Interface Navigation by Grade-Six Students: A Case Study of Three Multimedia CD-ROM Products

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Reports research to investigate how two primary school classes retrieved information from CD-ROM multimedia information sources in support of a class project. The students demonstrated confidence in operating the interfaces, but did not find them equally easy or effective. They were able to distinguish between the enjoyment of using an interface and the utility of the CD-ROM as a source of relevant information. The confidence demonstrated by students in interface manipulation must be distinguished from their problems in devising effective retrieval strategies. They preferred browsing to searching strategies. Students were unlikely to explore retrieval features, no matter how powerful, if these were not prominently displayed in the interface. Textual information was valued more greatly than images or sounds. Overall, students enjoyed using multimedia sources and many asked when they would be able to repeat the experience.

Introduction

The research investigated how grade-six students in a primary school use three CD-ROM multimedia information sources to support a class project on life in the Middle Ages. This is the first part of a larger study to identify design criteria for multimedia classroom products and to investigate more generally how best to integrate new technologies into classroom teaching.
Children as Information Seekers

Children as information seekers have only gained research attention in recent years. They constitute a distinct user group, approaching an information system differently from adults and consequently placing different demands upon it. As Druin and Solomon (1996) state, "when developing multimedia environments for children, we as designers must remember that children are not just short adults. We cannot water down multimedia environments designed for adults and expect them to be valuable environments for children."

A number of important studies are helping us to understand how children find information from databases. Kuhlthau (1989) developed a model of the Information Search Process (ISP) with six stages: initiation, selection, exploration, formulation, collection, and presentation. The last three stages were the specific concerns of the current project. Marchionini (1989) explored how primary school children searched for information on a CD-ROM encyclopedia; he found that in general young novice searchers could use command-driven Boolean retrieval software with minimal training, but seldom took full advantage of the available retrieval capabilities. Although the students were able to identify key facets in search queries they encountered difficulties in formulating effective search terms. Borgman and colleagues investigated the use of OPACs in school environments. They conducted empirical studies of children's information-seeking behaviors and found that higher success rates were achieved when they used concrete search terms that matched the catalog's terminology (Borgman, Hirsch, Walter and Gallagher 1995). Although their findings suggest that children are highly successful at finding bibliographic information, Hirsh (1997) concludes that more information retrieval tools designed specifically for children are necessary. In particular, they need help in formulating and articulating search queries that are appropriate for the system. Large, Beheshti, Breuleux and Renaud (1994) investigated the use by grade-six students of multimedia encyclopedias on CD-ROM. In studying retrieval behavior in an experimental setting, they found that young novice searchers could use an information retrieval system that incorporates several different retrieval paths with minimal training. The students were willing to explore and experiment with the interface, and overall their use was highly interactive.

Druin (1996) identified disorientation, navigation, and cognitive overload as the most serious problems in using interactive multimedia information settings. Solomon (1993) investigated OPACs and was struck by the success achieved by one students.

Interface Design

A great deal of research has been conducted on design principles, although rarely with children (Mandel 1997) believes that "the best interface is the one that users do what they want to do, when they want to do it." Marchionini (1992) argues to achieve their search goals with a minimum of enjoyment. They will also continue to use systems that give them pleasure. Microsoft's Windows Interface Guidelines for designed user interface is built on principles and that centers on users and their tasks." Shneiderman (1997) list the advantages offered by direct but recognise that the graphics can become the frequent user. Beaulieu (1997) has calculation into the cognitive load which different or features may impose.

Methodology

A case study methodology was selected to focus on students retrieving information over a period to satisfy genuine information needs. It has similar methodology adopted by Solomon (1993) in her study. Two grade-six classes (53 students) primary school participated in the research.

