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Design, Development, and Formative Evaluation of DB-notebook: A Prototype Computer-Based Tool to Support Less Skilled Readers.

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ABSTRACT

Design, Development, and Formative Evaluation of DB-notebook:
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Elizabeth Catherine Vincellér

The design, development, and formative evaluation of a prototype intended to support less skilled adult readers through a reading task are described. Less skilled readers are defined as students who have difficulty understanding school-assigned reading material because they lack metacognitive strategies. The prototype, called DB-notebook, aims to assist by providing a reading strategy that suits a given reading task and reading material. The computer was selected as the instructional medium because it is viewed as a powerful tool with the potential of helping learners become more strategic readers. To justify further the use of a computer, the reading material supplied was in electronic form. In the design phase, a storyboard was produced depicting the reading strategy and related activities. A subject matter expert informally evaluated this. Changes were based on the feedback obtained. The storyboard acted as the foundation upon which the computer-based prototype was built. Once a final prototype was completed, two experts and five students reviewed it. DB-notebook was assessed in terms of its appropriateness, its utility, its usability, and its aesthetics. The assessors' opinions regarding the use of computers to take and review notes and their feelings towards reading from a computer screen were assessed. The methods used to develop and evaluate DB-notebook and the results obtained are presented. Overall, the idea of a tool like DB-notebook was well accepted. Some activities were even considered useful. Nevertheless, DB-notebook was difficult to use and had problems with aesthetics. Recommendations for improvement and suggestions for further research are discussed.

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Chapter 1

Introduction

There is a popular saying that goes, " If you give a man a fish, you feed him for a day. If you teach a man to fish, you feed him for a lifetime." Its message is simple: if you truly wish to help people, help them help themselves. An example of this, in an educational setting, would be teachers helping students learn how to learn (LHTL). That is, instead of merely feeding content, educators could also empower learners by explicitly demonstrating how to go about acquiring knowledge in a particular field of interest, which could extend to a lifetime of further fields of interest.

According to Smith (1982), LHTL "involves possessing, or acquiring, the knowledge and skill to learn effectively in whatever learning situation one encounters" (p. 19). In addition, one can LHTL at any age. He states, "Because learning itself involves processes, understandings, and skills that can be learned and taught. [sic] One *can* learn how to learn more effectively and efficiently at any age" (p. 15). Hence, if one can learn, one can LHTL and what appears to be central in LHTL is having or somehow obtaining knowledge, processes, and skills that allow one to accomplish one's learning task successfully and with the least amount of time and effort. In essence, one must be or become a strategic learner: someone who can plan out how he or she will attack a learning task.

Bruce Joyce (1981) views LHTL as important as initially learning reading and arithmetic. Smith goes as far as to say that LHTL should be the fundamental purpose of education (Smith, 1990). Despite these comments, Candy (1990) points out that LHTL is most often acquired haphazardly. With such high praise for LHTL, one would think that it is happening in our educational institutions. On the contrary, many formal instructional settings such as elementary, secondary, and even colleges and universities promote memorization of content rather that LHTL.

Candy writes that many would be horrified by "the suggestion that schools and colleges are centers of mindless and meaningless rote learning" (p. 37). He points out that "the evidence against traditional educational institutions is damaging. . . . the fact is that traditional formal schooling, including higher education, tends to emphasize rote learning and regurgitation of isolated pieces of information" (p. 37-38). He further indicates that students pick up on this and adapt themselves by "developing study habits that exemplify reproductive (or surface) as opposed to transformational (or deep-level) learning outcomes (Biggs, 1987)" (p. 38).

To some extent, surface learning, or learning that concentrates on remembering or reproducing content, is needed because it allows students to acquire the "building blocks" necessary for further learning (Candy, 1990). Nonetheless, this approach to learning is very restrictive because a learner's "ability to function at more advanced levels, to solve problems, to apply principles, and to deal with novel or unanticipated situations is severely limited" (Candy, 1990, p.52). To be able to tackle complex tasks and problems, a deep or meaningful approach to learning is necessary. For example, Kember and Murphy (1995) indicate that students who adopt a deep approach to learning seek to relate what they have learnt to their own personal experiences. They attempt to connect pieces of information so as to form a whole and this whole is compared to what they already know. When reading, they search for the author's intention. They hypothesize and, to conclude, they gain satisfaction in accomplishing their academic task.

Regrettably, the field of instructional design (ID), like the educational institutions that employ it, has been accused of encouraging a surface approach to learning (Kember & Murphy, 1995). This is made evident by creations such as computer-based drill-and-practice programs. ID's endorsement of reproductive learning, however, stems from it being based on objectivism. Objectivism views reality as being external to or independent from the learner. As such, the role of the teacher or instructional system is to dispense "a body of knowledge predetermined by specified objectives" (Olson, 1995, p. 49). In turn, the learner is expected to take in, often

passively, this knowledge "that is frequently presented in isolated parts" (Olson, 1995, p. 49) and replicate it and its structure in his or her thinking (Tam, 2000).

Olson (1995) states that there is a shift, however, happening in the field of ID. The field is moving from objectivism towards constructivism. Constructivism views reality as being created internally by the learner. That is, the learner is involved in constructing meaning or "his or her own interpretations and perceptions of the external world" (p. 49). As a result, the role of the teacher is to act as a guide or "facilitator in structuring learning environments resembling authentic situations" (p. 49). The learner's role is an active one and involves "reflecting on information and creating his or her own knowledge base" (p. 49).

ID's move towards constructivism should result in the creation of products that promote a deep approach to learning, but how would such systems achieve this? According to Jonassen (1985), educational technologies should "teach learners to learn rather than acting as passive purveyors of information or reducing learner involvement in the learning process" (p. 31). One such technology that may be capable of encouraging LHTL is called Electronic Performance Support System (EPSS).

EPSS can be defined as "a computer application or series of applications that provides integrated information, tools, and methods, electronically, on demand, at the moment of need (Gery, 1991)" (Mikulecky & Kirkley, 1998, p. 310). Its primary goal is "to support the performance of a job or task" (Mikulecky & Kirkley, 1998, p. 310) but many organizations also use EPSS programs for "just-in-time" training (Longman, 1997).

As there are a variety of jobs and tasks, there is also an assortment of EPSS programs. Longman (1997) points out that Chrysler mechanics use a tailor-made EPSS to diagnose car problems. Avis Rental Car agents use their own EPSS to do their paperwork. Thus, if the task is learning, an EPSS program could be customized to include information about what a deep or meaningful approach to learning is and why it is important. It could also provide one or more

processes by which to accomplish meaningful learning and it could supply tools that stimulate meaningful learning such as a computer-based concept map creation tool.

Although the ultimate goal of an EPSS program is to assist people in completing a task, it indirectly demonstrates a good way to go about doing it. So if the task is learning, an EPSS can show people how to learn effectively and efficiently. Like LHTL, an EPSS program focuses on information, processes, skills, and even supplies tools. In the context of LHTL, an EPSS program would strive to develop a learner who can eventually work independently of the EPSS tool. Thus, an EPSS adaptation of LHTL would perform less like a "job aid" and function more like a "transitional instructional aid."

Creating a full-fledged EPSS program for this thesis equivalent was beyond the author's experience and time-frame. However, a small-scale tool incorporating some aspects of an EPSS program appeared feasible. For example, a method or a strategy could be incorporated into a computer-based tool to support a student through one particular task.

LHTL is a very broad topic since people can LHTL a number of things (i.e., write a paper, solve a problem, make a decision, etc.). Therefore, this thesis equivalent was narrowed down to helping students learn how to read effectively, in other words, actively or strategically. As we will see in the problem context, not all post-secondary students read effectively.

Problem Context

Once a student has graduated from elementary school, he or she is expected to have mastered reading (Candy, 1990). Nonetheless, a number of secondary and even post-secondary students are unable to read "at the level and pace required of them" (Candy, 1990, p. 41). Candy (1990) explains that it is not because these readers cannot decipher words nor is it because they cannot relate meanings to words. It is because the readers do not "invest the words with some

significance" (p. 41). That is, they often do not link new knowledge to prior-knowledge. To do this, however, a student must take a deep-level approach to learning.

Sadly, many readers, even in university, struggle to memorize textual content. In an informal interview, a reading specialist from the Department of Counselling and Development at Concordia University (Montreal, Que.) revealed that students who complain of having difficulty understanding text often try to pile information into their heads. This surface or reproductive approach to reading would not be a problem if the reading material these students have to read were easy and short. The fact is, however, university-level reading material is usually complex and dense with concepts. As such, Anderson and Armbruster (1984) point out that "It is folly to think that a student could (or should) learn and remember all, or even most, of the content in a textbook chapter" (p. 660).

If memorizing is not the goal, then why do students do it? According to the reading specialist, students learn by rote either because this strategy worked for them in the past or because it is part of their culture (e.g., they may be used to committing part of a religious text to memory). As we saw earlier, instructional institutions are also to blame for encouraging learners to memorize content.

The Department of Counselling and Development at Concordia is aware that many students entering university possess a surface or passive approach to reading. They are also conscious that this strategy probably accounts for the difficulty in comprehension some students claim to experience when reading. For this reason, a reading workshop is offered at Counselling and Development and its main goal is to get students to become strategic, active, or deep-level readers. That is, students are encouraged to predict, ask questions. take notes, make relations, reflect, and add their own examples.

The two-hour reading workshop consists of an introduction that briefly explains the reading process. This is followed by hands-on experience using a reading strategy first with a text that is supplied and then with the student's own book. Students are also grouped in pairs so as to

have the opportunity to share the questions and answers they have gathered from their text with someone else.

Without a doubt, students can benefit from the reading workshop. Nonetheless, the workshop has some limitations. First, it is open to students only a few times a semester. Second, it is on a pre-specified day, time, and place, and for a pre-set duration. It is important to note that making an appointment to see a reading specialist, free of charge, for personalized help, can circumvent some of these limitations.

The computer has not been incorporated into the reading workshop. Since reading material is predominantly in paper-based form, it is understandable why there has been little interest in using or even developing computer programs to support the task of reading effectively. However, with the availability of more and more articles and books in electronic form, this should change. That is, having text in electronic form may, in the end, alter the way we go about reading (Reinking, 1998) and learning how to read effectively.

A prototype was created for this thesis equivalent. It made use of the computer and electronic text to deal with the topic of learning how to read effectively. This computer-based tool is described next.

Aim of the Thesis Equivalent

The purpose of this thesis equivalent was to design, develop, and evaluate a prototype to assist undergraduate students through a specific reading task. The reading task involves reading an Internet article (saved on hard disk) on the topic of learning using the computer-based tool. The main reason for reading is to understand the given text. This tool, named DB-notebook, was developed for learners who claim to have difficulty understanding written material. The overall goal of DB-notebook is to provide students a reading strategy that matches the reading task and reading material supplied. The aim of this is to demonstrate a strategic or active approach to

reading. The general strategy, in turn, presents activities users can do to read, take notes, and review notes more effectively and efficiently. DB-notebook also has a feature that converts linear notes into non-linear ones (i.e., it generates a concept map of the outline of the reading material).

To design DB-notebook, an analysis was conducted to reveal requirements for such a system. This information was then used to create a storyboard or paper prototype. A reading specialist informally reviewed the paper prototype on a number of occasions. Her comments were used to make modifications. Once a final computer-based prototype was built, experts and users assessed it. This evaluation helped to detect problems related to such things as utility, usability, and aesthetics.

In using DB-notebook, the user would be engaged in an active rather than passive approach to reading. DB-notebook aims to achieve this by getting readers to create an outline of their text, ask questions, identify key ideas/terms, quiz themselves, compare important ideas/terms, and more.

Target Audience

DB-notebook is intended for undergraduate students who have difficulty understanding school-assigned reading material and who may also have problems gathering and remembering relevant information from such material. The lack of a strategic approach to reading must account for the difficulty in comprehension and retention. It should not be due to a physical or a learning disability. It also should not be because of the student's language ability. The target users have, therefore, been labeled as less skilled readers versus skilled readers: learners who do not have problems with comprehension and retention because they take an active or strategic approach to reading. The intended user must also possess some basic computer skills. For example, he or she should be able to use a word processor and the Internet.

Rationale of the Instructional Medium

At present, if students wish to improve their reading skill, they can either ask a friend or teacher for guidance, take a book out on study skills, go on the Internet and look up key words related to effective reading, or attend a reading workshop. In each case, learning is most likely occurring when the person is not involved in a school-related reading task. With an EPSS program, however, learning can arise within, and not outside, a person's work-context (Sherry & Wilson, 1996). As such, it allows learning to occur when it is relevant. An EPSS program also advocates learning by doing rather than learning through instruction (Sherry & Wilson, 1996). Thus, to make learning how to read effectively more pertinent, the computer was chosen as the instructional medium for this thesis equivalent.

To give users further reason for utilizing a computer to accomplish a reading task, the reading material was made available in electronic form only and could be viewed alongside the prototype. DB-notebook was also adapted for use with electronic texts. For instance, the prototype allows users to cut and paste part of their electronic text.

Scope of the Thesis Equivalent

The scope of this thesis project included the design, development, and evaluation of a prototype. The following activities were accomplished to fulfill these goals:

- A reading strategy and related activities suitable for a specified reading task and reading material were identified.
- A storyboard or paper prototype displaying the user interface and the activities related to a given reading strategy was created.
- A computer-based prototype, representing key features of the tool, was built based on the paper prototype.

- A formative evaluation was conducted on the final prototype to spot problems and gather comments and suggestions for improvement.

Resources and Limitations

Resources. The following resources were available to create the prototype:

- A reading specialist from Counselling and Development at Concordia University acted as the subject matter expert (SME). Her input was vital in the design phase of this project. Furthermore, she informally reviewed the paper prototype on a number of occasions and provided suggestions for improvement. She was also instrumental in finding participants to review the prototype.
- An experienced programmer coded the algorithm used to generate a concept map. In addition, he helped the author design the relational database. He was also accessible in case the author had problems related to computer programming.
- David Wells, who is well versed in the issues related to usability and interface design, and a reading specialist, other than the SME, were the experts who evaluated the final computer-based prototype. David Wells reviewed DB-notebook in terms of its usability (i.e., learnability, navigation, and assistance) and aesthetic appeal (i.e., appearance, interaction, and enjoyment). The reading specialist looked at the prototype's appropriateness to the target user, its usefulness or utility, and its general usability. The information collected by both experts is important in helping to resolve problems with using the prototype.
- Three writing assistants working for Counselling and Development and two Concordia students, appearing to represent the target group, also participated in assessing DB-notebook in terms of its utility, its usability, and its aesthetic appeal. Their comments and suggestions are essential so that the prototype may ultimately be improved.

- The technical supervisor in the Department of Education helped in finding and setting up an IBM computer for the evaluation sessions.

Limitations. Despite all the resources available, a number of limitations had to be set because of such things as time constraints, lack of manpower, and lack of knowledge and experience (e.g., in computer programming). One additional limitation is that DB-notebook is confined to running on PCs. This is because the database application used to create the prototype only works on PCs. DB-notebook has also been limited to tackling one purpose for reading (i.e., reading for comprehension and retention) and one kind of reading material. For instance, the text of interest must be non-fiction and content-based (e.g., Psychology books) versus problem-based (e.g., Engineering and Math books). The reading material must also be well structured. That is, it must contain relevant headings. However, it cannot contain sub-headings (this limitation could be removed in future applications). Finally, the reading material must be in electronic rather than paper-based form. These specifications of the purpose and text have helped to narrow down the features (i.e., strategy, activities, and tools) offered by the prototype and, therefore, make this project manageable.

The Ultimate Goal

Developing a usable and aesthetically pleasing prototype, the short-term goal of this thesis equivalent, is not meant to be the final phase of its development. Ultimately, if the early usability evaluations are successful and modifications can be made to accommodate the assessors' suggestions for improvement, a further set of evaluations is necessary. This set of evaluations would concentrate on the actual effectiveness of the prototype as a tool for improving reading skills and abilities in less skilled readers.

Chapter 2

Design and Development Methodology

The aim of this thesis project was to create a computer-based tool that assists readers through a reading task by engaging them in an active or strategic approach to reading. The design of such a tool, hence, focused on making available a general reading strategy (i.e., SQ3R: survey, question, read, recite/recall, review), specific reading strategies or activities (i.e., asking questions, summarizing, quizzing, and comparing), and "tools." The tools are actually graphic organizers that represent information in a visual manner. The strategies and activities are meant to act as a framework showing how one can go about reading, taking notes, and reviewing notes. No introduction and no tutorial for using DB-notebook were developed since the author expected the user interface (i.e., the screens with which the user interacts) to be easy and intuitive to use. An online help, however, was accessible.

Neither a traditional software development model nor a systematic instructional design model, like Dick and Carey's (1990) model (i.e., analysis, design, development, production, and evaluation), were appropriate to design and develop DB-notebook. The reasons are twofold. These models represent a linear process which can delay the detection of errors. Second, they do not incorporate end-users early enough in the design phase so as to expose such things as usability problems and aesthetic deficiencies. Instead, a methodology called rapid prototyping (Tripp & Bichelmeyer, 1990) was employed. A detailed account of the design method and development of DB-notebook follows next.

Traditional Instructional Design and Software Development

The fields of ID and software development have been going through some changes. One of the reasons for this is that many practitioners, in both fields, are no longer satisfied with the

traditional linear approach to designing and developing products. For one thing, in a linear approach, major errors are often found too late.

In the field of ID, Gayeski (1998) states, "Old, assembly-line ADDIE (analyze, design, develop, instruct, evaluate) instructional design just doesn't make it anymore" (p. 1). One problem with a linear process is that it tends "to make developers think that they can't offer anything at all until analysis and design are done. But that can mean that critical problems aren't addressed for many months" (p. 2). The same complaint is heard in the field of software development. One widespread model used to develop software is the Waterfall Model (Lowell, 1992). It has five phases: requirements analysis, design, implementation (coding), test, and maintenance. Like the ID process, the Waterfall Model is seen as linear and inflexible. Because of this rigidity, a long delay between analysis and testing often occurs and, consequently, problems "were (are) often overlooked until it was (is) too late to re-engineer the system" (Lowell, 1992, p. 19).

Another disadvantage of a linear approach is that it is only valid for well-defined requirements or problems. For instance, the Waterfall Model is appropriate for projects in which requirements remain unchanged once they have been established. The same applies in the field of ID. Wilson, Jonassen, and Cole (1993) state that for "well-defined content within stable training environments" (p. 3), a traditional systematic instructional design process may be suitable. For "ill-defined content domains, or when working with highly diverse populations" (p. 3), a more flexible or iterative design method is suggested.

To minimize design flaws, an iterative process was needed to create the DB-notebook prototype. A flexible approach was also needed because the author did not have a clear vision of the content and its scope. To some extent, this vagueness may be explained by the author's initial unfamiliarity with the capabilities of the software-authoring tool used to build DB-notebook and the author's lack of awareness of the time and effort involved in coding.

In addition to a flexible approach to designing, many suggest that users should participate as early in the design phase as possible. According to Myers (1995), "there are no design strategies that will guarantee that the resulting user interface will be learnable, easy to use, and 'user friendly' " (p. 324). He points out that the only reliable way to produce a quality user interface is to have target users evaluate a prototype and "modify the design based on the users' comments and performance (Goulds & Lewis, 1985; Swartout & Balzer, 1982)" (p. 324). This need to involve users or learners early is echoed by the field of ID. Gayeski (1998) stresses that it is no longer sufficient to obtain the opinion of only one SME during the design phase. She points out that "a variety of constituencies, including prospective learners" should be involved in setting objectives or requirements at this time (p. 3).

Gayeski (1998) claims that one major problem with many current instructional design models is that they are based on a "top-down, behavioristic, and SME-driven" approach. In such an approach, it is assumed that there is "a body of correct knowledge out there" that the SME and designer, isolated from the learner, can capture and translate it into "a complete set of learning objectives and content" (p. 2). The sole role of the learner is to act as receiver of this nicely packaged knowledge. However, this passive view of the learner goes against cognitive and constructivist models of learning which see the learner as being active in the learning process. If one believes in the latter view of a learner, then one would probably advocate the incorporation of end-users as early as possible in the instructional design process.

Since one of the objectives of this thesis equivalent was to create a software program that is relevant and easy to use, it was important to incorporate intended users early. One design methodology that advocates early use of target users and offers an iterative process is called rapid prototyping.

Rapid Prototyping

Not only the field of software development but also the field of ID, especially in creating computer-based instruction, has accepted rapid prototyping. Wilson, Jonassen and Cole (1993) describe rapid prototyping as a process of constructing, at the early planning stages, a "small-scale" model which demonstrates "key features of the intended system" (p. 3). The model, which can be a storyboard or a functioning computer program, has four possible purposes. First, a client or user can better view the requirements offered in a system when they are implemented in a model rather than just listed on paper. Second, with a model, a designer can try out a concept or explore and test a prototype to gain more information about the requirements for a larger system. Third, rapid prototyping can help a designer decide on one idea when alternative ones exist. Fourth, it helps evaluate user interface usability.

One vital part of rapid prototyping, however, is to have intended users utilize the model. In addition, a software-authoring tool is required that allows fast synthesis and modification of the model. In the end, the prototype generated is either evolved into a larger system or thrown away using only the design ideas to build the larger system.

