The research was made possible by funding from the Social Sciences and Humanities Research Council.

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