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Seekers have only gained research attention because they constitute a distinct user group, approaching differently from adults and consequently placing demands on systems. As Druin and Solomon (1996) state, multimedia environments for children, we as developers must design, are not just for adults. We need environments designed for adults, but the systems are helping us to understand how to design for children. Kuhlthau (1989) developed a Search Process (ISP) with six stages: exploration, formulation, collection and evaluation. The specific concerns of the onini (1989) explored how primary school information on a CD-ROM encyclopedia; young novice searchers could use Commander, software with minimal training, but selecting the available retrieval capabilities. Aligning with key facets in search queries, difficulties in formulating effective search strategies, some colleagues investigated the use of OPACs in libraries. Conducted empirical studies of children's behavior and found that higher success rates were achieved when using concrete search terms that matched the subject (Borgman, Hirsh, Walter and Gallagher). Findings suggest that children are highly visual in their thinking, Hirsh (1997) concludes retrieval tools designed specifically for children are particularly useful for children who need help in formulating and refining search strategies that are appropriate for the systems. Large, Lenard (1994) investigated the use by grade six students on a CD-ROM. In studying the experimental setting, they found that young people could use an information retrieval system that inferred retrieval paths with minimal training. To explore and experiment with the interface, and overall their use was highly interactive. Oliver and Oliver (1996) identified disorientation, navigation inefficiency and cognitive overload as the most serious problems encountered by children using interactive multimedia information sources in educational settings. Solomon (1993) investigated OPAC use in a primary school, and was struck by the success achieved by even the youngest grade-one students.

Interface Design

A great deal of research has been conducted to identify interface design principles, although rarely with children in mind as users. Mandel (1997) believes that "the best interface is the one that lets users do what they want to do, when they want to do it, and how they want to do it." Marchionini (1992) argues that most users want to achieve their search goals with a minimum of cognitive load and a maximum of enjoyment. They will also perform better and continue to use systems that give them pleasure or are interesting. Microsoft's Windows Interface Guidelines (1997) state that "a well-designed user interface is built on principles and a development process that centers on users and their tasks." Shneiderman (1992) and Head (1997) list the advantages offered by direct manipulation interfaces, but recognize that the graphics can become irksome gimmicks for the frequent user. Beaulieu (1997) has called for further investigation into the cognitive load which different interface environments or features may impose.

Methodology

A case study methodology was selected to focus on several groups of students retrieving information over a period of time in order to satisfy genuine information needs. It has similarities with the methodology adopted by Solomon (1993) in his OPAC research with children. Two grade-six classes (53 students) in a Montreal suburban primary school participated in the research.

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Interface Navigation by Grade-Six Students

group of users, who would access the system repeatedly to support a range of on-going information-seeking tasks or activities." In conformity with this argument, the multimedia CD-ROMs were made available at three workstations in the classroom itself. They could freely be used by the students during regular sessions time-tabled by the teachers over the course of four weeks. The students worked at the computer in groups of three. Students were also free to find information from other sources—both print and electronic—available in the classroom, school or public library, or from home. Additionally, the students had an incentive to undertake the task—the final results would be incorporated in the assessed school project.

The students' objective was to gather information for a class project entitled "The Middle Ages." The project comprised three components:

- a written assignment on people in the Middle Ages and the manorial system, alongside a comparison with their modern counterparts;
- an oral presentation, with accompanying poster(s) on three medieval history topics;
- the construction of a three-dimensional model of a manorial system.

Three identical workstations were installed in the classroom during the project. Each comprised a 486 IBM-compatible computer with a SVGA monitor and 8x CD-ROM drive, a Microsoft mouse and a DeskJet 400 Hewlett Packard printer. Three sets of the three multimedia titles were made available at each workstation so that the students could use at any time whichever one they so wished. A converter was used to capture screen images directly from the workstation's system unit on to VHS tape. A microphone enabled the searchers' voices also to be captured synchronously with the screen image on the videotape.

The students were given a relatively brief introduction to each of the three CD-ROM multimedia titles so that they could begin searching. More extensive training was not offered as all three CD-ROMs are intended for the home or school environment, and the interface designers cannot assume that users will be given training sessions beyond what is provided by the products themselves. The students were then free to explore the interfaces and to learn how exactly they would conduct their search. The students conducted in total 50 hours' searching, three hours per group. A typical search session lasted for around 15 minutes, but some were conducted in the schoolcomputer laboratory (but not the participants in the project).