Rapid prototyping has many advantages. Nevertheless, Tripp and Bichelmeyer (1990) warn that it should not replace front-end analysis (i.e., needs analysis). This is evident in the process of rapid prototyping that includes five phases: assess needs and analyze content, set objectives, construct prototype (design), utilize prototype (research), install and maintain system.

Although rapid prototyping was used to design and develop the DB-notebook prototype, this method was unfamiliar to the author at the start of this thesis equivalent. Consequently, it was not implemented appropriately. For example, creating sketches and paper prototypes is part of rapid prototyping. They were also generated for this thesis equivalent. The SME, acting like an end-user, even tested these models. However, she was basically the only who did. The author failed to see, at that time, the significance of checking paper prototypes, in addition to working

models, with more people, including actual end-users and other experts (e.g., an interface expert). The author was also unaware that a more structured evaluation of the paper prototype, that is, an assessment using a list of criteria, rather than an informal one, might have shed more light on the requirement needs and usability needs. Finally, she did not realize that outstanding issues, like the scope of DB-notebook, should have been resolved with paper prototypes before ever moving on to coding.

Rapid prototype was used incorrectly in another way. For instance, the synthesis of a prototype system in a timely manner is one main aspect of rapid prototyping. Even though the author's goal was to create a prototype computer program quickly, it did not happen. On the contrary, it took an extreme amount of time and effort. One reason is because, even during the coding period, the boundaries of the prototype were not set. That is, the author wanted to include a lot of functionalities that in the end she realized could not be added. Another reason is because time had to be spent learning a computer programming language and the authoring tool's capabilities.

Despite some drawbacks, a DB-notebook prototype was created. However, the author believes that the present usability problems, which will be discussed in the Results chapter, could have been avoided if the author would have been conscious of the above pitfalls.

Like traditional instructional design, rapid prototyping also has an analysis phase and an intertwined design and development phase. These stages will be look at one at a time.

Analysis Phase

Needs Analysis. Many resources are available to students who wish to become better learners. For example, a number of study skill books can be found on the bookshelves at Concordia University. The World Wide Web also contains an array of Internet articles on such topics as studying, time management, and test taking. In addition, the Department of Counselling

and Development at Concordia offers a resource center, workshops, and individualized help in such areas as studying, reading, writing, job search, and more.

Although these resources generally cover the broad spectrum of learning, they all usually include reading and provide strategies on how to go about reading to enhance comprehension. This attention on how to read effectively affirms that not all students do so. A literature review and a discussion with a reading specialist, done for the needs analysis, confirmed this observation.

A literature review revealed that many students, even at university, do not read at the level required. The reason given is that these learners take a surface approach to learning. They try to memorize text. For simple texts, this method may work. For complex and dense reading material found in post-secondary education, a strategic or deep-level approach to learning is beneficial. Such an approach involves using reading strategies, such as varying ones reading speed, asking questions, and summarizing. It also entails connecting new knowledge to old knowledge, predicting, hypothesizing, and providing personal examples.

In an informal interview with a reading specialist from the Department of Counselling and Development at Concordia University, the same problem and solution were exposed. She stressed that many students entering university tend to read passively. They do not interact with the text. That is, they do not ask questions, make connections, or reflect. Instead they learn by rote. As a result, they complain that they do not understand their school-assigned texts. They do not realize that their goal should be to become active readers, that is, strategic or deep-level readers. Hence, there is a need to assist students to become more skilled readers (i.e., active, strategic, or deep-level readers). The need to accomplish this with a computer may not, however, be evident.

Study skill books, Internet articles, and workshops or personalized help are some options available to learners wishing to improve their reading skill. However, another alternative is suggested here and, in the author's view, it should gain acceptance as more texts are accessible in

digital form and more computer-based learning support tools (i.e., encyclopedias, dictionaries) and cognitive tools (i.e., concept map creation tools) are made available. This alternative is a specialized and easy to use computer program, which is free of content (i.e., void of any target area reading material), but full of information, strategies, and tools aimed at assisting the reader through their own particular reading task at the time of need.

For this thesis equivalent, the purpose was not to create a large-scale system, but a small-scale prototype that supplies one general reading strategy, a few specific strategies or activities, and some tools (i.e., graphic organizers) to aid readers to comprehend a well-structured (i.e., texts with pertinent headings) and content-based (i.e., texts filled with information not problems) text.

In the end, the ultimate goal of DB-notebook is to get readers to complete their reading task by being active in the reading process. To achieve this, the prototype had to provide features that are relevant and a user interface that is easy to use.

Audience Analysis. A preliminary profile of the intended users, also referred to as passive or less skilled readers, was drawn up after an informal interview with the SME. It was revised and refined after some thinking, literature review, and further talks with the SME. The final version describes a target learner as an undergraduate student who:

- Feels as though he or she often has difficulty understand written text;
- Feels as though he or she often has difficulty remembering relevant information from written text;
- Feels as though his or her reading skills could be improved or could to be sharpened; and
- Has basic computer skills.

The undergraduate student can be:

- A man or a woman;

- A young or a mature student;
- A full-time or part-time student;
- In any program on the condition that he or she is assigned to read content-based texts (i.e. focus is on getting information) rather than problem-based texts (i.e. focus is on solving-problems);
- A second language student, but he or she must possess an excellent grasp of the English language; and
- One who preferably has *not* attended any reading workshops at Concordia.

The undergraduate student should *not* have:

- A learning disability; or
- A physical condition (i.e. an eye, a back, a hand, or a wrist problem).

Although the prototype arising from this thesis equivalent is meant for learners who claim to have difficulty understanding text, it does not discount the possible benefits for skilled readers. As a result, skilled or strategic readers also evaluated the final working version of the prototype.

Task Analysis. From the literature review, the author was already familiar with a number of reading strategies and a few computer-based tools. However, it was not clear which strategies and tools were pertinent and in what sequence. A task analysis was, therefore, needed to determine which strategies and tools to include in the prototype and to find out in what order to present them. The result of this task analysis was a list of requirements.

To find out what to incorporate in the prototype, the author decided that it would be useful to find out how a less skilled reader approaches a given text and how a skilled reader does.

Since the author did not have easy access to a less skilled reader, the SME, who is a reading specialist and, thus, very familiar with the target group, acted as if she were the intended reader. For this analysis, the SME was free to choose a text. However, it had to be content-based and well structured. The aim of the reading task was comprehension. The SME was prompted to explain aloud what she was doing and why throughout the reading activity. The author took copious notes, but in retrospect a tape recorder would have been more practical. On a separate occasion, the same procedure was repeated, but this time the SME was asked to act like a skilled reader.

A number of things were discovered from the task analysis. First, it was observed that certain activities should be done before reading. For instance, readers should start out by identifying their reason for reading. This will determine the strategy they could then use. Hence, if readers want to locate a piece of information, they do not need to read the entire text. It is sufficient to read through it quickly (i.e., skim). Next, if there is a table of contents, readers should look at it. They should check out the title, headings, and sub-headings. Before even reading readers should try to get a sense of what the text will be about using the reading aids (i.e., title, headings, sub-headings, etc.) available. Less skilled readers, as the SME represented them, often jump in and begin to read without getting the general idea or the "big picture" first. Moreover, they read every word. From this observation, it was clear that the prototype generated had to get the learner to do some before-reading activities, like look at the title and headings.

Second, it was found that when less skilled readers took notes, they often could not explain why they happened to write down one piece of information over another except that it appeared to be important. It could be extrapolated that highlighting and underlining follow the same reasoning. Furthermore, if less skilled readers are asked what they have read, even after taking a lot of notes, they would have to go back to their notes since the information was not learnt, it was simply recorded. This made it clear that a purpose other than taking notes because the information seems important had to be incorporated into the prototype.

Finally, it was shown that once the reading task had been completed, the given text and notes were not looked at again until examination time. There was no attempt made, at this point, to determine whether comprehension had occurred. The author speculates that review, for a less skilled reader, would entail re-reading the text and/or notes at the very least. A method of reviewing, other than re-reading, had to be considered and included in the prototype as well.

In addition to the above analysis, the author examined the strategies offered in the reading workshop and reviewed those recommended in the literature and study skill books. Several strategies kept re-surfacing. SQ3R was one of them. It is a method meant for content-based books for the purpose of enhancing comprehension. A modified version (i.e., get the big picture, read actively and selectively, and review to consolidate and integrate ideas) is presented in the reading workshop. Summarization and concept map generation were other strategies repeatedly mentioned. These are also used in the reading workshop. To conclude, the author also wished to add an activity to encourage higher-order thinking.

At the end of the task analysis, a list of requirements was gathered. It is important to mention, however, that the final prototype does not fulfill all these requirements because the author, in the end, was limited by time and lacked manpower and experience. The following are some of the before-reading activities collected: the user will be able to identify the purpose for reading; the user will be able to identify the reading aids (i.e., headings, bolded terms, etc.) available in the reading material; the user will be able to create an outline of the text using headings and sub-headings (in the final prototype only headings are used); the system will provide information clarifying the importance of identifying the purpose for reading and the reading aids and explaining the reason for creating an outline (this information was omitted in the final prototype).

The following are some while-reading activities suggested: the user will ask and answer questions; the user will summarize the section they have read; the user will identify and define key terms; the system will provide information explaining the importance of asking questions,

summarizing, and identifying key terms (this information was omitted); the system will explain how to go about creating questions, summarizing, and defining a term (this focus on sharpening skills was omitted).

The following are some after-reading or review activities suggested: the user will test himself or herself using the questions he or she generated; the user will test himself or herself using the summaries produced; the user will create a concept map (in the final prototype, a concept map is generate for the user); the user will create a database by filling out a template (this was omitted); the user will create and answer higher-order questions; the system will explain the purpose of these review methods (this information was omitted); the system will describe how to go about creating a concept map, a database, and higher-order questions (this focus on sharpening skills was omitted).

Other requirements were also needed to suit the computer environment. They included the following: the user will be able to search DB-notebook (this was omitted); the user will be able to view an electronic text; the user will be able to reference (i.e., enter title, author, etc.) their source (only partial referencing is done in the final prototype); the user will be able to access help; the user will be able to get a tour of DB-notebook (this was omitted since the author thought the prototype was intuitive to use); the user will be able to exit DB-notebook.

Looking back, it was naïve of the author to think that she could do all this because of the amount of experience required just to complete a basic product. In the end, the prototype had to be pared down. Unfortunately, this did not happen in the design phase. It was only in the development stage that the author became conscious of the amount of work involved in computer programming.

Design Phase

Selection and Structuring of Content. At this stage, the author should have been narrowing the focus of DB-notebook by asking and getting answers to questions such as: Should the prototype cater to electronic reading material and paper-based ones? Should it address how to approach a textbook (i.e., look at table of content, preface, etc.) or just a chapter (i.e., look at summary, introduction, title, etc.)? Should the prototype deal with all possible reading aids (i.e., introduction, summary, headings, sub-headings, etc.) or just a few? Should readers ask questions, summarize and identify key terms during note-taking or should they do only one thing? Should the users create their own concept map or should it be generated for them? Would a template for a database be easy to build and use? Should a search feature be active (i.e., programmed to work) or not? Is it essential to add information and, if so, what kind of information is necessary to include?

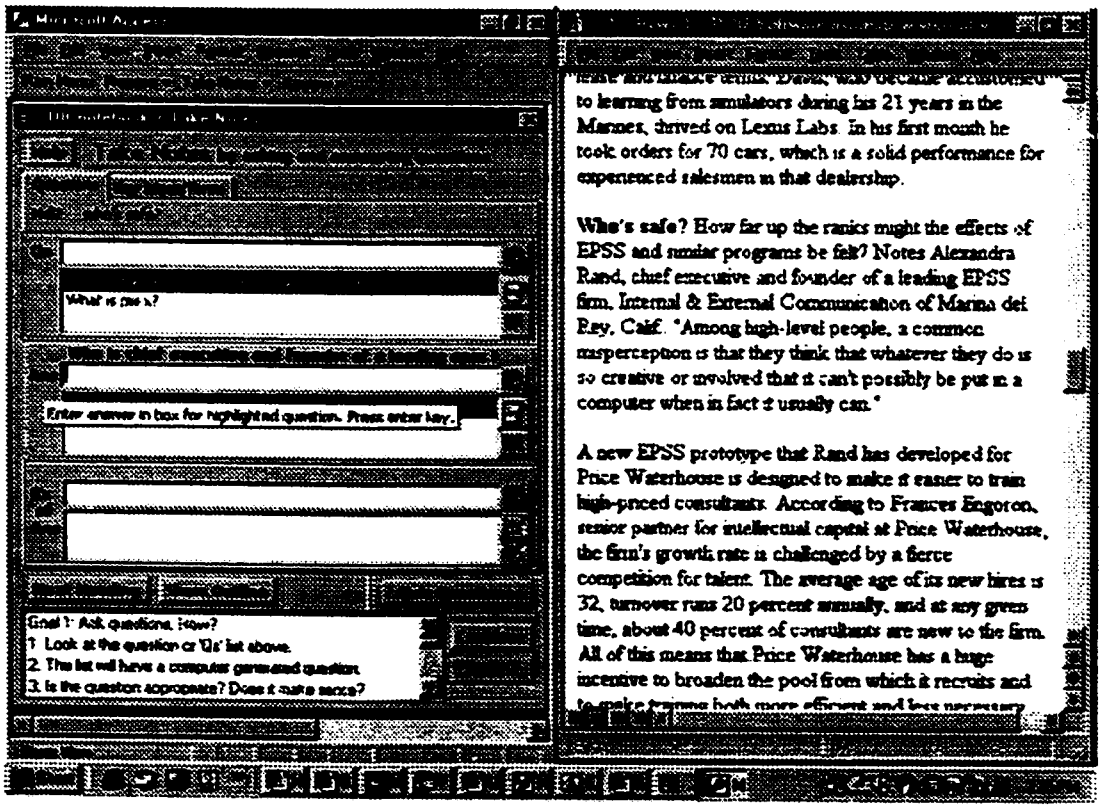
These outstanding issues could have been settled with the SME as well as the end-users. The result would most likely have been a smaller and more attainable list of requirements. Unfortunately, the author did not sense the danger. Instead, huge flowcharts were developed to depict the content structure of DB-notebook. However, with experience, the author eventually limited the scope. The content structure of the final version of DB-notebook can be viewed in Appendix A.

Interface Design. One of the goals of this thesis equivalent was to make the interface of DB-notebook as easy to use as possible. Consequently, the design principles selected were meant to enhance usability.

Some of the principles used were taken from Ben Shneiderman's "eight golden rules" (Baecker, Grudin, Buxton, & Greenberg, 1995). The first rule is "strive for consistency." To achieve this, careful attention was paid to keeping the screens, colors, icons, and system's

responses constant. Another rule is "offer informative feedback." When boundaries of DB-notebook are reached, a message box advises the user of this fact. An additional rule is "support internal locus of control." A main toolbar (i.e., with the labels "main menu," "prepare," "take notes," and "review") for general navigation and tabs (i.e. with the labels "questions" and "key ideas/terms") for localized movement are offered (see Figure 1). One more rule is "reduce short-term memory load." One way this is accomplished is by supplying an instruction box at the bottom left of the prototype, yellow pop up descriptions of controls (i.e., buttons, list boxes, text boxes, etc.) and burgundy words with their own pop up explanation (see Figure 1). Moreover, the author tried to keep the screens simple.

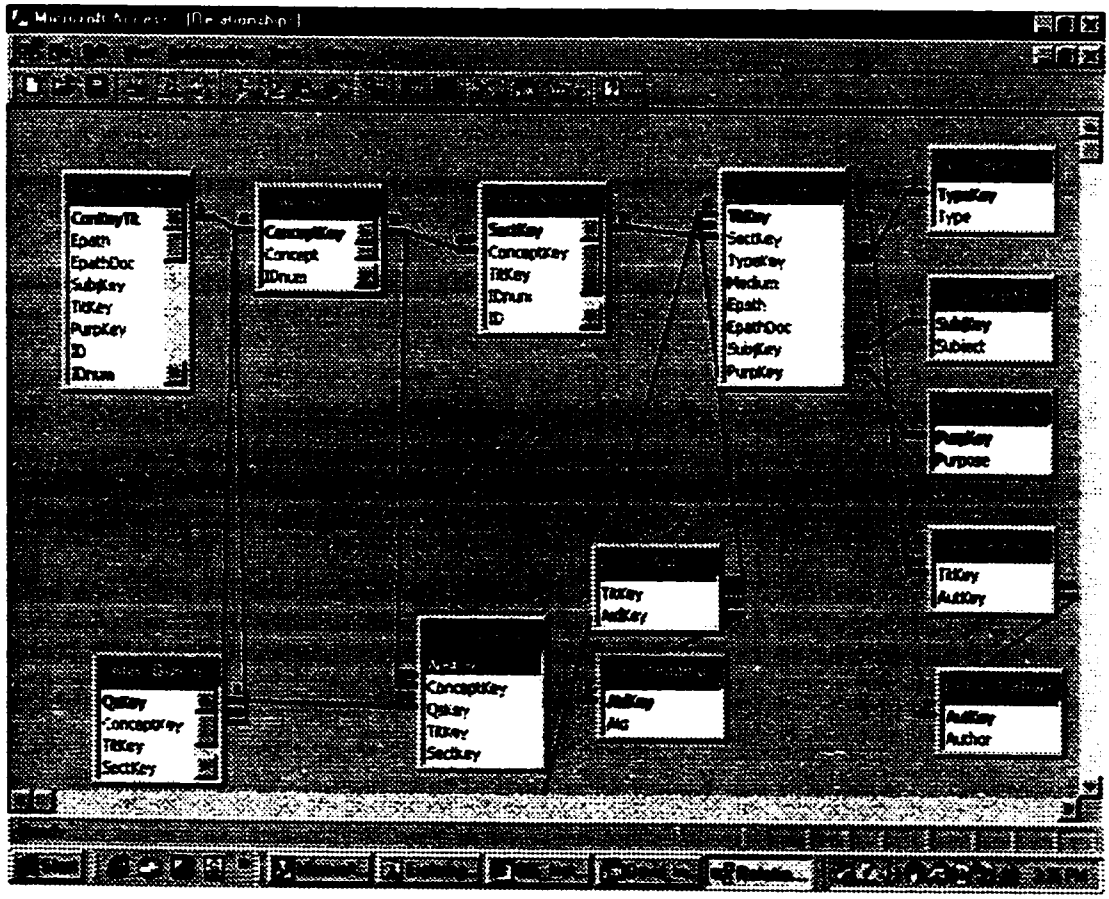
Figure 1. Screen Shot of the "Note Taking" Part of DB-notebook



From observing Internet screens, the author saw that buttons and other controls were often inactive when they did not apply to a particular task. This was employed in DB-notebook as well.

Relational Database Design. Via the computer interface, a user can enter his or her data. However, this information is not saved until it is put in a database. Moreover, the database is not really usable unless it is well organized. Hence, like user interfaces, databases must also be designed. This is not a simple task and for this reason, the author needed the help of an expert developer. What follows is a brief summary of the process used to design DB-notebook's relational database. See Figure 2 for a visual representation of the relational database.

Figure 2. A Snippet of DB-notebook's Relational Database



Dobson (1999) writes, "Tables are among the most fundamental building blocks of a relational database" (p. 137). This is because information is stored in tables. Hence, in designing the database for DB-notebook, the author had to decide on the kinds and number of tables needed. This, in turn, depended on the sort of information that would have to be saved. Once the tables were determined (i.e., a table to enter concepts, a table to enter titles, etc.), the next thing was to divide each table into columns or fields. For example, the table called "Concepts" contains the fields named "ConceptKey," "Concept," and "IDnum." After the fields were established, a set of design rules (Dobson, 1999) was applied. This was done to ensure that data was not repeated, that the size of the database was reasonable, and that searches could be done easily. Finally, the tables were related so that cascading deletes and updates could occur. That is, if one piece of data is deleted or updated, all related information is deleted or updated.

Paper Prototype Design. A paper prototype (like a storyboard) illustrates, on paper, the screens the user will face. In the paper prototypes created for this project, the order of the screens demonstrated the general reading strategy (i.e., reference, identify purpose, identify reading aids, etc.). The content of each screen represented things to do (i.e., identify reading material, get electronic text, etc.) or offered specific reading strategies (i.e., ask and answer questions, summarize, etc.) and tools (i.e., view concept map).

A number of paper prototypes were developed. To begin with, crude pencil and paper sketches were drawn, but it did not take long before the computer was used. For example, the drawing tools from Microsoft Word ™, which is a word processor, were utilized. Then the forms and controls (i.e., buttons, drop-down list) in Microsoft Access ™, which is a database software, were employed because this application was to be used to build the DB-notebook prototype.

The first Word™ paper prototype version was not evaluated. Instead it helped the author realize that too many features or functionalities were being included. These had to be trimmed and once a satisfactory Access™ version was worked out, it was informally evaluated by the

SME. The feedback obtained was used to make modifications. The SME reviewed a number of other paper prototypes. Each time some alterations were done (see Appendix B for examples of the screen layout of the final version of DB-notebook).

The SME's input was indispensable. Nevertheless, it would have been a good idea to have end-users and an expert in interface design look at the paper prototypes as well. Furthermore, the assessment session should have been structured (i.e., using a list of usability criteria with which to evaluate) rather than informal.

Finally, since it was taking very long for an acceptable paper prototype to be generated, parts of the system began to be developed in the design stage. One reason is that the author felt that she had to start learning the programming language. Another is that she had to get to know the authoring tool's capabilities.

Development Phase

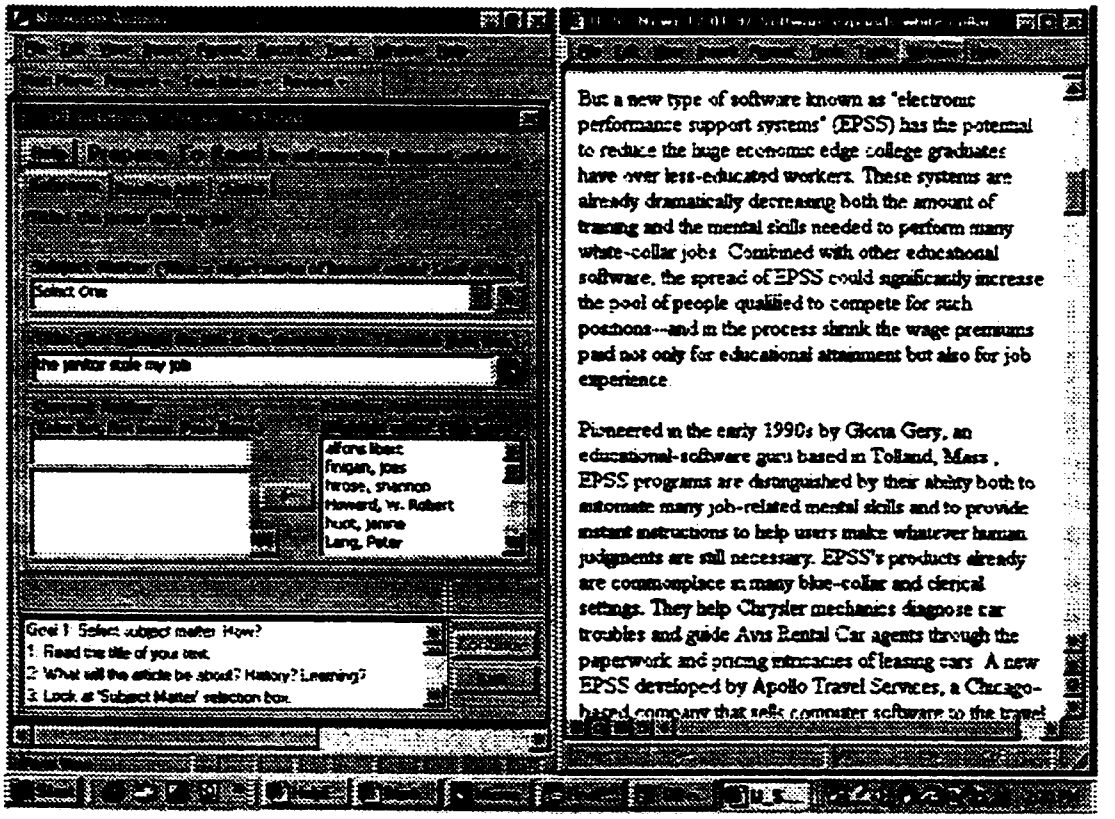
Software Authoring Tool. Microsoft Office 2000 ™ was selected to be the authoring tool. It was chosen because it contains a database, a word processor, and a slide presentation which provides drawing tools. A database was needed so users' notes could be stored and easily retrieved. A word processor was utilized to display electronic text. The drawing tools, in the slide presentation, were used to create a concept map. The programming language called Visual Basic for Application (VBA) was the glue that connected these three applications.

Since the author possesses a PC, a PC version of Microsoft Office 2000 ™ was obtained. It was later discovered that Access™, the database application available for PCs, is not cross-platform. That is, it does not run on PCs and Macs. Consequently, the prototype created, which is actually a database, runs only on PCs.

User Interface. DB-notebook was built using Microsoft Office ™ and, hence, it has the look and feel of a Microsoft application (see Figure 3). For instance, it contains windows. There are usually two windows open during the reading session. One is the electronic text in Microsoft Word ™ and the other is DB-notebook in Microsoft Access ™. On every interface there is a help button, a continue button, and an exit button. Furthermore, there is a box that displays a brief set of instructions for that particular screen or form. A main toolbar is also available with which to navigate.

Although some features are consistent throughout DB-notebook, others are not. For example, some forms contain text boxes in which data can be entered. Some have drop-down lists and list boxes from which data can be selected. Others have treeview controls from which information can be viewed in a branched format. Some even have tabs for local navigation. Some have a mixture of controls (i.e., text boxes, list boxes, treeview controls, etc.).

Figure 3. Screen Shot of the "Prepare to Read" Part of DB-notebook



Relational Database. Microsoft Access ™ provides all the tools (i.e., tables, fields, relations, etc.) necessary to create a relational database. This was used to produce DB-notebook's relational database.

Programming the Prototype. The author was the main programmer throughout the development stage. Nevertheless, an experienced developer was at hand. He was also in charge of the concept map.

A number of things had to be programmed in the prototype. For example, the forms or user interfaces needed to be linked. Data entered into text boxes by users had to be put into the database. Information also had to be retrieved and displayed either in text boxes or in a treeview control (i.e., a tree with main and sub-branches). Buttons and other controls had to be activated and deactivate depending on the situation. A main toolbar is programmatically created and parts are activated and deactivated according to where the user is. VBA code is also used to communicate with the other Microsoft Office ™ applications. For instance, through Microsoft Access ™, Microsoft Word ™ is opened and a table with the user's input is produced. Through Microsoft Access ™, Microsoft PowerPoint ™ is accessed and a concept map is generated.

A lot of time was spent on designing the paper prototype. However, an even longer time was expended on coding and debugging (i.e., finding problems in the code) the prototype. Because of the complexity of DB-notebook, some bugs (i.e., difficulties with code) still remain.

Concept Map. At the very beginning, the author had planned to use Inspiration ™ as the semantic mapping computer tool. This is because concept maps can easily be created with Inspiration ™. However, the author wanted this software to generate a concept map automatically, rather than having the user do it. The author envisioned a tool that would transfer the user's input into a concept map, assuming the information had an order to it (i.e., title, heading, sub-heading, etc.). She also imagined that the user could then modify the generic

concept map according to his or her liking. Because Inspiration ™ did not provide a programming language to control it, another tool had to be found. At first, Microsoft Word ™ was considered, but it lacked connectors (i.e., arrows that link to boxes and stay attached). Microsoft PowerPoint ™ had these and it could be manipulated via VBA.

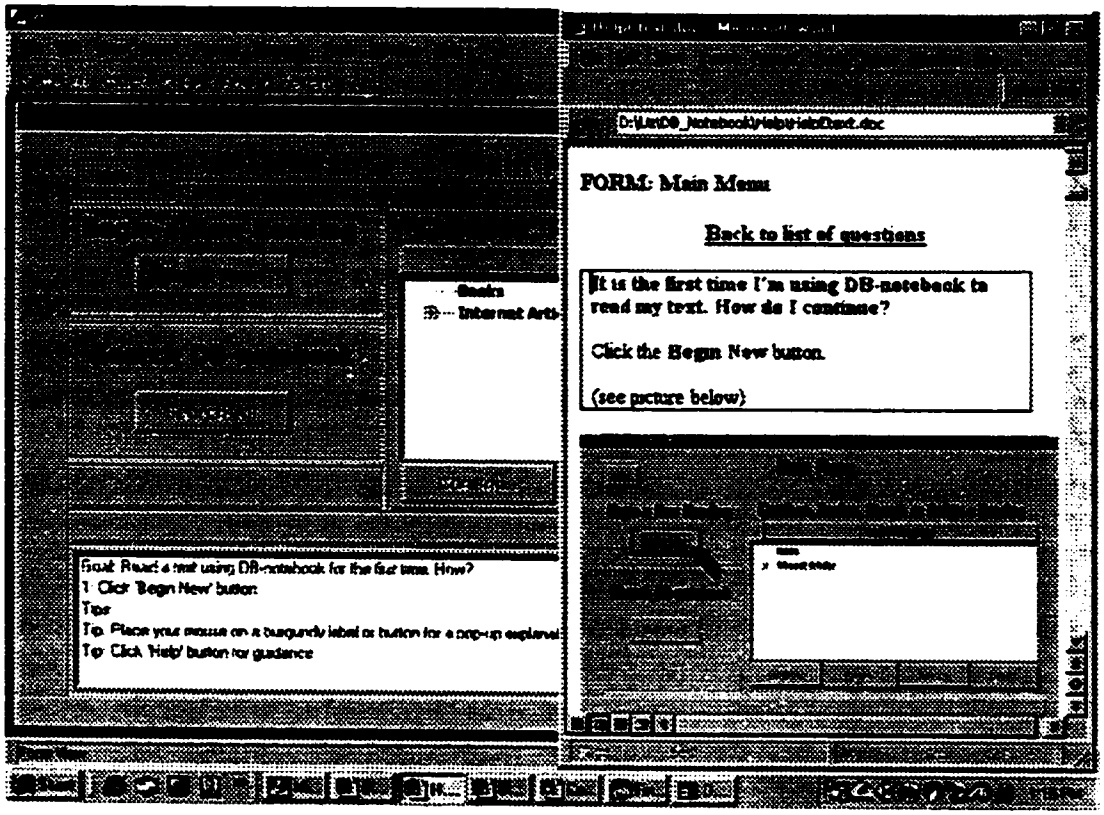
An expert software developer was needed to develop the VBA code that could generate a concept map using the drawing tools in Microsoft PowerPoint ™. He soon made the author aware that the programming involved was complicated and, therefore, boundaries had to be set. Consequently, DB-notebook's concept map tool is reduced to generating a concept map of the reading material's outline, the user's questions and answers, and the user's summaries. Moreover, it can only handle a limited number of items (i.e., headings, questions, summary points) because of the pre-set size of the PowerPoint slide. Hence, the concept map must fit on one slide. Finally, if users manipulate the concept map, the changes made are not saved in the database.

The concept map was meant to be a tool. However, because of the coding involved, it had to be restricted to a graphic organizer (i.e., a visual representation).

Help. An online help feature is accessible to users (see Figure 4). The assistance offered varies according to the screen that is opened. Thus, if the main menu is shown, the help supports the user through the main menu.

The online help was produced using Microsoft Word ™. It consists of a list of hyper linked questions. Each question leads to an answer or a directive. A screen shot (i.e., a picture of the screen) with arrows is also included. A way to go back to the list of questions is available as well.

Figure 4. DB-notebook's Online Help



Chapter 3

Formative Evaluation

DB-notebook is intended to guide a learner through a reading task by providing a reading strategy that suits the reading task and the reading material at hand. The aim is to model and, in turn, covertly teach a strategic or active approach to reading. It would make sense, therefore, to evaluate whether DB-notebook is successful in instructing the given strategy. Furthermore, it would be interesting to find out whether the user's comprehension and retention of relevant information from written text are enhanced if the prototype is used. However, if DB-notebook is unusable, neither can truly be determined. Consequently, before assessing the quality of instruction or the user's performance, it is necessary to evaluate the prototype's "ease of use" or usability. Thus, one of the main reasons for evaluation, for this thesis equivalent, was to determine DB-notebook's usability. To find a method to evaluate usability, the author had to leave the field of ID and enter the field of human-computer interaction (HCI).

Evaluation as viewed by both fields will be looked at next. A detailed account of the formative evaluation of DB-notebook will follow afterwards.

An Instructional Design Approach to Evaluation

Smith and Ragan (1993) view the term evaluation as "the broad topic including both assessment of learners and evaluation of the instruction" (p. 7). In assessing the learner, the aim is to find out whether the learner can "demonstrate the performance described in the objectives" (p. 101). In evaluating instruction (i.e., instructional material, educational program, computer-based instruction, etc.), the goal is to determine if the instruction is "effective, efficient, and appealing? And if it is not working well, what changes need to be made?" (p. 101). For this thesis

equivalent, the aim was to evaluate DB-notebook. As a result, the author did not concern herself in assessing learner performance. Rather, emphasis was placed on evaluating instruction.

The field of ID proposes two ways of going about evaluating instruction. One can either perform a summative evaluation or a formative evaluation. The evaluation technique chosen depends on the reason for the evaluation. A summative evaluation is conducted if a decision is required on whether to implement an instruction or continue to sustain an existing one (Smith & Ragan, 1993). It is worth noting that a finished product is evaluated in a summative evaluation. On the other hand, a formative evaluation is selected "to determine the weakness in the instruction so that revisions can be made to make them more effective and efficient" (Smith & Ragan, 1993, p. 388). In other words, a formative evaluation, done during the design or development phases, is used to obtain information concerning the instructional quality of an unfinished product. Formative evaluation can also inform instructional designers whether they have achieved their objectives and, hence, can continue on with the ID process or whether they need to go back to the design phase (Smith & Ragan, 1993).

Since DB-notebook is an unfinished product and since the purpose of evaluation is to gather data to help improve the prototype, a formative rather than a summative evaluation appeared to be appropriate for this thesis equivalent. However, a formative evaluation, as portrayed by the field of ID, is not really what the author was seeking because it focuses on evaluating the quality (i.e., effectiveness and efficiency) of instruction, whereas the author wanted to assess the usability of DB-notebook. To find an evaluation technique to determine usability, the author had to leave the field of ID and enter the field of HCI. This is because usability is the central thing evaluated in HCI (Preece, 1993). However, along with usability, we must also look at usefulness or utility of a system.

Utility and Usability

According to Nielsen (1998), the value of a system (i.e., whether it is a website, software application, or even a faucet) is determined by two components: utility and usability. Utility answers the question "Does the system do anything that people care about?" For example, does the system help a user perform a job or a task faster and/or better? To a degree, the answer to this question depends on the effectiveness of the features or functionalities offered. Usability responds to the question "Can the user use the system and can he or she do so effectively?" That is, can an end-user complete a task successfully, promptly, and with little difficulty (Ravden & Johnson, 1989)? To an extent, this depends on how easy the user interface is to use and learn, and on whether errors or other problems exist in its design.

In a sense, evaluating utility and usability can be compared to evaluating instruction. In all cases, content (not learner performance) is being assessed, but the content differs. In evaluating utility, the system's features are reviewed to determine if they are useful. In evaluating usability, the user interface is assessed to find out if it is easy to use. In evaluating instruction, the instructional material or computer-based instruction is examined to detect any problems (e.g., unclear directives, inappropriate examples, etc.).

For this thesis equivalent, utility and usability were evaluated. Aesthetics, which was viewed as a category of its own, was assessed as well. The method used to accomplish this is called usability evaluation. Usability evaluation is defined next and a description of who can go about evaluating usability, in what manner, and when follows afterwards (see Table 1 for a brief summary of usability evaluation in an HCI context and formative evaluation in an ID context). Although the methods given are meant to gather data related to usability, the author used these techniques or a modified version to collect information about utility and aesthetics. Opinions were also sought.

Table 1. Summary of Evaluation in an ID Context and Evaluation in an HCI Context

Evaluation	Who can evaluate?	How can they evaluate?	What is being evaluated?
Formative Evaluation in an ID context	Client or client representative	Design review	Determine whether goals meet client's expectations.
	Expert	Expert review	Determine appropriateness of the content to the learner. Find out accuracy and completeness of the content presented in the instructional material.
	End-user	Learner validation • One-to-one evaluation • Small group evaluation • Field trials	Identify problems such as typographical errors, unclear sentences, poor or missing directions, inappropriate examples, unfamiliar vocabulary, etc..
		Ongoing evaluation	
Usability Evaluation in an HCI context (Can be a formative or a summative evaluation)	Designer or expert (acting like end-user)	Analytical evaluation • Heuristic evaluation • Cognitive walkthrough	Assess usability.
	End-user	Empirical evaluation • Observation evaluation • Survey evaluation • Experimental evaluation	Assess usability.

A Human-Computer Interaction Approach to Evaluation

Preece, Sharp, Benyon, Holland and Carey (1994) state that, in the context of HCI, evaluation or, specifically, usability evaluation "is concerned with gathering data about the usability of a design or product by a specified group of users for a particular activity within a specified environment or work context" (p. 602). Although it is ideal to get end-users to evaluate the design (i.e., storyboard, prototype, etc.) or product, it is not mandatory. Designers or experts can also assess. For this reason, usability evaluation is made up of two general categories of

evaluations: analytical evaluation and empirical evaluation (Preece, Sharp, Benyon, Holland & Carey, 1994). In an analytical evaluation, a designer or an expert (e.g., a person in GUI development) performs tasks the way users would. In contrast, in an empirical evaluation, the actual users act on a built prototype. In this thesis equivalent, both kinds of evaluations were used and, therefore, they will be discussed.

Analytical Evaluation. In analytical evaluations, "real users" are *not* involved in the evaluation of a design or a system. Instead, it is the designer or some expert. The idea of using an expert to evaluate a design or a product is also present in the field of ID in the form of an expert review (Smith & Ragan, 1993). However, the thing being evaluated differs in both cases. In an expert review, a subject matter expert examines the appropriateness of the content to the learner and the accuracy and completeness of the content presented in the instructional material. In an analytical evaluation, the expert, acting as a target user, inspects the user interface to see if it is usable.

Two evaluation techniques are commonly used in an analytical evaluation: heuristic evaluation and cognitive walkthroughs (Preece, Sharp, Benyon, Holland & Carey, 1994). A heuristic is a "rule of thumb," a guideline, or general principle. Statements like "prevent errors" and "provide feedback" are examples of heuristics. Heuristic evaluation is a method whereby reviewers use a list of heuristics to guide their evaluation of a design or a system. One advantage of using a heuristic evaluation is that it is inexpensive to conduct yet effective in detecting major problems. In a cognitive walkthrough, one or more evaluators, acting as target users, examine the user interface by completing a particular set of tasks. They then evaluate how easy the interface is to understand and learn. The aim is to find out how well the interface design guides a user through a specified task.

To evaluate the paper prototype of DB-notebook, something similar to a cognitive walkthrough was done. The SME, who is a reading specialist, was asked to act like the end-user

to complete a specific reading task using the paper prototype (i.e., storyboard). She made comments which were then noted by the author.

A reading expert (RE) and a usability and interface design expert (UIDE) assessed the final prototype. The RE did something like an expert review, which is used in the field of ID. She determined, for example, whether DB-notebook was appropriate to the target group. However, instead of checking the accuracy of the content, she reviewed the effectiveness of the features supplied. That is, she rated the usefulness of the activities and visual outputs (i.e., diagrams and tables) offered in DB-notebook in enhancing comprehension and retention of important information from a given written text. The UIDE, on the other hand, examined the user interface using a list of criteria regarding usability and aesthetics, instead of a list of heuristics. A detailed account of these two expert evaluations will be presented later in this chapter.

Empirical Evaluation. In an empirical evaluation, actual users operate a prototype (i.e., a storyboard, a paper prototype, or a built prototype). The idea of having end-users evaluate is also present in the field of ID in the form of learner validation, such as a one-to-one evaluation, small group evaluation and field trials (Smith &Ragan, 1993). What is examined in both cases, however, varies a bit. In a one-to-one evaluation, intended users utilize the instructional material and identify problems. Problems may include typographical errors, unclear sentences, poor or missing directions, inappropriate examples, unfamiliar vocabulary, and more (Smith & Ragan, 1993). In an empirical evaluation, data related to usability is gathered from "real" users. Users determine such things as whether the user interface is easy to use, learn, and remember, and whether the help offered is really helpful.

Corry, Frick, and Hansen (1997) define usability testing as "the process of involving users to evaluate a system to ensure that it meets usability criteria" (p. 66). Since usability testing utilizes end-users to check ease of use, it can be regarded as an empirical evaluation. Preece, Sharp, Benyon, Holland, and Carey (1994) present three evaluation methods that can be

employed in an empirical evaluation and, in turn, in usability testing: observational evaluation, survey evaluation, and experimental evaluation. In an observational evaluation, the goal is to accumulate information about what users do when they interact with an interface. There are a number of techniques available to collect this kind of data such as direct observation and verbal protocols. Direct observation involves observing users while they work through some specified tasks. The observer takes notes. One disadvantage of this technique is that it is obtrusive and may affect the performance being monitored. Verbal or "think aloud" protocols entail having users talk while they complete specific tasks. This can be videotaped or tape-recorded. One problem with this technique is that users may forget to talk or they may find it difficult to talk and complete a task at the same time. In a survey evaluation, the aim is to gather users' opinions either through interviews or questionnaires. In an experimental evaluation, the objective is to investigate how changes made in an interface design affect aspects of user performance. To determine this, a very controlled environment is set up.