Student Characteristics

All but one student (aged 11) were either 12 or 13, there were boys and 36% girls. A majority of students owned a computer, and in all such cases there were home computers (40% daily, 47% weekly and 13% monthly). Many students without a home computer reported using neighbors or a parent's office. A majority also spent time on the Internet, and all had used CD-ROMs in the computer laboratory (but not the participants in the project).

CD-ROMs

Three CD-ROM products were selected, each representing a different interface design concept. A number of general encyclopedias are available on CD-ROM, any of which would have served the research purpose. The Encarta 96 (Microsoft Corporation 1995) was chosen because it has been extensively reviewed and is widely used in schools, but also represents a specific school involved in the research. It relies heavily on down menus and offers search options on any word (Search), or on words within articles where Boolean searching and stem truncation can be used (Text + Search). Encarta 96 contains information relevant to the project scattered through many different articles.

The other two CD-ROMs are specialist products designed to help students in the Middle Ages. Castle Explorer, one of these, was published by DK Multimedia (1996), has a 3D model of a castle that encourages information retrieval by exploring areas.
Students Six Students

beyond what is provided by the products themselves. The students were then free to explore the interfaces and decide for themselves how exactly they would conduct their searches. The 17 groups of students conducted in total 50 hours’ searching, or on average around three hours per group. A typical search session by one group lasted for around 15 minutes, but some were considerably longer.

Student Characteristics

All but one student (aged 11) were either 12 or 13 years of age: 64% were boys and 36% girls. A majority of their homes (88%) contained a computer, and in all such cases the students had access to it (40% daily, 47% weekly and 13% monthly on average). Even the students without a home computer reported computer use at friends, neighbors or a parent’s office. A majority also had used CD-ROMs outside school, and all had used CD-ROMs in the School’s Information Technology Laboratory (but not the particular CD-ROMs used in the project).

CD-ROMs

Three CD-ROM products were selected, each representing a different interface design concept. A number of general multimedia encyclopedias are available on CD-ROM, any one of which would have served the research purpose. The Encarta 96 Encyclopedia (Microsoft Corporation 1995) was chosen because it has garnered very positive reviews and is widely used in schools, but was not available in the specific school involved in the research. It relies on pop-up and pull-down menus and offers search options on article titles (Pinpointer Search), or on words within articles where Boolean operators, phrase searching and stem truncation can be used to combine terms (Word Search). Encarta 96 contains information relevant to the students’ project scattered through many different articles.

The other two CD-ROMs are specialist products dealing with castles in the Middle Ages. Castle Explorer, one of a family of products published by DK Multimedia (1996), has a 3-D multimedia interface that encourages information retrieval by exploration of images of
the castle itself, various sections of the castle and surrounding countryside, and individual rooms within the castle. Several subsidiary navigational aids are offered: “Library” reveals six chained books (Health, Society, Warfare, Trades, Crime and Food) whose pages can be scrolled, and “Word Search” displays a vertically scrollable index of terms that link the user to the relevant page in a book or the relevant caption from the castle scenes.

*Exploring Castles*, published by Anglia Multimedia (1995), relies heavily upon hierarchically organised menus as well as button, icons and scrollable alphabetical lists of terms. A “Find Text” pop-up window allows a search to be undertaken on any word or part of a word.

**Information-Seeking Behavior**

Overall, the students proved remarkably skillful at manipulating the three interfaces. The only one to cause real problems was *Exploring Castles*. Its interface employs a number of different devices and is inconsistent in structure and operation. It is easy to get lost within its hierarchically structured menus, a problem not helped by the fact that it is possible to exit from any part of the program only to the main menu, and not to an intermediate menu level.

The most innovative interface was that employed by *Castle Explorer*. Its object-oriented approach encouraged the students to explore the information store in a visual and tactile manner. In order to retrieve information it was necessary to use a variety of manipulation techniques: image rotation (for example, revolving the 3-D image of the castle on both a horizontal and vertical plane in order to “enter” a particular section such as the lower bailey or the castle surrounds); horizontal and vertical screen scrolling; clicking on objects to reveal what is ‘inside,’ and so on. The students demonstrated impressive competence in undertaking such manoeuvres, and required little practice to achieve such dexterity.