For this thesis equivalent, a combination of observational evaluation and survey evaluation was used. Assessors (i.e., experts and users) were given a task to do. While completing the task, they were asked to explain what they were doing and asked to provide reasons for their actions (i.e., "think aloud" protocol was used). The users were directly observed and their comments and actions were recorded via a tape-recorder and hand written notes. Finally, a post-questionnaire was given to get the users' opinions about DB-notebook. A comprehensive explanation of the empirical evaluation of the prototype will be given shortly.

Summative Evaluation or Formative Evaluation

So far we have answered two questions. Who can conduct an evaluation and how can it be accomplished? Formative evaluation and summative evaluation indicate when it can be done. As in the field of ID, usability evaluation can either be a summative or a formative one. Which it is depends on when evaluation happens. A summative evaluation takes place after a product has

been put into operation (Preece, 1993). The purpose is to test how well the completed system works. A formative evaluation occurs before a product is implemented (Preece, 1993). The information obtained from the assessment is then used to make improvements. Since the final DB-notebook prototype is far from being completed and since the purpose for its evaluation was to gather recommendations for improvement, the assessment of DB-notebook can be considered a formative one. A detailed account of this formative evaluation follows.

Formative Evaluation of DB-notebook

Subjects. Two experts were involved in the formative evaluation of the final DB-notebook prototype: a RE and a UIDE. The RE assessed three things: the appropriateness of DB-notebook for the intended audience; the usefulness of the before-, while-, and after- reading activities and the visual outputs offered by DB-notebook for a particular reading task and reading material; and the prototype's general usability. Her opinions about reading from a computer screen and the use of computers to take and review notes were also gathered. The UIDE reviewed DB-notebook in terms of its usability and aesthetics. In the case of usability, particular attention was paid to learnability (i.e., how easy was the prototype to use and learn), navigation (i.e., how easy was it to move around), error correction (i.e., how helpful were the error messages) and assistance (i.e., how good was the help). In the case of aesthetics, attention was focused on appearance (i.e., how appealing was DB-notebook's look), interaction (i.e., how fast did it respond), and enjoyment (i.e., was it boring to use).

Five users also evaluated the final prototype. Out of these five, three users claimed that they had no difficulty with comprehension of written text and two users stated that they did have problems. DB-notebook is meant for the latter group of users. However, lack of comprehension should not be due to any language, psychological, or physical inability. All five users assessed DB-notebook in terms of its utility, usability, and aesthetics. For utility, the users rated the usefulness of the strategies or activities and visual outputs. For usability, the users reviewed DB-

notebook in terms of learnability, navigation, and assistance. For aesthetics, they evaluated DB-notebook in terms of appearance, interaction, and enjoyment. Finally, their opinions about reading from a computer screen and the use of computers to take and review notes were collected.

Criteria. The criteria to evaluate usability (i.e., learnability, navigation, and assistance) and those to assess aesthetics (i.e., appearance, interaction, and enjoyment) were obtained from Head's (1999) book entitled Design Wise. These criteria were designed to evaluate information resources, but they seemed general enough to assess DB-notebook. The criterion of enjoyment, however, should have been changed to satisfaction instead. This is because enjoyment seems more appropriate for a game than a tool. Nevertheless, enjoyment was used to determine whether DB-notebook was boring or frustrating to use and whether a user would use it again. It is important to note that users' satisfaction was also determined.

Design. An analytical evaluation and an empirical evaluation were conducted once the prototype was finished. For the analytical evaluation, a UIDE was involved. For the empirical evaluation, six users participated. A RE did something like an expert review, which is related more to the field of ID than the field of HCI. In all cases the evaluations were one-to-one.

Instruments. A number of instruments were used to conduct the evaluation and to gather data: a script, a consent form, a pre-questionnaire, a sheet containing the reading task and evaluation tasks, a list of criteria, and a post-questionnaire. A "think aloud" protocol and direct observation were used as well. All these are expanded on here.

At each of the seven evaluation sessions, a script with accompanying visual aids (see Appendix C) was used to introduce DB-notebook and to explain the purpose of the assessment. It was meant to help keep the evaluation sessions relatively consistent. The script, however, varied slightly depending on whether an expert or a user was evaluating.

Before the evaluation began, the assessors, except for the UIDE, were given a consent form (see Appendix C) to sign.

Pre-questionnaires (see Appendix D) were used to collect general information about the expert or the user. The pre-questionnaires, however, were not the same for all assessors. For example, the UIDE was asked to provide some information about his background and computer skills only. The RE was requested to do the same, but she was also asked to comment about her opinions towards computers and electronic texts. Furthermore, she was instructed to point out the strategies used by skilled and less skilled readers. The users were directed to provide information about their background, computer skills, and opinions towards computers and electronic texts. They were also requested to identify the reading strategies they used before, while and after reading.

A sheet containing the reading task and the specific evaluation tasks to complete (see Appendix C) was utilized as well. This was meant to inform and guide the expert or the user. Unfortunately, the author observed that the extra activity of looking at this task sheet was too much. Although it was presented to all participants, it was hardly used, except to explain the reading task. Instead, the author verbally explained the next task to do, if the need arose.

The UIDE also received a list of criteria (see Appendix C). It was meant to guide his comments concerning DB-notebook's usability and aesthetics.

A "think aloud" protocol was employed with all assessors. That is, the assessors were prompted to verbalize their thoughts while they used DB-notebook. This was tape-recorded. The purpose of the "think aloud" was to accumulate data related to user-requirements as well as problems related to usability and aesthetics.

Direct observation was also done and was meant to complement the "think aloud" protocol. In addition to the users' comments, the author also noted the users' actions and any pop up messages or problems that occurred.

Post-questionnaires (see Appendix E) were used to gather the experts' and users' attitudes towards DB-notebook. All the post-questionnaires had a section that asked general usability questions about DB-notebook. The sections that followed, however, differed depending on who the assessor was. For example, the RE was asked to assess the appropriateness of the reading strategy (i.e., SQ3R) for the given reading task and the appropriateness of DB-notebook to the target user. The RE and all of the five users were also requested to rate the usefulness of the before-, during-, and after-reading activities as well as the visual outputs offered by the prototype. Every user and the UIDE were asked to review the usability and aesthetics of DB-notebook. Finally, all the assessors, except for the UIDE, were asked once again for their opinions (i.e., opinions towards reading from a computer screen and the usefulness of computers to take and review notes). It is noteworthy that some of the questions in the post-questionnaire came from Ravden and Johnson (1989) and from Brooke (1996).

Constraints. The evaluation of DB-notebook did not occur without problems and limitations. First, it was difficult to recruit students representing the target group because it was hard to tell who had difficulty understanding written text. It was even more challenging to determine whether the problem in comprehension was because the user lacked strategies. Two students appearing to fit the target group were found by writing assistants. The other three students were writing assistants as well and, as such, were considered skilled readers at the outset.

Five users does not seem like a large number, but in usability testing a few people is enough to find major problem areas. However, it is better if these users are part of the target group. To verify whether a user was actually a skilled or a less skilled reader, the participant was asked to identify, in the pre-questionnaire, the strategies she used before, while and after reading. A RE was also asked to identify the strategies skilled and less skilled readers used. To find out if a user was actually a skilled reader or not, her answers were matched against the answers obtained from the RE. Unfortunately, it was only later that the author realized that the instrument

(i.e., the section on reading strategies found in the pre-questionnaire) given to the RE was not completely the same as that given to all five users. Moreover, the RE's responses were not always conclusive. For instance, the RE could not always indicate if a strategy should be used or not because the length and complexity of the reading material was not specified. Hence, it was difficult to determine whether the users were really skilled readers or not. Consequently, there is a threat to external validity, since results gathered cannot be generalized to all less skilled readers.

Two other threats to external validity exist as well. First, using a computer to take and review notes from an electronic text was a novel activity. It can be viewed as a new experience because most users indicated that they did not normally do this. Second, the use of DB-notebook was not done under normal conditions. The users had to talk while they used the prototype. At the same time they were observed and tape-recorded. This intimidating environment might have affected their comments and behavior.

Data Analysis. The RE's assessment of the appropriateness of DB-notebook and the assessors' opinions related to computers are presented in a discussion format to reflect the qualitative nature of this information. Information related to the assessors' background and DB-notebook's utility, usability, and aesthetics are also supplied in a discussion format, since three subtly different evaluations were conducted. That is, one group of three assessors received no introduction at all, another group of two users was shown how to use DB-notebook, and one final group of two users obtained basic information about the prototype. A more comprehensive look at the five users' results (i.e., regarding reading strategies used and DB-notebook's utility, usability, and aesthetics) is also provided via descriptive statistics (i.e., mode, mean, and standard deviation). Frequencies and percentages are used to summarize the users' background. Responses, comments, suggestions for improvement, strengths, and weaknesses were compiled and are provided in the appendices.

Procedure. The experts and users were first contacted to establish different times for evaluating the final DB-notebook prototype. In the case of the RE, an appointment was set up through the SME. The UIDE and five users were contacted directly by the author.

The procedure for evaluation was essentially the same for everyone and all the evaluations took place at the McConnell Library Building at Concordia University in a class or room on the fifth floor. Furthermore, the same IBM computer, supported on a trolley, was used in all evaluations.

First, the assessor was introduced to DB-notebook and informed of the goal of the evaluation session. Second, the assessor was asked to sign a consent form, except for the UIDE. Third, he or she was requested to complete a pre-questionnaire. Fourth, the author either demonstrated how to use DB-notebook, or introduced the main features and activities present in DB-notebook, or excluded this part altogether. Fifth, the assessor was given the reading task. The UIDE was also presented with a list of criteria concerning usability and aesthetics. Sixth, he or she was permitted to use DB-notebook. The assessor was asked and often prompted to talk aloud. This was tape-recorded. In addition, the author observed and took notes. Finally, once the task was completed, the assessor filled out a post-questionnaire. At the end of the evaluation session, the user was paid then or later. The experts were not paid.

Results

Once a final prototype was produced, a number of things were evaluated: the appropriateness of DB-notebook (i.e., for the target group), the utility of the features offered, and the usability and aesthetic appeal of the user interface. The assessors' (i.e., experts and users) level of satisfaction with the prototype was determined as well. Strengths, weaknesses, problems, comments, and suggestions for improvement were also compiled. Finally, opinions concerning reading from a computer screen and using the computer to take and review notes were gathered. All data were obtained from the pre-questionnaire, post-questionnaire, "think aloud" protocol, and through observation.

The results below are partitioned into six categories: background information, appropriateness, utility, usability, aesthetics, and opinions. Each category is further divided into four sections. The first three sections present the results collected from three slightly different evaluation sessions. That is, in one session, assessors received no demonstration and no brief description of DB-notebook; in another session, assessors received a demonstration; and in a final session, assessors received a brief description. Originally, no assessor was supposed to be introduced to DB-notebook since the author believed it was intuitive enough for it to be used on its own. This did not end up being the case. After a few evaluations, the author discovered that DB-notebook was quite unusable as it stood. For example, the initial assessors were uncertain why they were doing things because the reasons behind the general reading strategy and related activities given were not made clear. As a result, the author decided that for the next assessors, she would demonstrate or model how to use DB-notebook with a text other than what the assessor was about to use. While modeling, the author explained the important features (i.e., instruction box, main toolbar, etc.) and went over the reasons for the activities. According to the assessors, this demonstration took too long. So the author concluded, that for the remaining assessors, only the key features would be introduced and a brief rationale for the activities would be given. Thus,

three slightly different methodologies for evaluating DB-notebook were employed and the first three sections of each category (except for appropriateness) reflect these different evaluation sessions. The fourth section, however, provides a summary of the results (e.g., related to utility, to usability, and to aesthetics) collected from the five users (experts are excluded). To an extent, this summary is supplied because it was found that the quality of information given by each group was fairly the same. That is, readers using DB-notebook often experienced similar problems and gave similar comments. As such, it was felt that an overall look at the data collected from the users was valid.

Background Information

Via the pre-questionnaire, general background information was collected from the reading expert (RE), usability and interface design expert (UIDE), and all five users. The RE also provided data regarding the reading strategies used by skilled and less skilled readers for a given reading task. Some of this information is referred to below. Users also indicated the degree to which they understood and remembered content from reading material. Moreover, they pointed out how often they used given reading strategies. This data are presented below to differentiate the target group (i.e., less skilled readers) from the non-target group. Information about the users' comprehension and retention of written text and their, as well as the RE's, responses concerning reading strategies is presented in Appendix F.

Background of the Group That Received No Demonstration or Brief Description. The RE, UIDE, and one student user, called U1, made up this group. The RE chosen to evaluate DB-notebook has been a learning and study skills specialist for two years. Prior to that, she was a teacher for 19 years. Some of that time was spent as a remedial reading teacher. Presently, it is part of her job to help undergraduate students improve their reading skills. For example, she works with them on their texts and she conducts workshops. She has also written a distance

education manual on reading skills. She indicated that she felt very comfortable using a computer and that she had worked on a PC and a Mac.

A faculty member from the Educational Technology Programme was the UIDE. He pointed out that he was experienced in evaluating software usability and interface design. He also mentioned that he felt very comfortable using a computer.

U1 was a 29-year-old female whose first language is Chinese. She was a graduate student in Art Education/Studio Arts at Concordia University. She stated that she did not feel comfortable using a computer. Nevertheless, she had worked on a PC and a Mac. U1 admitted that she had difficulty comprehending class assigned texts, but she explained that once she managed to understand the reading material, she could remember the important ideas. Although U1 claimed to have a hard time understanding reading material, it does not appear to be because she lacks strategies. For example, in the pre-questionnaire, she indicated that she summarized most of the time and that she always created questions to ask herself (the RE pointed out that these two things were usually done by skilled readers). Thus, U1 appears to use strategies when she reads and, therefore, cannot be considered a target user. It is important to note, however, that this conclusion might be incorrect since it is based on data gathered from a self-reported instrument.

Background of the Group That Received a Demonstration. Two users, called U2 and U3, made up this group. U2 was a 21-year-old female whose first language is English. She was a full-time undergraduate student in English Literature/Creative Writing at Concordia University. It was her fourth year. She pointed out that she felt moderately comfortable using a computer and always used a PC. U2 also indicated that she rarely had difficulty comprehending class assigned texts. However, it was sometimes difficult for her to remember the important ideas. Since she did not claim to have problems with comprehension of written text, U2 is not considered a target user. Nevertheless, her difficulty retaining key ideas may stem from lack of strategies. For example, she indicated that she rarely summarized or asked herself questions about the text.

U3 was a 33-year-old female whose first language is Hungarian. She was a part-time certificate student in Applied Human Sciences/Family Life Certificate at Concordia University. It was her third year. She mentioned that she felt moderately comfortable using a computer and always used a PC. U3 also indicated that she sometimes had difficulty comprehending class assigned texts. Moreover, it was often hard for her to remember the important ideas. Her problems in comprehension and retention may be because she lacks strategies. For example, she pointed out that she never summarized and rarely asked herself questions about the reading material. As such, she can be considered a target user.

Background of the Group That Received a Brief Description. Two users, called U4 and U5, made up this group. U4 was a 22-year-old female whose first language is English. She was a full-time undergraduate student in English Literature/Creative Writing with a minor in Linguistics at Concordia University. It was her second year. She pointed out that she felt comfortable using a computer but always used a PC. U4 also indicated that she rarely had difficulty understanding class assigned texts or remembering the important ideas. Consequently, she is not considered a target user.

U5 was a 21-year-old female whose first language is English. She was a full-time undergraduate student in Anthropology/Creative Writing at Concordia University. It was her fourth year. She stated that she felt comfortable using a computer and always used a PC. She mentioned that she rarely had difficulty comprehending class assigned texts. However, it was sometimes hard for her to remember the important ideas. Since she did not claim to have problems with comprehension of written text, U5 is not considered a target user. Nevertheless, her difficulty retaining key ideas might stem from lack of strategies. For example, she pointed out that she rarely summarized.

Summary of Users' Background and Reading Strategies. Table 2 provides an overview of the users' background. One thing that can be noted is that all five users were female.

Table 2

Frequency Distribution for Demographics

Question	Frequency	Percentage
Gender		
Male	0	0.0%
Female	5	100.0%
Age		
Early 20s	3	60.0%
Late 20s to early 30s	2	40.0%
Mother Tongue		
English	3	60.0%
Chinese	1	20.0%
Hungarian	1	20.0%
Programme		
English Literature/Creative Writing	2	40.0%
Anthropology/Creative Writing	1	20.0%
Applied Human Sciences/Family Life Certificate	1	20.0%
Art Education/Studio Arts	1	20.0%
Year		
2-3	3	60.0%
More than 3	2	40.0%
Student Status		
Unknown	1	20.0%
Full-time	3	60.0%
Part-time	1	20.0%
Level of Comfort Using Computer		
Not very comfortable	1	20.0%
Moderately comfortable	2	40.0%
Comfortable	2	40.0%
Platforms Used		
PC and Mac	1	20.0%
PC mainly	4	80.0%
Attended Reading Workshop		
Yes	1	20.0%
No	4	80.0%

Table 3 provides a summary of the extent to which users claimed to have had difficult understanding and retaining content from written text. A five point scale from "never" to

"always" was used. Each item on the scale was assigned a value ranging from –2 to +2. The negative means (means = - 0.20 for both comprehension and retention) indicate that users, on the whole, did not have difficulty with comprehension and retention of written material. Consequently, this information confirms that the group of five users did not really represent the target group (which should have difficulty in comprehension at minimum).

Table 3

Summary of Users' Responses Regarding the Frequency Content of Text is Understood and Retained

	Mode 1	Mode 2	Mean	S. D.
Frequency content is understood	-1		-0.20	1.30
Frequency important ideas are retained	-1	0	-0.20	0.84

Table 4 presents an overview of the extent to which users employed particular before-, while-, and after-reading activities. A five point scale from "never" to "always" was used (a value was assigned from –2 to +2, respectively). In regards to before-reading activities, users identified purpose for reading and predicted content from the title most of the time (mean = 1.00 for both). The RE indicated that skilled readers usually do these two activities. She also pointed out that skilled readers identify reading aids and predict content from headings. This was done some of the time by the users (mean = 0.00 for identifying reading aids and mean = 0.20 for predicting from headings). Headings were rarely used to create an outline of the text (mean = - 0.80). The RE stated that this activity was not always necessary and that its use should depend on the complexity of the reading material and task. In terms of while-reading activities, the five users almost always predicted meaning of unfamiliar words from context (mean = 1.60). The RE agreed that this is an important strategy. Reading every word, however, is not a strategy used by skilled readers. Nevertheless, this was often done by the users (mean = 0.60). They, however, rarely copied lots of information out of the text (- 1.40), but they also rarely summarized (mean =

- 0.80). The RE pointed out that skilled readers summarize. They also focus on important information and think about the way the author organized the content. These last two activities were not often done by the users (mean = - 0.20 for both). Finally, with respect to after-reading activities, users often re-read their underlined/highlighted text (mean = 1.40). They rarely created something visual (mean = - 0.80). They also did not often ask themselves questions about the text (mean = - 0.20). The RE indicated that skilled readers usually do these last two after-reading activities. Overall, users sometimes acted like skilled readers (i.e., used strategies skilled reader use) and sometimes they did not. This indicates that the users reading skills could be refined, even though they may not have had difficulty with comprehension of reading material.

Table 4

Summary of Users' Responses Regarding the Use of Before-, While-, and After-Reading Activities (Strategies)

Before-Reading Activities	**Mode 1**	**Mode 2**	**Mean**	**S. D.**
Identify purpose for reading	2		1.00	1.41
Identify reading aids			0.00	1.58
Predict content from title	1	2	1.00	1.22
Read all headings	1		0.00	1.41
Use headings to create outline of text	-2		-0.80	1.30
Predict content from heading	1		0.20	1.64
Think of questions to answer	-1	1	0.00	1.00
While-Reading Activities				
Read every word	2		0.60	1.67
Focus only on what appears to be important	1		-0.20	1.30
Feel like looking up unfamiliar words	0	1	0.20	0.84
Predict meaning of unfamiliar words	2		1.60	0.55
Underline/highlight or take notes of only Important words or phrases	1		0.60	1.14
Underline/highlight chunks of a paragraph	2		0.20	1.79
Copy lots of information out of text	-1		-1.40	0.55
Summarize	-1		-0.80	1.10
Think about the way the author organized the content	1		-0.20	1.30
After-Reading Activities				
Re-read underlined/highlighted text	2		1.40	1.34
Re-read notes taken	-1	2	0.60	1.52
Ask self questions	-1		-0.20	1.30
Create something visual	-1	0	-0.80	0.84
Feel like review strategies help prepare For test	2		0.80	1.30

Appropriateness

The RE assessed the appropriateness of the given reading task, the appropriateness of the general reading strategy (i.e., SQ3R) for the given reading task, and the appropriateness of DB-notebook for the target users. The resulting data were gathered from the post-questionnaire.

The RE found the given reading task was representative of what undergraduate students received as course work. In addition, she agreed that the purpose of the given reading task was to get students to understand the article's content and to retain relevant information. She also

thought that the SQ3R reading strategy (i.e., survey, question, recite/recall, and review) was appropriate for the given reading task. Since DB-notebook is based on SQ3R, the prototype, in turn, could be viewed as suitable for the given reading task.

As for the target group, the RE indicated that DB-notebook was appropriate for readers who had difficulty with comprehension and retention of written text. However, it was not suitable for skilled readers who did not have these problems. She wrote that once the strategic process has been modeled and learned, the reader should be able to apply it independently without a computer program like DB-notebook.

Utility

The RE and all five users indicated the amount of time they thought they spent using DB-notebook. They also pointed out the degree to which the prototype helped them see the "big picture" (i.e., main ideas versus details) and helped them become aware of the reading process (i.e., the steps taken to complete a reading task). Furthermore, the assessors also indicated the degree to which they felt satisfied with DB-notebook in enhancing comprehension and retention of written text. Their level of satisfaction was also collected regarding the "prepare to read" activities, "note taking" activities, "review" activities, and visual outputs. Lastly, they rated the utility or usefulness of the individual activities (i.e., identify purpose, etc.) and the visual outputs (i.e., diagrams, tables) supplied by DB-notebook. Comments and suggestions for improvement, related to utility, were also collected from the post-questionnaire, "think aloud" protocol, and through observation. The assessors' responses, comments, and recommendations regarding utility are presented in Appendix G.

Results Concerning Utility for the Group That Received No Demonstration or Brief Description. The RE felt that she spent more time reading with DB-notebook than usual. U1, on the other hand, was not certain how much time she spent. The RE also indicated that DB-

notebook helped her look at the "big picture" a bit. She explained that, to an extent, it did this by breaking down the reading task. U1 stated that DB-notebook did not help her see the "big picture." Both the RE and U1, however, thought that DB-notebook helped them become a little aware of the reading process. U1 wrote that she liked the "prepare to read" part of DB-notebook, since it guided the user through the article. For example, it prompted users to find headings and bolded words. Finally, the RE found DB-notebook moderately satisfactory in helping to enhance comprehension of written text, but she was neutral about its ability to improve retention. U1 considered DB-notebook moderately unsatisfactory in enhancing comprehension and retention of written text.

The RE found the "prepare to read" activities moderately satisfactory. For example, she rated most of these activities as useful. However, she viewed "creating an outline using headings" as only moderately useful. U1 was moderately unsatisfied with the "prepare to read" activities. Nevertheless, she found "creating an outline using headings" useful, but "identifying purpose for reading the text" was seen as not useful. U1 rated the other two activities as a little useful.

The RE was moderately satisfied with the "note taking" activities, whereas U1 was moderately unsatisfied. Nonetheless, both assessors indicated that "identifying key ideas and/or terms" was slightly more useful than "asking and answering questions."

The RE found the "review" activities moderately satisfactory. For instance, she rated the three "review" activities as moderately useful. U1, on the contrary, found the "review" activities moderately unsatisfactory. She rated the three activities as a little useful.

As for the visual outputs, the RE viewed them as moderately satisfactory (note that U1 did not indicate her level of satisfaction with the visual outputs). The ER and U1 found the "diagram of the text's outline" (i.e., a concept map of the text's outline) particularly useful and the "linear view of the text's outline" as least useful.

Results Concerning Utility for the Group That Received a Demonstration. U2 felt that she spent more time than usual reading. U3 found that it took her about the same time as usual. U2 and U3 indicated that DB-notebook helped them look at the "big picture" quite a bit or a lot, respectively. U2 explained that the prototype made her sit back and think about the main purpose of the article. U3 noted that DB-notebook focused her attention by getting her to answer questions related to the headings. U3 also found that the prototype made her more aware of the reading process. U2 did not become more aware of it than usual. U2 wrote that she was already familiar with the steps and that it seemed tedious to have to fill out the forms. Lastly, U2 and U3 considered DB-notebook moderately satisfactory in helping to enhance comprehension and retention of written text.

U2 and U3 found the "prepare to read" activities moderately satisfactory and very satisfactory, respectively. Both users found "creating an outline using headings" very useful and "identifying the subject matter of the text" useful. U2 viewed "identifying the reading aids" as not useful, but U3 found it useful.

The two users considered the "note taking" activities as moderately satisfactory. Nevertheless, U3 rated the two "note taking" activities as a little useful. U2 viewed "asking and answering questions" useful, but "identifying key ideas and/or terms" was seen as a little useful.

Both users found the "review" activities moderately unsatisfactory. For instance, U3 rated all three activities as a little useful. U2 found "comparing key ideas/terms" useful, but the other two were viewed as a little useful.

U2 and U3 were moderately satisfied and very satisfied with the prototype's visual outputs, respectively. U2, however, preferred the "linear outline of the text." U2 and U3 found the "diagram of the text's outline" useful as well. U2 did not consider the "diagram of the questions, answers, and examples" useful, but U3 did. U2 did not consider the "table of the comparison questions and answers" useful either, but U3 found it moderately useful.

Results Concerning Utility for the Group That Received a Brief Description. U4 indicated that it took her about the same time as usual to read with DB-notebook. U5 felt that it took her more time than usual. U4 also pointed out that DB-notebook did not make her look at the "big picture" more than usual nor did it make her more aware of the reading process. She wrote that DB-notebook basically led her through the steps that she would have gone through anyways. U5, on the contrary, found that DB-notebook helped her look at the "big picture" quite a bit. She noted that the prototype asked her for specific things, which then got her to look for those things. DB-notebook, however, did not make U5 more aware of the reading process. She explained that the steps shown in DB-notebook are usually in the back of her mind. Finally, U4 found DB-notebook moderately satisfactory in helping to enhance comprehension of written text, but U5 was neutral about this. Both users, however, saw DB-notebook as moderately unsatisfactory in enhancing retention of written text.

U4 and U5 found the "prepare to read" activities quite satisfactory. For instance, the two users found "creating an outline using headings" very useful. Both also agreed that "identifying the subject matter of the text" was useful. All the other activities were viewed as either useful or moderately useful.

Both users were quite satisfied with the "note taking" activities as well. U4, however, was given the option to enter questions or key ideas/terms. This is because she found them similar. She chose the later and found it very useful. U5 rated the two "note taking" activities as useful.

U4 found the "review" activities moderately satisfactory, whereas U5 found them moderately unsatisfactory. That is, U4 found two out of three "review" activities useful. "Get quizzed on questions" was rated as only a little useful. U5, on the other hand, found two out of three "review" activities as not useful. "Compare key ideas/terms" was rated as moderately useful.

U5 considered the visual outputs very satisfactory, but U4 was neutral about them. Nonetheless, the two users found "the linear outline of the text" very useful. U5 also found "the diagram of the text's outline" very useful, while as U4 found it moderately useful. All other outputs were rated useful by U5 and a little useful by U4.

Summary of Results Regarding Utility. Table 5 displays a summary of the extent to which DB-notebook helped users look at the "big picture" and helped them become aware of the reading process. A five point scale from "not at all" to "a lot" was used (a value was assigned from –2 to +2, respectively). Overall, it appears that DB-notebook got users to look at the "big picture" a bit (mean = 0.40). However, the prototype did not make them aware of the reading process more or less than usual (mean = 0.00).

Table 5

Summary of Results Regarding Users' Responses Related to the "Big Picture" and the Reading Process

	Mode	Mean	S. D.
Big picture	1	0.40	1.52
Reading process	0	0.00	0.71

Table 6 presents an overview of the users' level of satisfaction with DB-notebook in enhancing comprehension and retention of written text. Table 7 shows a summary of the users' level of satisfaction with the "prepare to read" activities, "note taking" activities, "review" activities, and visual outputs offered in DB-notebook. A five point scale from "very unsatisfactory" to "very satisfactory" was used for both (a value was assigned from –2 to +2, respectively). It appears that users found DB-notebook somewhat satisfactory in enhancing retention (mean = 0.60) and just a bit less satisfactory in enhancing comprehension (mean = 0.40). As for the activities and outputs, users where particularly satisfied with the visual outputs

(mean = 1.25) followed by the "prepare to read" activities (mean = 1.10). They were less satisfied with the "review" activities (mean =

- 0.06).

Table 6

Summary of Results Regarding Users' Level of Satisfaction With the Enhancement of Comprehension and Retention

	Mode	Mean	S. D.
Satisfaction/Comprehension	1	0.40	0.89
Satisfaction/Retention	1	0.60	0.89

Table 7

Summary of Results Regarding Users' Level of Satisfaction With the Activities and the Outputs Offered in DB-notebook

Overall Satisfaction With Activities and Outputs	Mode	Mean	S. D.
"Prepare to read" activities	2	1.10	1.24
"Note taking" activities	1	0.80	1.10
"Review" activities	-1	-0.60	0.89
Visual outputs	2	1.25	0.96

Table 8 provides a general idea of the utility of the activities and outputs offered in DB-notebook. A five point scale from "not useful" to "very useful" was used (a value was assigned from –2 to +2, respectively). In regards to the "prepare to read" activities, creating an outline using headings was considered quite useful (mean = 1.80). Identifying the purpose for reading was seen as least useful (mean = - 0.60). In terms of the "note taking" activities, both were viewed as somewhat useful. However, identifying key ideas/terms has a slightly higher mean (mean = 0.20) than asking and answering questions (mean = 0.00). Regarding the "review" activities, getting quizzed on questions was not seen as particularly useful (mean = - 1.20) and getting quizzed on key ideas/terms was viewed as only a little useful (mean = -0.80). Comparing

key ideas/terms was somewhat useful (mean = 0.00). As for visual outputs, the linear and non-linear outline of the text was considered useful (both with a mean = 1.20). Not so useful was the table of questions (mean = - 0.50) and the diagram of the key ideas/terms (mean = - 0.25).

Table 8

Summary of Results Regarding Utility of the Activities and Outputs Offered in DB-notebook

"Prepare to Read" Activities	**Mode 1**	**Mode 2**	**Mean**	**S. D.**
Identify subject matter	1		0.60	0.89
Identify purpose	-1		-0.60	1.14
Identify reading Aids	1		-0.20	1.30
Use headings to create outline	2		1.80	0.45
"Note Taking" Activities				
Ask and answer questions	-1	1	0.00	1.15
Identify key ideas/terms	-1		0.20	1.30
"Review" Activities				
Quiz questions	-1		-1.20	0.45
Quiz key ideas/terms	-1		-0.80	1.10
Compare key ideas/terms	-1	1	0.00	1.00
Visual Outputs				
Linear outline of text	2		1.20	1.30
Non-linear outline of text	1	2	1.20	0.84
Diagram of questions			0.00	1.83
Diagram of key ideas/terms	-1		-0.25	0.96
Table of key ideas/terms	0		0.00	0.82
Table of questions			-0.50	1.29

Usability

The UIDE and all five users indicated their level of satisfaction with the usability of the user interface in terms of learnability (i.e., how easy was the prototype to use and learn), navigation (i.e., how easy was it to get around) and assistance (i.e., how helpful was the online help). The users further rated different aspects of learnability (e.g., how complex was the prototype, etc.), navigation (e.g., did users ever feel lost, etc.), and assistance (e.g., how limited was the online help, etc.). A five point scale from "strongly disagree" to "strongly agree" was used for this evaluation. Thus, results were interpreted as "strongly disagree," "disagree,"

"neutral," "agree," and "strongly agree." Comments and suggestions for improvement, related to aesthetics, were also gathered from the UIDE, ER, and five users from the post-questionnaire, "think aloud" protocol, and through observation. The assessors' responses, comments, and recommendations regarding usability are presented in Appendix H.

Results Concerning Usability for the Group That Received No Demonstration or Brief Description. The UIDE and U1 considered learnability as moderately unsatisfactory. The UIDE explained that DB-notebook was a complex piece of software that would need some time and effort to learn how to use. U1 indicated that DB-notebook was not complex. However, she pointed out that it was not very easy to use or learn. She also found it inconsistent in terms of layout, color, and response. Moreover, she was not clear as to what needed to be done to complete a form and she did not feel confident using DB-notebook.

The UIDE and U1 rated navigation as moderately unsatisfactory. The UIDE wrote that the main toolbar was not clearly identified and, hence, it was not noticed and used. He added that once a user knew about the toolbar, it was easy to navigate through the prototype. U1 indicated that it was not difficult to get around DB-notebook. However, she did not always know where she was and felt lost at times.

The UIDE found assistance very satisfactory. He commented that the online help was very clear. U1 rated assistance as moderately satisfactory. For example, she did not find it limited. She also indicated that she did not need help in a hard-copy form.

Results Concerning Usability for the Group That Received a Demonstration. U2 rated learnability as moderately satisfactory. She indicated that DB-notebook was complex, but easy to use and learn. She also found the prototype consistent in terms of layout, color, and response. U3, on the other hand, viewed learnability as moderately unsatisfactory. She did not find the prototype easy to use and she did not find it consistent. She also felt like there was a lot to learn

and she pointed out that she did not feel confident using DB-notebook. While U2 was clear about what needed to be done to complete a form, U3 was not.

U2 viewed navigation as moderately satisfactory. For instance, she did not find it difficult to get around the prototype. She also did not feel lost. U3 was neutral about navigation. However, she indicated that she felt lost at times and that she did not always know in which part of DB-notebook she was. She was not able to go where she wanted as well.

U2 did not use the help feature. U3 did and considered it moderately unsatisfactory. Nonetheless, U3 indicated that the online help was not useless and that it helped answer her questions. However, she would like it in a hard-copy form rather than on the computer.

Results Concerning Usability for the Group That Received a Brief Description. U4 rated learnability as somewhat unsatisfactory, whereas U5 viewed it as moderately satisfactory. U4 indicated that the prototype was complex and not easy to use or learn. She also did not feel confident using the prototype. Lastly, it was not always clear what needed to be done to complete a form. U5, on the other hand, found the prototype easy to use, learn, and consistent in terms of layout, color, and response. In addition, U5 was clear about what had to be done to complete a form.

U4 was neutral about navigation. U5 was very satisfied with it. Neither user found it difficult to get around the prototype. However, U4 did not always know where she could go and could not always go where she wanted. U5 did not have these problems.

U4 and U5 did not use the online help.

Summary of Results Regarding Usability. Table 9 provides a general idea of the users' level of satisfaction with usability in terms of learnability, navigation, and assistance. A five point scale from "very unsatisfactory" to "very satisfactory" was used (a value was assigned from –2 to +2, respectively). On average, Learnability was considered slightly unsatisfactory (mean = -

0.20). Navigation was viewed as a little satisfactory (mean = 0.40). Assistance is difficult to evaluate since the mean is based on the responses given by two out of five users.

Table 9

Summary of Results Regarding Users' Level of Satisfaction With Usability

Usability	Mode	Mean	S. D.
Learnability	-1	-0.20	1.10
Navigation	0	0.40	1.14
Assistance		0.00	1.41

Table 10 presents a summary of the users' responses towards different aspects of learnability, navigation, and assistance. A five point scale from "strongly disagree" to "strongly agree" was used (a value was assigned from –2 to +2, respectively). In regards to learnability, on average, users agreed that the prototype was complex (mean = 0.20) and hard to use (mean = - 0.20). Users also did not feel confident using DB-notebook (mean = - 0.60) and were not always clear what needed to be done (- 0.40). Regarding navigation, users did not find it difficult to get around (mean = -1), but they did not always know where they were (mean = - 0.40) or where they could go (mean = - 0.25). Finally, in terms of assistance, the online help seemed to answer all questions (mean = 0.50) and was not considered limited (mean = -1) or useless (-0.5). However, this information is based on two users.

Table 10

Summary of Results Regarding Users' Responses to Different Aspects of Learnability, Navigation, and Assistance

Learnability	Mode 1	Mode 2	Mean	S. D.
Tool was complex	0	1	0.20	0.84
Tool was easy to use	-1		-0.20	1.64
Technical support was needed	-1		-0.60	1.14
There were too many inconsistencies	-2		-0.20	1.79
Tool was quick to learn			0.00	1.58
User felt confident using tool	-1		-0.60	1.14
User needed to learn a lot of things	-2		-1.00	1.41
User was clear on what needed to be done	-1	1	-0.40	1.34
Navigation				
It was difficult to get around	-1		-1.00	0.71
User knew where she was	0		-0.40	1.14
User felt lost			0.00	1.83
User knew where she could go	0		0.00	0.82
User could go where she wanted	-1		-0.25	0.96
Assistance				
Help was limited			-1.00	1.41
Help answered all questions			0.50	0.71
Help was useless			-0.50	0.71
Hard-copy preferred			0.50	2.12

Aesthetics

The UIDE and all five users indicated their level of satisfaction with the aesthetic appeal of the user interface in terms of appearance (i.e., how did the prototype look), interaction (i.e., how fast did it respond), and enjoyment (i.e., how appealing was it to use). The users further rated different aspects of appearance (e.g., how easy was the content to see and read, etc.), interaction (e.g., how quick did the program process information, etc.), and enjoyment (e.g., how frustrating was it to use). Comments and suggestions for improvement, related to aesthetics, were also gathered from the UIDE, ER, and five users from the post-questionnaire, "think aloud" protocol, and through observation. The assessors' responses, comments, and recommendations regarding aesthetics are presented in Appendix I.

Results Concerning Aesthetics for the Group That Received No Demonstration or Brief Description. The UIDE rated appearance as moderately satisfactory. Nonetheless, he recommended that the computer screen be less cluttered. U1, on the other hand, indicated that appearance was moderately unsatisfactory. For example, U1 did not find the content logically organized or easy to see and read. She also felt very overloaded by all the things on the screen. Furthermore, she believed that visual aids were lacking a lot.

The UIDE found it difficult to evaluate interaction. U1 viewed it as moderately satisfactory. For instance, she found the prototype quick in responding and processing information.

The UIDE and U1 were neutral about enjoyment. The UIDE explained that DB-notebook was not a game and that it would not be used for entertainment. However, he wrote that it was useful as a tool. Although neural about enjoyment, U1 indicated that she got very bored using the prototype and that she felt frustrated in some parts. Nevertheless, she would use it and recommend it to others, if improvements were to be made.

Results Concerning Aesthetics for the Group That Received a Demonstration. U2 rated appearance as moderately satisfactory. For example, U2 indicated that she found the content logically organized and easy to see and read. She also really liked having the screen divided in two (i.e., DB-notebook on the left and the text on the right). U3, however, was neutral about appearance. Nevertheless, U3 pointed out that she found the content not very logically organized and difficult to see and read. She also felt overloaded by the things on the screen. Both users did not find visual aids lacking.

U2 and U3 rated interaction as moderately satisfactory. For example, both indicated that the prototype was fast in responding.

U2 was neutral about enjoyment. U3 was very satisfied with it. Both pointed out that they did not get bored using the prototype. However, U2 would not use the prototype frequently. U3,

on the other hand, would use it and she would recommend it to others. U2 wrote that she would only recommend it to people who enjoyed working on computers and who wanted to take notes more effectively.

Results Concerning Aesthetics for the Group That Received a Brief Description. U4 rated appearance as moderately satisfactory. U5 was neutral about it. Both found the content logically organized and easy to see and read. The two users also really liked having the screen divided in two. Only U5 found that visual aids were lacking.

U4 and U5 rated interaction as very satisfactory. Oddly, however, user # 4 indicated that DB-notebook was slow in responding and in processing information.

U4 rated enjoyment as moderately satisfactory. U5 was neutral about it. Neither got bored using the prototype, but U4 wrote that she sometimes felt frustrated. Neither would use DB-notebook frequently. U4 explained that she did not want to change her own note taking system. Only U4 would recommend DB-notebook to others, but mainly to people who found it hard to read and take notes.

Summary of Results Concerning Aesthetics. Table 11 provides an overview of the users' level of satisfaction with aesthetics in terms of appearance, interaction, and enjoyment. A five point scale from "very unsatisfactory" to "very satisfactory" was used (a value was assigned from -2 to +2, respectively). Interaction was considered most satisfactory (mean = 1.40) followed by enjoyment which was viewed as somewhat satisfactory (mean = 0.60). Appearance was the least satisfactory of all the three criteria related to aesthetic appeal (mean = 0.20).

Table 11

Summary of Results Regarding Users' Level of Satisfaction With Aesthetics

Aesthetics	Mode 1	Mode 2	Mean	S. D.
Appearance	0	1	0.20	0.84
Interaction	1		1.40	0.55
Enjoyment	0		0.60	0.89

Table 12 presents a summary of the users' responses towards different aspects of appearance, interaction, and enjoyment. A five point scale from "strongly disagree" to "strongly agree" was used (a value was assigned from –2 to +2, respectively). In regards to appearance, it can be seen that, on average, users felt somewhat overloaded (mean = 0.60) by DB-notebook. However, they did not seem to mind having the screen divided in two (mean = 1.20). In terms of interaction, users found the prototype fairly quick in responding to their actions (mean = 0.80) and a little less quick in processing information (i.e., creating a concept map) (mean = 0.40). Finally, regarding enjoyment, users did not get very bored (mean = - 0.60) or very frustrated (mean = - 0.33) using DB-notebook. However, it would not be used frequently (mean = - 0.20). It would, nevertheless, be recommended to others (mean = 0.80).