Ironically, the visual sophistication of the interface proved to be its main downfall, at least when *Castle Explorer* was being used to find specific information for a class project rather than to explore in a more serendipitous fashion. The opportunity to start a new game or open a save file for this game is “a dangerous secret mission” of Baron Mortimer’s castle in fourteen years, intended to introduce users to the CD-ROMs and make them explore the castle. In other working rather than a searching mode. Not some groups, on their first encounter with *Castle* undertake the game rather than delve deeper in order to discover the other search options engrossed in the game and spent more time out explicitly identifying relevant information, though it could be argued that they familiarly with the castle interior and its environment.

When exploring the castle, students opened but in many cases they scarcely paused to move to the next visual stimulation. The visual interface encouraged a high level of interactivity, and the constantly changing screen left little time for the second or third search session, such as alternative navigational aids such as Library.

On *Encarta* almost all searches began with (Pinpointer). There seemed to be an-expectation term typed in the Pinpointer search box with that specific title, resulting in searches that nothing relevant being repeated several times taken on *Exploring Castles*, of which there was little. The students seemed to have less on the other two CD-ROMs and moved about the little sense of purpose. The word search castles was not used at all. In the early stages, *Castles* was used as frequently as the other because quickly declined as the project progressed.

Generally speaking, students employed site...
sections of the castle and surrounding cour-
rooms within the castle. Several subsidiary
features: “Library” reveals six chained books
(FAKE, Trades, Crime and Food) whose pages
“Search” displays a vertically scrollable
list for the user to the relevant page in a book or
from the castle scenes.

The program, by Anglia Multimedia (1995), relies heav-
ily on heavily organized menus as well as button, icons and
fields of terms. A “Find Text” pop-up window
was undertaken on any word or part of a word
by the user.

Behavior

The remarkable skillfulness at manipulating the
interface was that employed by Castle Explorer.
Each encouraged the students to explore the
tactile and tactile manner. In order to retrieve
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The sophistication of the interface proved to be
most when Castle Explorer was being used to
for a class project rather than to explore
in a more serendipitous fashion. The opening screen offers an op-
portunity to start a new game or open a saved game. The scenario
for this game is “a dangerous secret mission inside the stone walls
of Baron Mortimer’s castle” in fourteenth-century Europe. It is
intended to introduce users to the CD-ROMs’ interface and to
make them explore the castle. In other words, it supports a brows-
ing rather than a searching mode. Not surprisingly, all student
groups, on their first encounter with Castle Explorer, chose to un-
take the game rather than delve deeper into the interface in
order to discover the other search options. Some groups became
grossly engrossed in the game and spent more than 45 minutes on it with-
out explicitly identifying relevant information for their project,
though it could be argued that they familiarized themselves thor-
oughly with the castle interior and its environ.

When exploring the castle, students opened the caption windows,
but in many cases they scarcely paused to look at the text before
moving on to the next visual stimulation. The visual richness of the in-
terface encouraged a high level of interactivity with the interface, but
the constantly changing screen left little time for information absorp-
tion. By the second or third search session, students were discovering
alternative navigational aids such as Library and Word Search.

On Encarta almost all searches began with an article title search
(Pinpointer). There seemed to be an expectation that any search
term typed in the Pinpointer search box would find an article with
that specific title, resulting in searches that had already failed to find
anything relevant being repeated several times. The searches under-
taken on Exploring Castles, of which there were relatively few, tended
to be long. The students seemed to have less grasp of direction than
on the other two CD-ROMs and moved around the interface with
little sense of purpose. The word search capability on Exploring Cas-
tles was not used at all. In the early stages of the project Exploring
Castles was used as frequently as the other two titles, but its usage
quickly declined as the project progressed.

Generally speaking, students employed single-word search terms,
but occasionally entered search phrases (such as “people of the mid-
dle ages*). Search terms were usually directly linked to the project, and in many cases students searched only on the terms used by their teachers to present the project.