Table 12

Summary of Results Regarding Users' Responses to Different Aspects of Appearance, Interaction, and Enjoyment

Appearance	Mode 1	Mode 2	Mean	S. D.
Content was easy to see and read	1		0.00	1.41
User felt overloaded	0		0.60	0.89
Content was logically organized	-1	1	0.40	1.34
Visuals were lacking	-1	2	0.00	1.87
User liked divided screen	2		1.20	1.10
Interaction				
Tool was slow in responding	-2	-1	-1.20	0.84
Tool was quick in responding	1	2	0.80	1.64
Tool was quick in processing information	1		0.40	1.52
Enjoyment				
User got bored using tool	-1		-0.60	1.52
User was interested in using tool throughout task	0		0.60	0.89
User felt frustrated using tool	0		-0.33	0.58
User would use tool frequently	-1		-0.20	1.64
User would recommend tool to others	0	1	0.80	0.84

Opinions

The RE and all five users revealed their opinions regarding the use of computers to take and review notes from reading material. In addition, they shared their feelings about reading electronic text from a computer screen. Finally, they stated whether a tool like DB-notebook should be made available for paper-based texts. The data below were collected from the pre- and post-questionnaires.

Opinions Gathered From the Group That Received No Demonstration or Brief Description. In the pre-questionnaire, the RE noted that although she recognized the possible value of computers as a tool to take notes with, especially as more people own laptops, she was uncertain whether computers could be useful to take and review notes from reading material. She also did not recommend its use to students because most use pen and paper during class. In addition, since the conversation about reading from a computer has never really arisen, she has

focused on reading from paper. After using DB-notebook, the RE remained unconvinced whether computers could be useful to take and review notes except for, perhaps, recording and reviewing key words. Regarding U1, in the pre-questionnaire she indicated that she did not use a computer to take and review notes. She was also uncertain whether computers could be useful for these two activities. However, after using DB-notebook, her mind was changed. She noted that computers could be useful for both tasks. For example, these activities could be made easier and could be accomplished faster with such a tool. Nevertheless, the current software would need to be improved.

The RE pointed out that she was not very fond of reading text from a computer screen. The glare of the screen bothered her, so the lighting had to be good. She said that if she found something interesting on the Internet, she would rather print it out than read from the screen. U1 also found it hard to read from a computer screen because she got lost in the electronic text. In both cases, reading a text from a computer screen was viewed as unpleasant.

U1 indicated that a program like DB-notebook was a good idea for paper-based texts. The RE wrote that a software like DB-notebook could help less skilled readers internalize some aspects of reading effectively by getting them to be strategic (i.e., by getting them to go through the steps). She added that a program like DB-notebook, however, could be frustrating for skilled readers because it would force them to externalize some of these strategic behaviors and this may make them feel too constrained. On the other hand, she explained that such a program could cause a strong reader to reflect on these behaviors, which might, in itself, be a positive learning experience.

Opinions Gathered From the Group That Received a Demonstration. In the pre-questionnaire, U2 and U3 indicated that they did not use a computer to take and review notes. Both also mentioned that they were uncertain whether computers could be useful to take notes. U2 explained that it might be too much trouble to use the computer to take notes. She would

rather write them out by hand. As for reviewing with a computer, U3 mentioned that she was uncertain of its usefulness, whereas U2 indicated that computers could be useful to review. U2 explained that software could ask pertinent questions that could help the reader understand the text. After using DB-notebook, U2 and U3 indicated that computers could be useful to take notes. U2 added, however, that she would not be inclined to use it to take notes because she would then be stuck in front of a computer, which would be tiring. Both also agreed that computers could be practical for reviewing. U2 explained that computers could be useful to review if good questions are available to help readers understand the individual text.

U2 wrote that she found it very tiring to read from a computer screen. She would rather print a text out and read it at her leisure, anywhere, instead of being stuck in front of a computer. U3 noted that she did not like reading from a computer screen either. She found it hard on the eyes. She said that if she found an interesting text, she would rather print it out than read from the screen. Only if she needed specific information would she scroll through the text on the computer. In the case of these two users, paper-based texts were preferred over text displayed on a computer screen.

Both users were uncertain whether a tool like DB-notebook should be made available for paper-based texts. U2 explained that it would be too tedious to be worthwhile. She added that if the notebook could provide some basic ideas to think about when analyzing a text, then it could help people read any kind of text, electronic or otherwise.

Opinions Gathered From the Group That Received a Brief Description. In the pre-questionnaire, U4 indicated that she was unsure whether computers could be useful to take and review notes. However, she realized that computers were useful for a lot of things. She also considered them as being especially useful to take notes from electronic text and she added that, if a program could be practical to take notes, it could be helpful to review them. She mentioned that, personally, she used a computer to type important ideas while reading, but she did not use it

to review. Although U4 was uncertain, she had a positive attitude towards computers. After using DB-notebook, U4 was able to indicate, with more certainty, that computers could be useful to take notes because the texts used were Internet articles that could be viewed on the computer screen. Reviewing was also seen as useful since the computer software could lead a learner through some steps. U5 pointed out that she did not use a computer to take or review notes. She also revealed that she was uncertain whether computers could be useful for these two activities. She found it faster to take notes by hand. However, she mentioned that she was open to new strategies, but it depended on the software and the method offered. After using DB-notebook, U5 specified that computers were not useful to take notes. She explained that long hand was faster and forced a person to pay more attention to what he or she was writing. Reviewing, however, could be helpful depending on the methodology used.

U4 wrote that she was partial to paper-based texts. Nevertheless, she pointed out that if it was easy to scroll through a text displayed on a computer screen, she did not particularly mind. U5 stated that it did not bother her to read from a computer screen as long as the text was not too long. If it was more than ten pages, it would become uncomfortable. She would rather read lengthy texts out of a book. Paper-based texts were preferred by both users. Nonetheless, neither objected reading from a computer screen, if certain conditions were met.

U4 noted that a computer program like DB-notebook would not be good for paper-based texts. She explained that what was really great about DB-notebook was the ability to apply the electronic text directly to the note taking and reviewing tasks. Without that, it would be like reading instructions from the computer and, therefore, not as useful of a program. On the contrary, U5 indicated that a program like DB-notebook was a good idea for paper-based texts because the information (i.e., the breakdown of the reading process) it provided would be helpful. However, reading text from a computer screen for too long was considered unpleasant.

Summary of the Users' Opinions. At the outset, all the users stated that they were uncertain whether computers could be useful to take and review notes. Two users, however, indicated that they saw the potential of using computers. After using DB-notebook, four out of the five users pointed out that computers could be helpful to take notes. One user did not find computers practical for note-taking because she believed that it would be faster to take notes by hand. As for reviewing, all the users indicated that computers could be useful for this, especially if good questions exist or if a good methodology is presented.

All the users preferred paper-based texts to electronic ones. Nevertheless, if certain conditions were met (i.e., if good lighting and a short, scrollable text were provided), they would not mind reading from a screen.

Only two users thought a program like DB-notebook should be made available for paper-based texts. Two users were uncertain and one said that it should not be made accessible because the benefit of DB-notebook lay in its ability to display electronic text.

To conclude, from the formative evaluation a number of weaknesses, particularly related to usability and aesthetics, were discovered (see Appendix J for a brief list of strengths and weaknesses gathered from the post-questionnaire from the RE, UIDE, and all five users). Nevertheless, a few strengths were revealed as well. For one thing, people liked the idea of a tool that could assist students to read and take/review notes more effectively. Users also liked the diagrams provided, the ability to create an outline of their text, and the ability to view an electronic text. Hence, to make DB-notebook a better tool, its strengths need to be amplified and its weaknesses need to be minimized. Suggestions for improvement will follow shortly.

Discussion

The formative evaluation provided valuable information for the improvement of DB-notebook. For instance, the trial of the prototype by experts and users allowed the identification of problems concerning usability and aesthetics. Comments, needs (i.e., user-requirements), and suggestions for improvement were also collected. The "think aloud" protocol and observation were especially useful in extracting this information. With the post-questionnaire, the appropriateness and utility of DB-notebook were determined and the assessors' level of satisfaction was examined. Some strengths, weakness, problems, comments, needs, and recommendations were also compiled.

Regarding the evaluation of the final prototype, it was difficult to find less skilled readers who represented part of the target population. Only two of the students who were recruited claimed to have had difficulty understanding written text. One, however, did not appear to lack strategies. Hence, readers who indicated that they did not have trouble with comprehension assessed the prototype as well. Although Corry, Frick, and Hansen (1997) recommend that the intended audience test the usability of a prototype, the mixture of users in this thesis-equivalent was useful in discovering how skilled readers would view DB-notebook versus less skilled readers.

Since DB-notebook was designed for less skilled readers, it was important to determine whether it was appropriate for these readers. A RE addressed the question of appropriateness. She concluded that the prototype was suitable for the target group because it could model a strategic approach to reading. However, she did not think that DB-notebook was appropriate for skilled readers who were already considered as active learners. Although DB-notebook may not be ideal for skilled readers, that does not signify that computers with the appropriate software cannot

facilitate and even enhance the reading experience of these readers. More research is needed to find out the needs of strategic readers.

Because of the slightly different evaluation sessions, three groups of results were presented (plus a summary including all three groups). What was observed is that the quality of information accumulated for each group was about the same. Nevertheless, the quantity varied somewhat. That is, different groups often provided the same comments, problems, and suggestions. However, the group that did not receive any demonstration or brief description discovered the most problems especially in terms of learnability (see Appendix H). This suggests that DB-notebook is not usable as it stands and that some form of introduction is necessary.

Each group's assessment of DB-notebook's utility or usefulness was examined. Nonetheless, a more comprehensive look, which included all the five users' inputs, was made as well. In regards to the time spent reading an article using the prototype, no one thought that they spent less time than usual. Either it was about usual or more than usual. It must be noted that since DB-notebook was a bit hard to manipulate, time had to be invested in learning how to use it. Even though using DB-notebook did not manage to save the reader time, it appears to be have at least gotten users to look at the overall ideas of an article rather than the details, even though only slightly more than usual. The prototype achieved this by getting assessors to think about the purpose of the article and by encouraging them to answer questions or look for particular things. DB-notebook appears to have been less effective in increasing users' awareness of the steps taken to accomplish a reading task. The RE explained that, to some extent, DB-notebook could raise readers' awareness of the reading process because it breaks the reading task down. Two readers, however, claimed that they already did what DB-notebook suggested. As a result, the prototype did not make them any more aware of the reading process as before.

With respect to the activities and outputs offered in DB-notebook, users were most satisfied with the visual outputs (i.e., diagrams and tables). The linear and non-linear illustrations of the outline of the reading material were found to be particularly helpful. The other diagrams

and tables, however, were viewed as less practical. For instance, one user did not understand the reason for visually presenting questions and answers. This is a valid point and more investigation is needed into determining the kinds of visual outputs that can enhance comprehension and retention of written text. Users were also somewhat satisfied with the "prepare to read" activities. They found the activity of creating an outline of the text using headings especially useful. This is interesting because most users claimed that they did not normally generate an outline before they read. Users also found it somewhat practical to identify the subject matter. The other two "prepare to read" activities were considered less useful. This may be because no information was available explaining their purpose. The two "note taking" activities were seen as somewhat useful. However, identifying key ideas/terms was viewed as slightly more helpful than asking and answering questions. Nevertheless, some people claimed that the two note-taking tasks were very much alike. That is, a reader could gather the same kind of notes with both activities. This did, indeed, prove to be a problem. One possible solution is to make only one task available (i.e., identify key ideas/terms). Another alternative is to allow any kind of notes to be entered, be they ideas/definitions or questions/answers, in one note-taking area instead of two. As for the "review" activities, they were not as well accepted. One user even wrote that these activities should be removed. The disappointment with the "review" tasks may stem from the user interface being too overwhelming and not intuitive enough to use. In addition, the purpose for doing these tasks might have been less apparent. A less busy screen and more information may help rectify this problem to some degree.

The usability of DB-notebook was investigated in terms of learnability, navigation, and assistance. The major problem area appeared to be learnability. Three out of five users found it moderately unsatisfactory. The results related to the different aspects of learnability provided some insight. For example, users did not appear to feel confident using DB-notebook and were not always clear what needed to be done. From the "think aloud" and through observation, a better understanding of the problem was gained. For one thing, the steps required to use the

prototype often did not match the users' expectations. For example, many users expected the "open file" button to be in DB-notebook, but it was in Microsoft Word™ instead. The method to enter information was also not always consistent. That is, data could be entered either by clicking a "paste" icon or by pressing the "enter" key. Moreover, the function of some controls was not always clear. For instance, when users saw two boxes, it took a while for them to realize that in the top box data had to be entered and in the bottom box data was displayed. Lastly, users were not always certain how to complete a task and sometimes felt unsure of what was expected of them. An in-depth look at ways to minimize these problems is presented later. Regarding navigation, it was mainly a problem for people who did not receive a demonstration or a brief introduction. For example, they rated it as moderately unsatisfactory. This was because the main toolbar blended in with Microsoft Access™'s toolbar and was unnoticeable unless its presence was revealed. Nevertheless, one user who received an introduction to the prototype claimed to have felt lost and two indicated that they could not always go where they wanted. Once a person knew about the toolbar, he or she could jump from one form to another easily. However, it was observed that it was not so easy to go from one section (i.e., heading) to another, which was necessary so that notes could be linked to the appropriate section of the text. The form that allowed users to hop from section to section, however, was not intuitive to use. This form would need to be improved. Finally, it is hard to evaluated assistance since only two users rated it. One found it moderately satisfactory and the other found it moderately unsatisfactory. Nevertheless, it was observed that when the online help was used, it was not very helpful. That is, it did not adequately assist the user in completing the activity on the form. The reasons behind this would need to be studied further.

To obtain a better understanding of the look and feel of the prototype, information about its aesthetic appeal in terms of appearance, interaction, and enjoyment was gathered. In regards to appearance, it was considered to be the least satisfactory out of all three criteria. For one thing, users felt overloaded by DB-notebook. Through observation and the "think aloud" protocol it was

discovered that the screen was considered too busy. Other problems were also encountered. For example, a few forms blended together, a picture was judged misleading, and visual aids and color were lacking. Thus, improvements are required to rectify these shortcomings. Some suggestions will be looked at later. As for interaction, most people were satisfied with the response rate and processing power of the program. Finally, enjoyment was viewed as somewhat satisfactory. However, some problems with enjoyment were noted. For instance, one user claimed to be bored using DB-notebook and two indicated that they felt frustrated at times. As for using it again, only the two users who claimed to have difficulty with comprehension pointed out that they would use DB-notebook on other occasions. Two other users explained that they were not interested in employing the prototype because they were happy with their own reading techniques. Three out of five users, however, would recommend DB-notebook to others. However, some indicated that these people should, first, like working on a computer and want to read and take notes more effectively. It is believed that once problems related to usability and aesthetic appeal are resolved, the prototype will be more appealing to users, especially the target group.

The major purpose of DB-notebook is to get learners involved in a strategic approach to reading. At the same time, however, the prototype intends to facilitate and make the tasks of taking and reviewing notes more effective. This latter objective is of interest because it has the potential of making the prototype appealing to all types of readers, not just less skilled ones. To determine how users' felt about the use of computers to take and review notes, their opinions on this topic were collected. It was discovered that most users did not normally use the computer for these two activities. Only one user claimed to take notes via a computer. Before using DB-notebook, all the users indicated that they were uncertain whether computers could be useful to take and review notes. Two users explained that it was faster and less troublesome to take notes by hand. After using DB-notebook, the users' feelings towards computers seemed to change. Most users, except for one, agreed that computers could be useful to take notes. One explained

that this was especially true because of the ability to view an electronic text. Another recognized that a computer could facilitate the tasks of taking and reviewing notes. Despite the positive views, one user believed that long hand was faster and would force a reader to pay more attention. Another also stated that she would not like to be stuck in front of a computer. As for reviewing using a computer, all users saw it as useful. Two students added, however, that good questions or a good methodology must exist. It is believed that some of the students' concerns, especially related to using the computer to take notes, may be alleviated by the advancement of technology. For example, electronic books or eBooks (Moschella, 1999), which are small lightweight computers designed to display reading material, may provide the freedom some users seek. Electronic notepads (Smart Computing, 1999), with a cordless pen, can be an option for people who prefer to write rather than type. Lastly, using the computer may become more pertinent once school-assigned texts are available in electronic form.

The users' opinions about reading an electronic text from a computer screen were also assessed. The reason was to find out whether users felt negative or positive towards electronic texts. It is thought that a negative attitude towards electronic texts may translate into a negative attitude towards a computer-based tool like DB-notebook. It was found that all the users preferred reading paper-based texts to electronic ones. Many admitted that they would rather print a text out than read from a computer screen. Some complained that the computer screen was just too hard on the eyes and too tiring. One user added that she did not like being stuck in front of the computer. Another indicated that she got lost in electronic text. In spite of these criticisms, some mentioned that if certain conditions were met, they would not mind reading text from a computer screen. For example, the text should not be too long and scrolling should be easy. It is believed that further research is needed to discover ways to make electronic text more appealing to users and less tiring on the eyes.

To determine whether a tool like DB-notebook could be helpful to read non-electronic reading material, users were asked whether they thought such a tool should be made available for

paper-based texts. Two users said it was a good idea. For example, one user explained that the breakdown of the reading process was helpful. Two users, however, indicated that they were uncertain. One user claimed that it would be too tedious to take notes, but if it could supply things to think about, then it might be useful. Finally, one user stated that it was not a good idea because such a tool would not be as practical with paper-based texts as with electronic ones. For people who have difficulty typing, using a tool like DB-notebook for paper-based texts might seem like a lot a work. However, if such a tool makes the effort worthwhile, it is believed that it would be used even for non-electronic texts. The challenge lies in creating a computer-based tool that fulfills people's needs for electronic and paper-based texts.

Some suggestions for improving DB-notebook are presented next. These recommendations were provided by the RE, UIDE, and all five users and they were collected from the post-questionnaire, "think aloud" protocol, and through observation (note that the ideas concerning the concept map came from the author).

Suggestions for Improvement

Suggestions for improvement can be grouped into seven categories: include more information, make DB-notebook simpler, make DB-notebook intuitive, make DB-notebook more consistent, add some features and color, get users to be more active, and allow users to practice using DB-notebook. Each of these will be looked at soon. Table 13 provides an overview of the comments/suggestions made by the assessors that led to the suggestions for improvement.

Table 13. Assessors' Comments/Suggestions and Corresponding Suggestions for Improving DB-notebook

Assessors' Comments/Suggestions	Suggestions for Improving DB-notebook
• The prototype did not always explain why something was important to do. • A promotional or introductory slide presentation of the prototype would be nice. • Have a "why" button that, when clicked, will provide an explanation of why the user is doing a particular thing. • The main toolbar was not noticeable, so it was not clear how to navigate through the prototype. • A paper explaining the important parts of the prototype would be nice.	Include more information. For example, provide: • A Microsoft PowerPoint™ presentation, • A "why" button, and/or • A sheet describing DB-notebook's key features (i.e. main toolbar).
• Make screens less busy. • Have less information on the screens. • Simplify DB-notebook. Create a few key tools and make those highly flexible. • DB-notebook should be clearer and easier to use. Any confusion, whatsoever, in the program is going to affect comprehension and retention of the text. • Directives were not always found and the instruction box was often forgotten. • It was irritating to have to scroll through the instruction box. • It would be nice to have a help icon to lead the user through the program. • It would be nice to have a pop up icon with audio as the online help. • The "note taking" part of DB-notebook should not be broken down so much (i.e., box for question, box for answer, and box for examples). • The "note taking" part of the prototype should be less structured because it is not always obvious how information should be categorized. • The notes taken should be put onto one page. The user should then be able to move those notes around on this page. • The two activities (in the "note taking" part) are so similar that by doing one, it fulfills the other. Maybe there should only be one. • If there was a "go back" button and a "next" button, it would have been simpler.	Make DB-notebook simpler. For example: • Replace the instruction box with an icon that provides audio or visual instructions. • Replace the boxes in the "note taking" part of DB-notebook with a treeview. • Merge the "ask and answer" activity with the "identify key ideas/terms" activity. • Limit buttons to "back", "forward", and "close".

Assessors' Comments/Suggestions	Suggestions for Improving DB-notebook
• The form used to enter a new subject matter was not intuitive. After the "add" button was clicked the form remained. The user, however, expected it to close automatically. • The "open file" button was hard to locate. One reason was because the user was expecting it to be in DB-notebook, but it was in Microsoft Word™. A suggestion would be to put the button in DB-notebook.	Make DB-notebook intuitive by matching DB-notebook's action with user's expectation (which is probably based on conventionalities). For example: • When a subject is added to the list, have the form close automatically. • Place the "open file" button in DB-notebook instead of Microsoft Word™.
• The prototype was not always consistent. For example, the method to enter a title was different from the method to enter a heading.	Make DB-notebook more consistent. For example: • There should be only one way to add information.
• The given reading material contains bolded words that could be seen as sub-headings. It would be nice if sub-headings could be added in the outline. • A navigational map may be useful to show where one is and where one can go. • The text is hard to read on the screen. It would be nice if it could take up the whole screen instead of only half. • Consider adding more color and more illustrations. • Try to make the screen less confusing by using a different color for the instruction box at the bottom left of the screen.	Add some features and color. For example: • Permit subheadings to be added. • Include a map for navigational purposes. • Permit electronic text to be enlarged. • Add color to forms.
• In the "quiz" part of DB-notebook (e.g., quiz questions), it would be more enjoyable to write down answers than just guess at them. It could be like a game. • It would be nice to have a fill in the blank quiz with computer scoring preferably. It could offer hints. • It would be helpful to have a place where definitions could be entered. Then, as a review activity, definitions could be matched to key terms.	Get users to be more active in the "review" part of DB-notebook. For example: • Supply fill in the blank activities. • Allow users to match terms with definitions. • Permit users to create or modify a concept map.
• Allow for a practice run. • An example showing how to use DB-notebook would be helpful. • It would be nice if the program could lead users through it. • Have an introduction with step-by-step instructions.	Allow users to practice using DB-notebook. For example: • Provide a tutorial.

Include More Information. Some evaluators directly stated that information was lacking. For example, DB-notebook did not make its purpose clear or expand on the general reading strategy given. It also did not explain the reasons for doing the activities offered. This omission undoubtedly affected DB-notebook in terms of utility. Nevertheless, providing information should rectify this problem. For instance, an introduction to DB-notebook and the reading strategy can be supplied via a Microsoft PowerPoint™ presentation. Furthermore, the purpose of an activity can be described when a "why" button is clicked.

No explanation of the key features (i.e., toolbar, instruction box, etc.) in DB-notebook existed either. As a result, a few assessors (mainly those who did not receive an introduction) were unaware that there was a main toolbar or tabs via which they could navigate. Usability, especially in regards to navigation, was affected by this oversight. One suggestion, therefore, would be to provide users with a sheet describing the key functionalities. A Microsoft PowerPoint™ presentation can also be used to explain the important features in DB-notebook.

Make DB-notebook Simpler. Another general suggestion made was to make the prototype simpler by making the screens less busy. This can be accomplished by removing things that are useless or confusing. For example, the instruction box found at the bottom of each DB-notebook screen was often ignored or was considered irritating. Hence, this box ought to be removed since it did not help with usability. An icon can be added in its place to provide audio, maybe even visual, instructions as to what to do and where to go.

The boxes presented in the "note taking" part of DB-notebook were often confusing. For instance, a few users were not certain in which of the six boxes they should enter their questions, answers, or examples. In addition, all the separate boxes made the note-taking task appear disjointed. These boxes affected usability in terms of learnability. A suggestion would be to get rid of the boxes and replace them with one treeview. A treeview would allow users to view information in a branched format. As such, a question can be viewed and underneath the question

the answer can be provided. Underneath the answer can also come its examples. By pressing a minus sign, information can then be collapsed, so only questions are shown if desired.

Decreasing the number of forms (i.e., activities) can also simplify the prototype. For instance, the two activities offered in the "note taking" part of DB-notebook were seen by many as repetitious. That is, by asking and answering questions, one identifies the main ideas or key terms. By identifying important notions, one gets answers to unstated questions. Although most assessors preferred identifying key ideas and terms, asking questions has its merits as well. It would, therefore, be nice to keep both. However, they should not be on two separate forms. A treeview may be the solution to this problem. It would allow either a question or a key idea/term to be added. For that matter, the user could also add personal notes or a summary. Caution, however, must be taken. That is, the user should be made aware of the kinds of notes (i.e., questions, key ideas, summary, etc.) that can be entered and the benefits and drawbacks of entering those sorts of notes.

Finally, a treeview would remedy another major problem. When using DB-notebook, a few users did not enter notes related to the section or heading they were in. That is, they would be reading the first section of the given text but be in the introduction section (or some other section) in DB-notebook. This may have happened because the users forgot to place themselves in the correct section in DB-notebook or it may have been because they did not know that they had to be in the appropriate section. As a result, all the notes entered were related to the wrong section. This confusion can be avoided with a treeview. The treeview could present the outline of the text. To enter notes, the users can be made to click the heading under which they want the notes to fall. No notes would be entered unless a heading is selected.

Having a treeview for the "note taking" part of DB-notebook could remove a number of difficulties. However, one foreseeable problem with having a treeview is that the information in it may get very long. It may get annoying having to scroll through this. More thought must, therefore, be put into finding a better way to take notes.

Boxes and forms can be removed, but so can a number of buttons. Many buttons (i.e., show outline, questions, continue, etc.) are supplied in DB-notebook. To simplify things, only three buttons can be made available: a "back" button, a "forward" button, and a "close" button. For precise navigation, the main toolbar can be used.

Make DB-notebook More Intuitive. The way to do things in DB-notebook did not always correspond to the way the user thought it should be done. For example, to add a new subject matter, clicking the "add" button should have closed the form. It did not. This went against some user's expectations. It also led to some confusion. The solution to this problem would be to have the form close automatically after the "add" button is clicked. Another example is the "open file" button that was shown in Microsoft Word™, but some users were looking for it in DB-notebook. To correct this, the "open file" button should be placed in DB-notebook. Many such problems existed and, therefore, need to be resolved since they affected the prototype's usability, especially in terms of learnability.

Make DB-notebook More Consistent. Great care was made to make things consistent. Unfortunately, some inconsistencies existed. For example, the way the title had to be entered was not the same as the way the headings had to be entered. A suggestion would be to have one generic way to add information. For example, users can highlight the data and then click an "add" button. If consistency can be guaranteed, then usability should be improved as well.

Add Some Features and Some Color. A few user-requirements were identified during the evaluation. One requirement, however, stood out: DB-notebook should allow subheadings to be added. Other suggestions were also made. For example, DB-notebook should include a map of some sort to help navigation. It should also permit users to enlarge the electronic text, so that it takes up the full-screen.

Lack of color was a problem and influenced usability. For instance, forms were gray, tabs were gray, and even pop up forms were gray. Everything in the end blended in together. A recommendation would be to add color. For example, pop up forms can be in a different color from the main forms and tabs can be highlighted so they can be seen.

Get Users to be More Active. Most users did not find the "review" activities useful. To some degree, it is because the user interface was complex and, consequently, the users did not know what to do. However, users may also not have liked the "review" part of DB-notebook because it was too passive. For example, in the quiz questions part, users simply had to guess the answers to the questions they had entered. Perhaps if users are more involved, the "review" activities can be made more appealing. As an example, the quiz part can be made into a game where users fill out some blanks. Users can also try to match key terms with definitions. Moreover, the graphic organizers provided in DB-notebook can be expanded into a tool that users can use to create a concept map or modify a computer generated one. It is important to note, however, that for the "review" activities to be successful, the screens displaying them should be simple. In addition, information should be provided explaining the reasons for doing the activities and clear instructions should be given on how to complete the activities.

Allow Users to Practice Using DB-notebook. Having a user read a school-assigned text using DB-notebook for the first time is not a great idea because it is not easy to learn content while learning how to use a tool. Time, therefore, must be set aside to learn how to use DB-notebook. A tutorial can provide this opportunity. To alleviate the pressure of school related work, example texts, in electronic form, can be supplied and used instead.

Conclusion

A number of realizations were made during the course of this project. Some insights were gained during the design and the development phases of the prototype. Some understandings were acquired during the evaluation phase and data analysis. They are discussed here.

Rapid prototyping (i.e., the process involving the quick development of a mock up that displays key features) was employed to created DB-notebook. Although this method was utilized, it was inadequately implemented. For instance, the development of the paper prototype and the final prototype was slow instead of fast. One reason for this is that the author wanted to include a large number of features. Another reason is that the author believed she could learn how to program and, at the same time, build a prototype quickly. The author realized that one way to take advantage of rapid prototyping is to limit the features offered to only the pertinent ones. Another way is to make certain a mock up is constructed fast. That means that the developer ought to be familiar with the authoring tool and programming language chosen to build the prototyped. It is not an ideal time to learn.

In addition to the pitfalls experienced during the design and the development phases, the author also made some invalid assumptions that became apparent during the evaluation phase and data analysis. One false idea was to think that the purpose of a reading strategy and its related activities would be self-evident to a user without any form of explanation. Another false notion was to believe that a user interface could be made usable without its repeated assessment by end-users. The author, hence, became conscious of the importance of conducting a formative evaluation, such as usability testing, not only on final prototypes but also on paper prototypes to determine not only usability problems but also to pin point any misconceptions the designer may have.

In assuming that DB-notebook would be usable, it was supposed that the user would be able to learn from a specified reading material while using the prototype. On the contrary, the users were often torn between learning how to use the prototype and learning the content of the given text. The author did not consider that guidance and time is needed to learn how to use a tool for the first time (i.e., even a usable one), whether that tool is a hammer or a computer-based program.

Finally, the author thought that the target group could be easily found. This proved to be incorrect. For one thing, the writing assistants in charge of recruiting less skilled readers had a hard time doing so. In their opinion, people were more average readers than less skilled readers. In the end, however, they managed to find two people who claimed to have difficulty with comprehension of written text. An instrument was then used to determine whether these students as well as the other three (there were five student users in all) were actually less skilled readers or not. Unfortunately, this instrument proved to be faulty and inconclusive. For example, even if a user claimed to use a strategy, it did not imply that the strategy was properly used. That is, if a reader indicated that she highlighted only important ideas, it could not be proven whether what she highlighted was actually relevant, unless she was observed and her notes were analyzed.

The author's goal to create a computer-based tool with the purpose of guiding less skilled readers through a reading task by providing a reading strategy was accomplished. Although the tool was considered as somewhat useful, it was not found to be very usable and lacked a bit in aesthetic appeal. Through the formative evaluation, however, information has been gained that can help make improvements. In the event that the design and development of DB-notebook is pursued, a few general recommendations can be made. First, the number of features provided should be limited and promptly tried out by end-users. Second, a rationale for the features offered should be supplied and its effectiveness evaluated. Third, users should be provided a tour of the tool and/or be allowed to practice using it with example texts before tackling any school related reading task.

Regarding further research, a few suggestions can be made as well. For instance, the development of a profile of strategies used by less skilled readers (i.e., people with difficulty in comprehension because they lack strategies) versus skilled readers (i.e., people with no difficulty in comprehension) may aid in determining user-requirements. This profile could also be used to develop a diagnostic module which could be included in DB-notebook and which would allow readers to determine whether the computer-based tool is appropriate for them or not (this information would also be useful to the designer).

Once DB-notebook is deemed usable, a set of summative trials could be developed to assess whether the prototype actually performs in the instructional manner that was intended. For example, to evaluate the effectiveness and the unique contributions of DB-notebook, an experimental trial could be set up where achievement with DB-notebook is compared both with no special reading instruction and with equivalent and simultaneous experience with a non-computerized form of the prototype. Furthermore, since DB-notebook can be considered a reading tutor, experience with the prototype could be compared with equivalent experience with a human tutor. The usefulness of a web-based adaptation of DB-notebook could also be explored. For example, can a web-based DB-notebook somehow assist distance education?

DB-notebook's primary function is as a reading tutor and, as such, its goal is to help students sharpen their reading skills and abilities. Nonetheless, in using DB-notebook, users were required to take advantage of the strengths of computers (e.g., to store and to retrieve/display information) and to take advantage of electronic texts (e.g., to manipulate information). Hence, to a small extent, DB-notebook intended to challenge our traditional approach to reading (which involves reading paper-based text and taking/reviewing paper-based notes). However, should our traditional approach to reading change to make use of electronic texts and computers? If yes, then how should our approach change and is a computer-based tool like DB-notebook the answer? Further investigation of this topic (on reading, computers, and electronic texts) is required.

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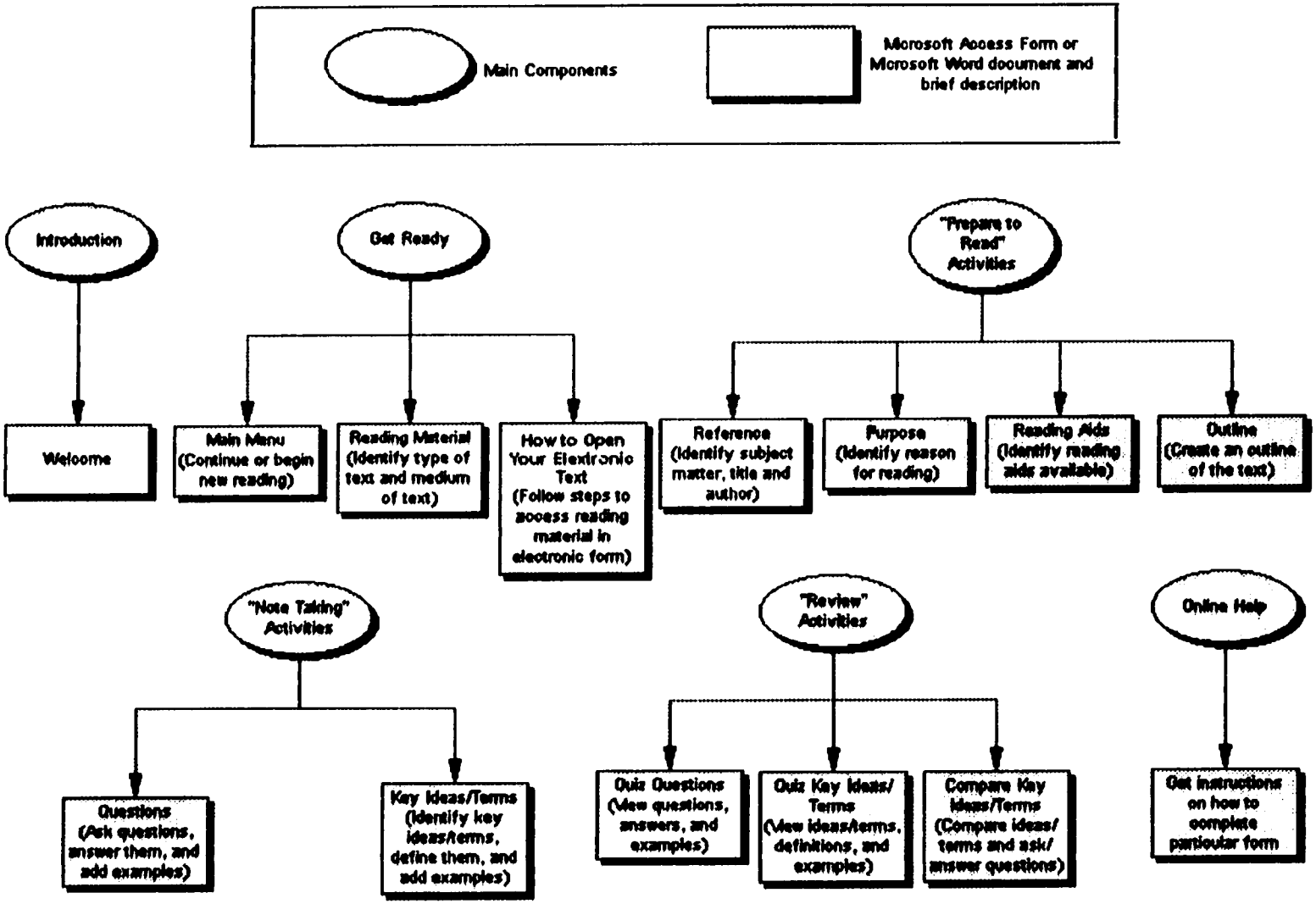
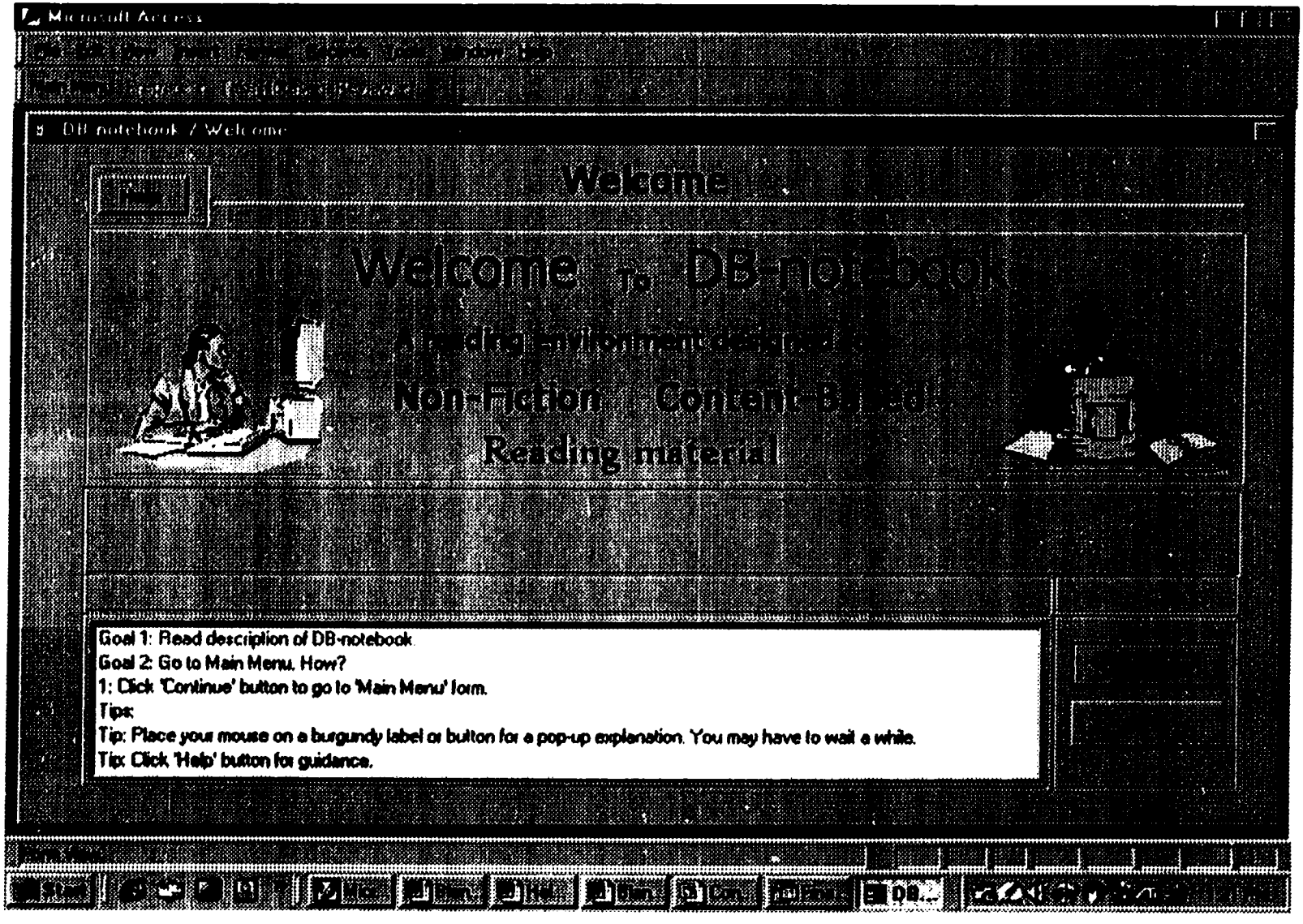
Appendix A