The students showed little inclination to utilise the help screens provided by all three CD-ROMs; less than half the students reported they had used the on-screen glossaries or dictionaries. Although hypertext links are found on the CD-ROMs, they were infrequently used. The links from the text to a dictionary on Castle Explorer, for example, were largely ignored even though it is clear from some of the taped discussions that students were not always sure of words' meanings.

None of the interfaces employed a primary search approach that depended upon terms being typed accurately at the keyboard. Although spelling problems occurred—"shepherd" and "manorial" in particular caused problems for several students—they did not greatly handicap retrieval, because in most cases inputting a search term merely scrolled an alphabetical index of terms to that approximate location; the term itself was then selected from the list (with its correctly spelled version).

Students were influenced in their choice of search devices by the way in which they were presented in the interface. More prominent facilities which were thereby given an emphasis in the interface were much more likely to be used than those facilities afforded a secondary location. This can best be illustrated with Encarta. On choosing Find from the main menu, users are presented with the Pinpointer search of article titles. All students opted for this on first using Encarta, and most continued to opt for this as their first move even after repeated experiences with the interface. Searching on subject categories, and especially the powerful word search capability, were much less used, and it is hard to avoid the conclusion that in part this is a result of their lack of prominence. In quantitative terms, analyses of 20 searches revealed that Pinpointer was used 89 times compared with 20 for Subject Categories, three for Timeline and two for Word Search. Hypertext links were only followed on four occasions.

A reluctance to use word search on any of the three CD-ROMs leads to another conclusion: students may demonstrate a confidence and capability in physically manipulating the interface, but retrieval strategies are much less well developed. For information via such interfaces is by no means easy; given the opportunity, students preferred browse strategies. The browsing environment provided by the CD-ROMs is popular than its retrieval features, although this is especially as students became more familiar with the system; many students opted for the browsable Pinpointer or Timeline as a Word Search. A preference for browsing rather than typing is explained either by the lower cognitive and processing demands placed upon the user, or by the precedence given to browsing in both the interface (for the two). Frequently it was not clear to the student how to modify a strategy. This problem was compounded when the teacher asked for information on a particular topic. Information must be present on the CD-ROM and the actual term used by the teacher to describe things with high school students, see Neuman, 1982, to distinguish between a concept and the variety of terms to find that concept proved a major cause of some synonyms were not tried when a keyword search

One interest of the research team was to examine how students demonstrated a learning curve over several weeks on CD-ROMs. Inevitably, the students exhibited a learning curve on operating the interfaces, andfalse trails were used. On Castle Explorer, students initially used the game to explore the other browse and search options, but soon mastered the mechanics of the interface and onwards used them confidently and competently. The problems encountered in designing effective interfaces remained with them throughout the duration of the project period, although in a few cases at the end of the project period is a useful searching skills are being acquired.

Despite the availability of multimedia resources, images, video (with sound) and animation students concentrated their attention largely on text, notwithstanding the fact that the oral presentations of poster sessions include at least one poster, and that the student
were usually directly linked to the project, students searched only on the terms used by their project.

Little inclination to utilise the help screens provided on the CD-ROMs; less than half the students reported screen glossaries or dictionaries. Although students were infrequently doing so, they did not greatly notice this even though it is clear from some of the students' notes that students were not always sure of words' meanings in their choice of search devices by the way they were inputted in the interface. More prominent facilities — including those for several students — were not greatly used in most cases inputting a search term alphabetical index of terms to that approximate word was then selected from the list (with its alternatives).

employ a primary search approach that was not exactly accurate at the keyboard. Alternatives occurred — “shepherd” and “manorial” in particular — but did not greatly assist in their first move even after repeated use. Searching on subject categories, and vocabulary search capability, were much less used. In the conclusion that in part this is a result of use of the CD-ROMs. Inevitably, the students exhibited initial hesitations in operating the interfaces, and false trials were followed. In the case of "Castle Explorer," students initially used the game and only later began to explore the other browse and search options. Nevertheless, they very quickly mastered the mechanics of the interfaces and from then onwards used them confidently and competently. At the same time, the problems encountered in designing effective search strategies remained with them throughout the duration of the project. Only in a few cases at the end of the project period is there a sense that new searching skills are being acquired.

Despite the availability of multimedia resources with relevant still images, video (with sound) and animation sequences, the students concentrated their attention largely on textual information. This was notwithstanding the fact that the oral presentation had to include at least one poster, and that the students had to construct a
model of a medieval village. In the post-project questionnaire students were asked which medium was most helpful in supplying them with information for their assignments. Taking all three CD-ROMs together, 92% answered the text only. There are several explanations for the relative lack of attention to non-textual information. One CD-ROM did not allow students to print retrieved information. Notes could be made without too much difficulty, but still images are quite a different matter. In the absence of printing capabilities, images cannot be directly used. A second CD-ROM allowed textual but not visual information to be printed. The third CD-ROM did permit images to be printed, but the results were often too small and lacking in clarity to be useful. Theoretically, visual information could have been highly relevant to the model building exercise. None of the CD-ROMs, however, contained a picture of a medieval manor as such. They certainly included images of manor buildings such as castles, churches and windmills. That the students did not use them for this purpose can be explained by several factors. Firstly, as commented above, the students were very focused in their searching. If the objective was to find a manor, then it, and it alone, would be sought. Second, the model seemed to be considered both by the teachers and the students as the least significant part of the project. The model was produced at the very end of the time period allotted, and by then most students had spent as much time as they wanted on the CD-ROMs. Video and animation can both convey a lot of information, and it may be information that would be difficult to present in textual form. Nevertheless, written, oral and model-building projects do not provide good scope for the incorporation of such moving visual information. The only remotely relevant sound was incorporated in the video sequences on Exploring Castles, and these sequences were not in fact directly relevant to the project objectives.

The students in general were more than willing to print retrieved textual information, although this was less evident in the case of images. This does not support Small and Ferreira (1994) who found that sixth through eighth graders tended to take more notes from print sources than extract information from multimedia sources. It could be, of course, that in the intervening few years students have become much more familiar with electronic sources of various kinds.

In many cases entire sections, uncredited, were used for projects, but there seems no reason to think that this is any less prevalent in the case of digital than of print sources.

Student Assessment

The students' reactions to the CD-ROMs were captured in various ways. Firstly, comments made by the students were collected on occasions the research assistants did ask the students why they had taken certain decisions. Secondly, they were asked to complete a post-project questionnaire that considered assessments of the CD-ROMs. The students in every case found these sources to be useful. They answered that they had most enjoyed using Castle Explorer, while the other two CD-ROMs or other resources on the Internet. Encarta also scored well in the 14.5%, two CD-ROMs scored far higher than Exploring Castles. Conversely, very few students liked Castle Explorer or Encarta; Exploring Castles, was generally considered the least useful.

Students found it both difficult to use and read their written assignment, oral presentation or report. In the case of Castle Explorer, they also found it more difficult to use in any of the three assignments, but clearly this did not mean enjoying it. It is interesting that the students commented that between finding an interface easy and even enjoyable, hand, and finding the information content of the CD-ROM useless for their project.

Ancillary Information Sources

Despite the availability of the three CD-ROMs, students continued to use other sources. These included sources such as Compton's Multimedia Encyclopedia, Grolier's Encyclopedia and Encarta 97, printed encyclopedias, Book Encyclopaedia, and various monographs. Generally, "It is faster and there is more information on it. If it is specific then it is better." On the other hand, it was easier to use Encarta than a printed
village. In the post-project questionnaire students indicated the medium was most helpful in supplying them with their assignments. Taking all three CD-ROMs of the text only. There are several explanations of attention to non-textual information not allow students to print retrieved information without too much difficulty, but still relevant matter. In the absence of printing capabilities directly used. A second CD-ROM allowed information to be printed. The third CD-ROMs to be printed, but the results were often in clarity to be useful. Theorically, visual information has been highly relevant to the model building of ROMs, however, contained a picture of a man. They certainly included images of manor churches and windmills. That the students used is purpose can be explained by several factors. Above, the students were very focused in the objective was to find a manor, then it, and it Second, the model seemed to be considered that the students as the least significant part of was produced at the very end of the time when most students had spent as much time as ROMs. Video and animation can both vision, and it may be information that would textual form. Nevertheless, written, oral effects do not provide good scope for the influencing visual information. The only remotely portrayed in the video sequences on Explorations were not in fact directly relevant to

In many cases entire sections, uncredited, were copied into their projects, but there seems no reason to think that such “plagiarism” is any less prevalent in the case of digital than print sources.

**Student Assessment**

The students’ reactions to the CD-ROMs were gathered in two ways. Firstly, comments made by the students at one of the three workstations were captured by a microphone. Additionally, on occasions the research assistants did ask the students at the workstation why they had taken certain decisions. Secondly, all students were asked to complete a post-project questionnaire which in part gathered assessments of the CD-ROMs. The student responses from both these sources are in conformity. They answered overwhelmingly that they had most enjoyed using *Castle Explorer* in comparison with the other two CD-ROMs or other resources such as printed books or the Internet. *Encarta* also scored well in enjoyment, and these two CD-ROMs scored far higher than *Exploring Castles* or the non-CD sources. Conversely, very few students least enjoyed either *Castle Explorer* or *Encarta*; *Exploring Castles*, was the clear “winner” here. Students found it both difficult to use and relatively unhelpful for their written assignment, oral presentation or model building. In the case of *Castle Explorer*, they also found it relatively unhelpful for any of the three assignments, but clearly this did not prevent them enjoying it. It is interesting that the students could distinguish clearly between finding an interface easy and even fun to use on the one hand, and finding the information content of the database useful or useless for their project.

**Ancillary Information Sources**

Despite the availability of the three CD-ROMs in the classroom, students continued to use other sources. These included other CD-ROMs such as *Compton’s Multimedia Encyclopedia*, *Grole’s International Encyclopedia* and *Encarta 97*, printed encyclopedias such as the *World Book Encyclopedia*, and various monographs. One student commented: “It is faster and there is more information on the CD, but if the book is specific then it is better.” On the other hand, another student said that it was easier to use *Encarta* than a printed encyclopedia because
information could be printed out and because it was easier to look up. Some students also consulted Web sites from their homes.

Conclusions
The students were asked to find information about certain people, occupations and equipment, as well as several concepts. This required them to retrieve factual information on a number of specific topics and to present this information in a written project and an oral presentation. The class project was not about gaining a feel for life in a bygone age, but about assembling concrete factual information to present for assessment. This helps to explain why much more information was taken from Encarta than either Castle Explorer or Exploring Castles (and the heavy use of other encyclopedic sources, both on CD-ROM and in print). Castle Explorer and Exploring Castles try to give students a sense of life in and around a medieval castle, and in this objective they are in all probability successful. Encarta has no such aim. As a general encyclopedia, its objective is to deliver information on a wide range of topics, a few of which are relevant to the medieval project. This is the kind of information that the students’ projects above all demanded.

Furthermore, moving images and sound cannot easily be incorporated into traditional school projects. Very considerable cognitive effort must be made to transform such visual information into static textual information - why bother when sufficient textual information is on hand? So long as the educational tasks can better be accomplished by using more traditional text presentations, then more traditional information sources will continue to play an important role. Before multimedia information can play a full role, as Neuman (1997) says, “students and teachers alike must develop new conceptions of the best ways to access, evaluate and use multimedia information for learning.”

The prominence of retrieval features in the interface will influence use. If a full-text word searching capability is considered an important part of the search software, it must be displayed prominently in the interface if it is to be chosen. Regardless of prominence, however, the lower cognitive load and reduced need for prior subject knowledge both favor browsing lists of search results, of course, may not be confined to your

Identifying suitable concepts in which to end research, and then converting these concepts into phrases (including synonyms) are not intuitive actions. Students not been trained to do this will find it challenging to retrieve required information from database sources and incorporate them into their own projects. The students can utilise simple authoring software to incorporate multimedia products on specific topics covered in the course.

The current phase of this research is employing the CD-ROM for the medieval room and enjoyed using them. Many asked to be able to repeat the experience. In order to ever, it will be necessary to rethink the objective above. One solution is to have students download additional sources and incorporate them into their own projects. Students can utilise simple authoring software to incorporate multimedia products on specific topics covered in the course.

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Identifying suitable concepts in which to end research, and then converting these concepts into phrases (including synonyms) are not intuitive actions. Students not been trained to do this will find it challenging to retrieve required information from database sources and incorporate them into their own projects. The students can utilise simple authoring software to incorporate multimedia products on specific topics covered in the course.

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Six Students

unted out and because it was easier to look consulted Web sites from their homes.

It was not always easy to find information about certain people, event, as well as several concepts. This re-
al factual information on a number of specific is information in a written project and an class project was not about gaining a feel for about assembling concrete factual informa-
mencation. This helps to explain why much more from Encarta than either Castle Explorer or the heavy use of other encyclopedic sources, in print. Castle Explorer and Exploring Cas-
a sense of life in and around a medieval give they are in all probability successful. As a general encyclopedia, its objective is in a wide range of topics, a few of which eval project. This is the kind of information is above all demanded.

Images and sound cannot easily be incorpo-
more projects. Very considerable cognitive transform such visual information into static ny bother when sufficient textual informa-
g as the educational tasks can better be ac-
re traditional text presentations, then more sources will continue to play an important information can play a full role, as Neuman d teachers alike must develop new concep-
access, evaluate and use multimedia infor-

Several features in the interface will influence searching capability is considered an impor-
software, it must be displayed prominently in e chosen. Regardless of prominence, how-
load and reduced need for prior subject

knowledge both favor browsing lists of search terms. Such a preference, of course, may not be confined to young users.

Identifying suitable concepts in which to encapsulate an information need, and then converting these concepts into effective search terms (including synonyms) are not intuitive actions. Children who have not been trained to do this will find it challenging. If the ability to retrieve required information from databases is a necessary skill to acquire in school then it will have to be inserted into the curriculum.

The students appreciated having the CD-ROMs on hand in the classroom and enjoyed using them. Many asked when they would be able to repeat the experience. In order to exploit them fully, however, it will be necessary to rethink the objectives of class projects. One solution is to have students download information from such sources and incorporate them into their own multimedia projects. Students can utilise simple authoring software to produce new multimedia products on specific topics covered in the class curriculum.

The current phase of this research is employing a similar methodology but to investigate how grade-six students navigate the World Wide Web to retrieve information for a classroom project on the 1998 Winter Olympics. Here they have access to a vast reservoir of textual as well as audiovisual information; the results should be interesting to observe.

References


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The unreserved support of the school board, school principal, teachers and, of course, students is gratefully acknowledged. Data collection and analysis would not have been possible without the dedicated work of the two research assistants, Shelley Woods and Katalin Simon. The research was supported by a grant from the Social Sciences and Humanities Research Council, Canada.

L’accès et la navigation dans l’ENSSIB: le cas des utilisateurs qui accèdent à distance.

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L’accès à distance aux catalogues en ligne aux WWW-OPACs à travers l’Internet devient un outil de recherche bibliographique. Nous appelons ce type de naviguer relevé feedback (BRF).

Le but de cet article est d’évaluer l’accès et la navigation qui accèdent à distance au catalogue de l’ENSSIB donnée sur le comportement de ces usagers, notamment d’un usage complémentaire: les transactions et un questionnement.

Les résultats de cette étude montrent que la stratégie est plus d’un tiers des usagers. Cependant d’autres.

Remote use of WWW-OPACs is rapidly increasing. Some Webbed OPACs allow browsing (records that share the same index terms) as browsing Relevance Feedback (BRF). This paper focuses on the evaluation of the behaviors of remote users as they use the ENSSIB.

This study utilizes two data collection methods: transaction log analysis. Descriptive data on searches, number and type of errors, choice of strategy. Similar studies should be done with comparable results are achieved.