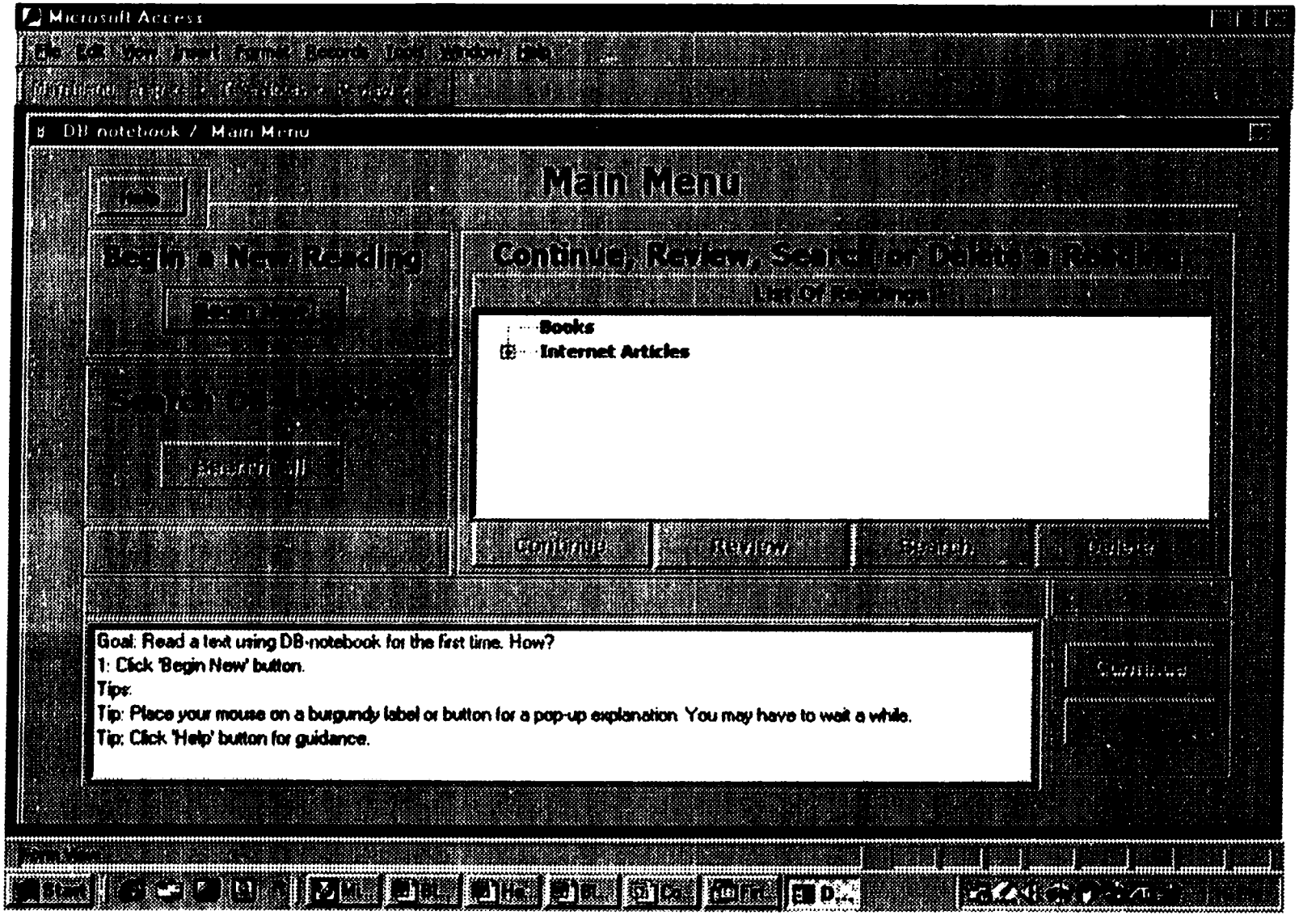
Content Structure

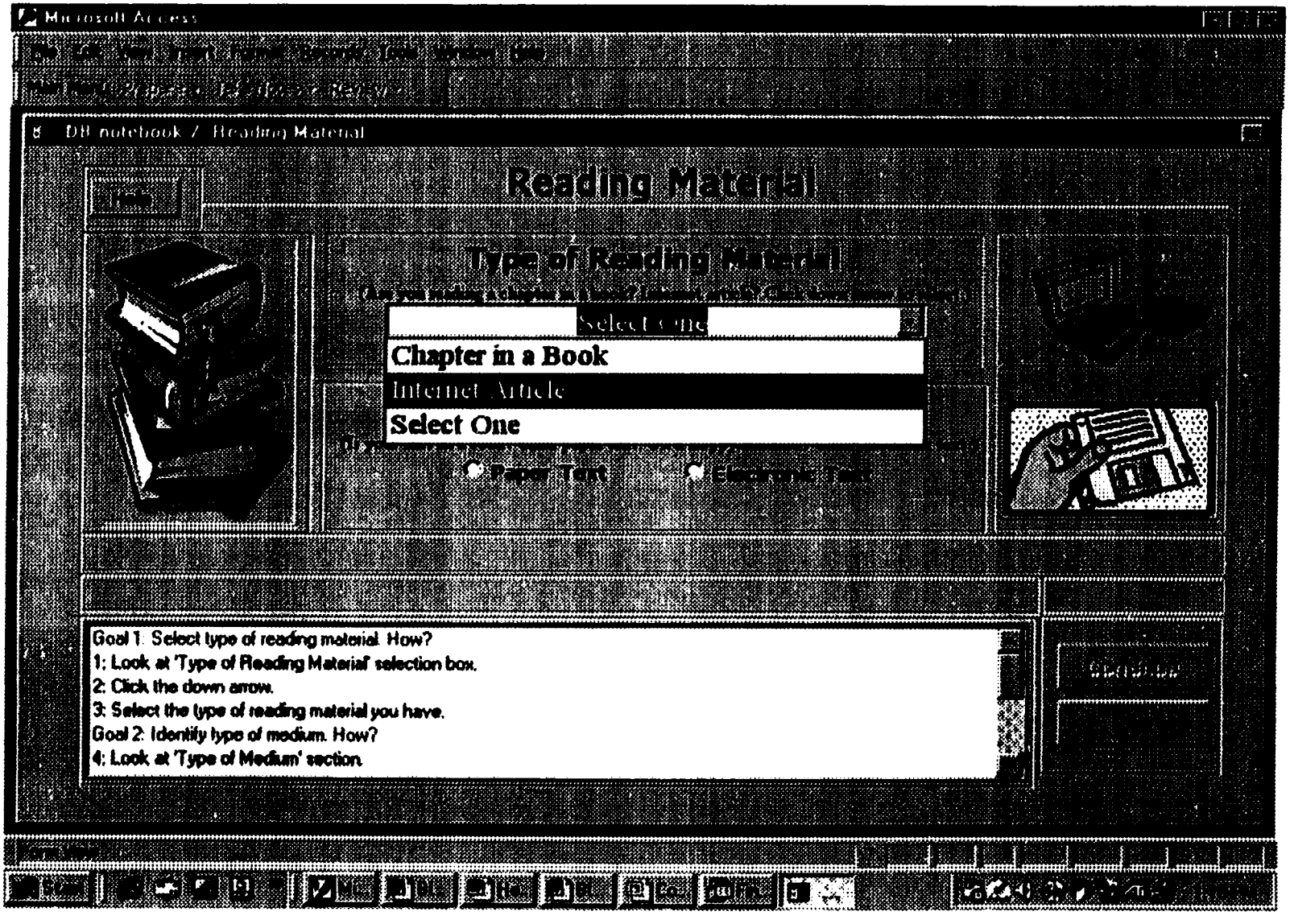

Main Components
Microsoft Access Form or Microsoft Word document and brief description
Introduction
Get Ready
"Prepare to Read" Activities
Welcome
Main Menu (Continue or begin new reading)
Reading Material (Identify type of text and medium of text)
How to Open Your Electronic Text (Follow steps to access reading material in electronic form)
Reference (Identify subject matter, title and author)
Purpose (Identify reason for reading)
Reading Aids (Identify reading aids available)
Outline (Create an outline of the text)
"Note Taking" Activities
"Review" Activities
Online Help
Questions (Ask questions, answer them, and add examples)
Key Ideas/Terms (Identify key ideas/terms, define them, and add examples)
Quiz Questions (View questions, answers, and examples)
Quiz Key Ideas/ Terms (View ideas/terms, definitions, and examples)
Compare Key Ideas/Terms (Compare ideas/ terms and ask/ answer questions)
Get instructions on how to complete particular form

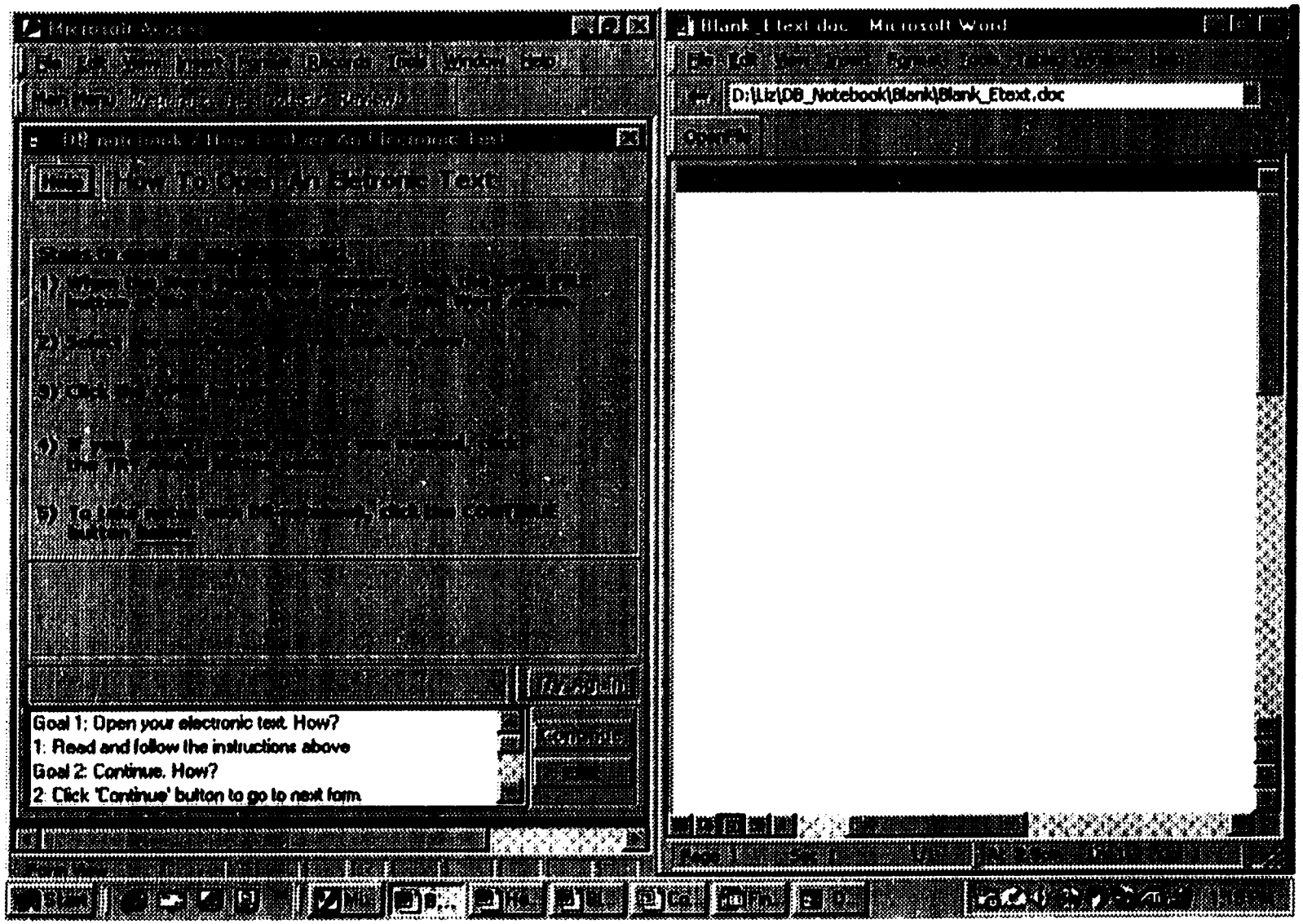
Appendix B

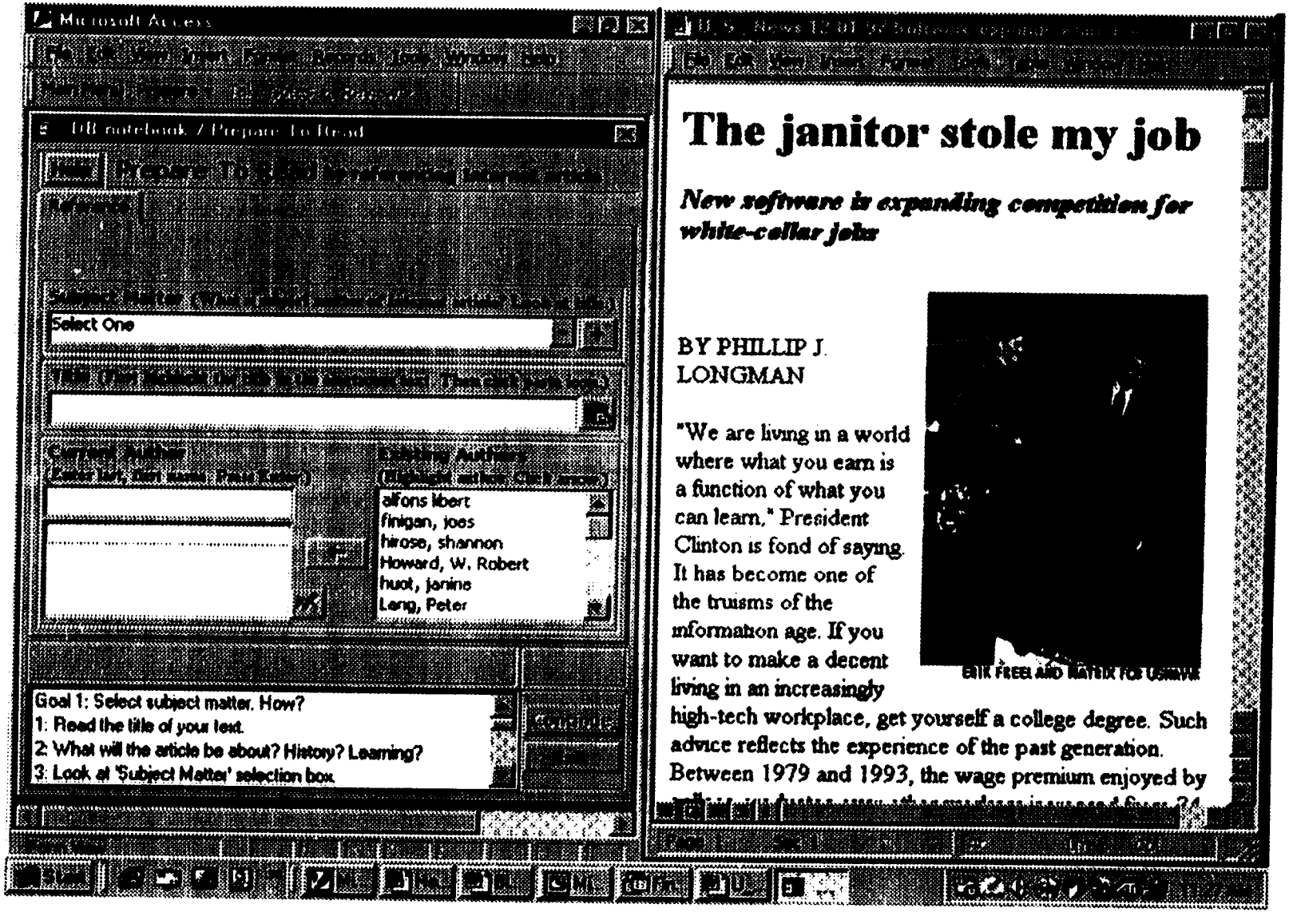
Examples of Screen Layouts


DB-notebook / Welcome
Welcome
Welcome To DB-notebook
Non-Fiction Content-Based
Reading material
Goal 1: Read description of DB-notebook
Goal 2: Go to Main Menu. How?
1: Click 'Continue' button to go to 'Main Menu' form.
Tips:
Tip: Place your mouse on a burgundy label or button for a pop-up explanation. You may have to wait a while.
Tip: Click 'Help' button for guidance.


Microsoft Access
DB notebook / Main Menu
Main Menu
Books
Internet Articles
Goal: Read a text using DB-notebook for the first time. How?
1: Click 'Begin New' button.
Tips:
Tip: Place your mouse on a burgundy label or button for a pop-up explanation. You may have to wait a while.
Tip: Click 'Help' button for guidance.


Microsoft Access
DB notebook / Reading Material
Reading Material
Type of Reading Material
Select One
Chapter in a Book
Internet Article
Select One
Goal 1: Select type of reading material. How?
1: Look at 'Type of Reading Material' selection box.
2: Click the down arrow.
3: Select the type of reading material you have.
Goal 2: Identify type of medium. How?
4: Look at 'Type of Medium' section.


Blank_Etext.doc - Microsoft Word
D:\Liz\DB_Notebook\Blank\Blank_Etext.doc
Goal 1: Open your electronic text. How?
1: Read and follow the instructions above
Goal 2: Continue. How?
2: Click 'Continue' button to go to next form


Microsoft Access
DB notebook / Prepare To Read
Select One
alfons ibert
finigan, joes
hirose, shannon
Howard, W. Robert
huot, janine
Lang, Peter
Goal 1: Select subject matter. How?
1: Read the title of your text.
2: What will the article be about? History? Learning?
3: Look at 'Subject Matter' selection box.
The janitor stole my job
New software is expanding competition for white-collar jobs
BY PHILLIP J. LONGMAN
"We are living in a world where what you earn is a function of what you can learn," President Clinton is fond of saying. It has become one of the truisms of the information age. If you want to make a decent living in an increasingly high-tech workplace, get yourself a college degree. Such advice reflects the experience of the past generation. Between 1979 and 1993, the wage premium enjoyed by

Microsoft Access

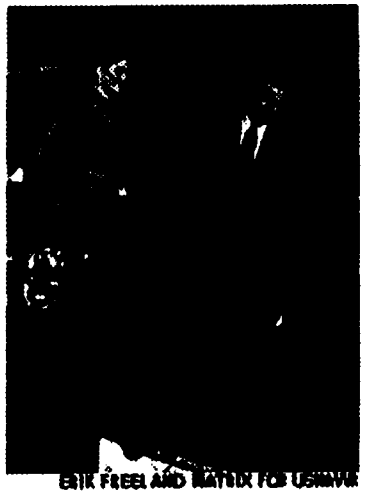
DB notebook : Prepare To Read

Read to get an overview
Gather information for a writing assignment
Critique reading material
Select One
Solve problems

Goal 1: Identify purpose or reason for reading. How?
1: Think of the reason you need to read your text.
2: Look at 'Purpose For Reading' selection box.
3: Click the down arrow.

The janitor stole my job

New software is expanding competition for white-collar jobs



ERIK FREELAND MATRIX FOR USNEWS

BY PHILLIP J. LONGMAN

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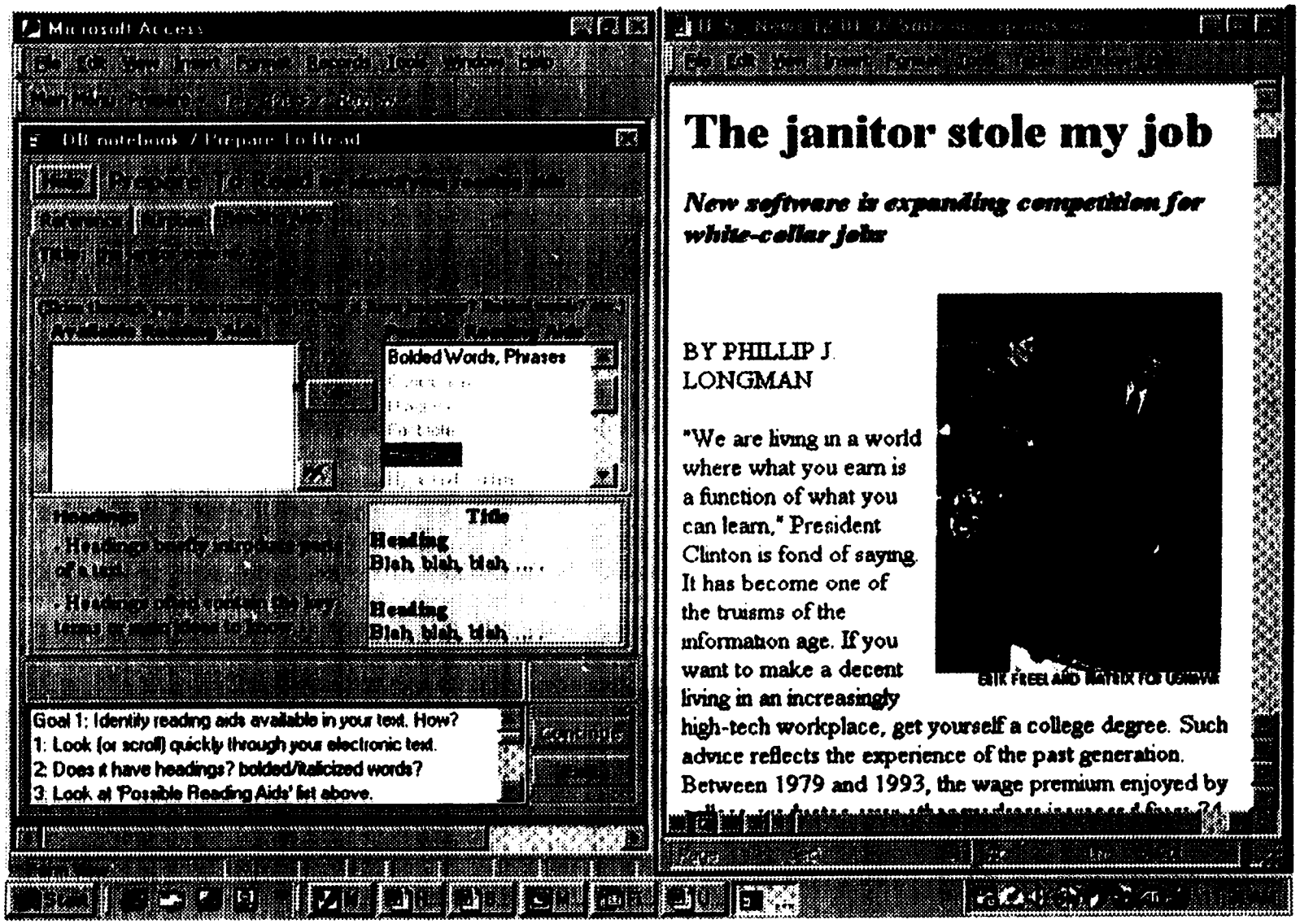
Microsoft Access
DB notebook : Prepare To Read
Bolded Words, Phrases
Title
Heading
Blah, blah, blah, . . .
Heading
Blah, blah, blah, . . .
Goal 1: Identify reading aids available in your text. How?
1: Look (or scroll) quickly through your electronic text.
2: Does it have headings? bolded/italicized words?
3: Look at 'Possible Reading Aids' list above.
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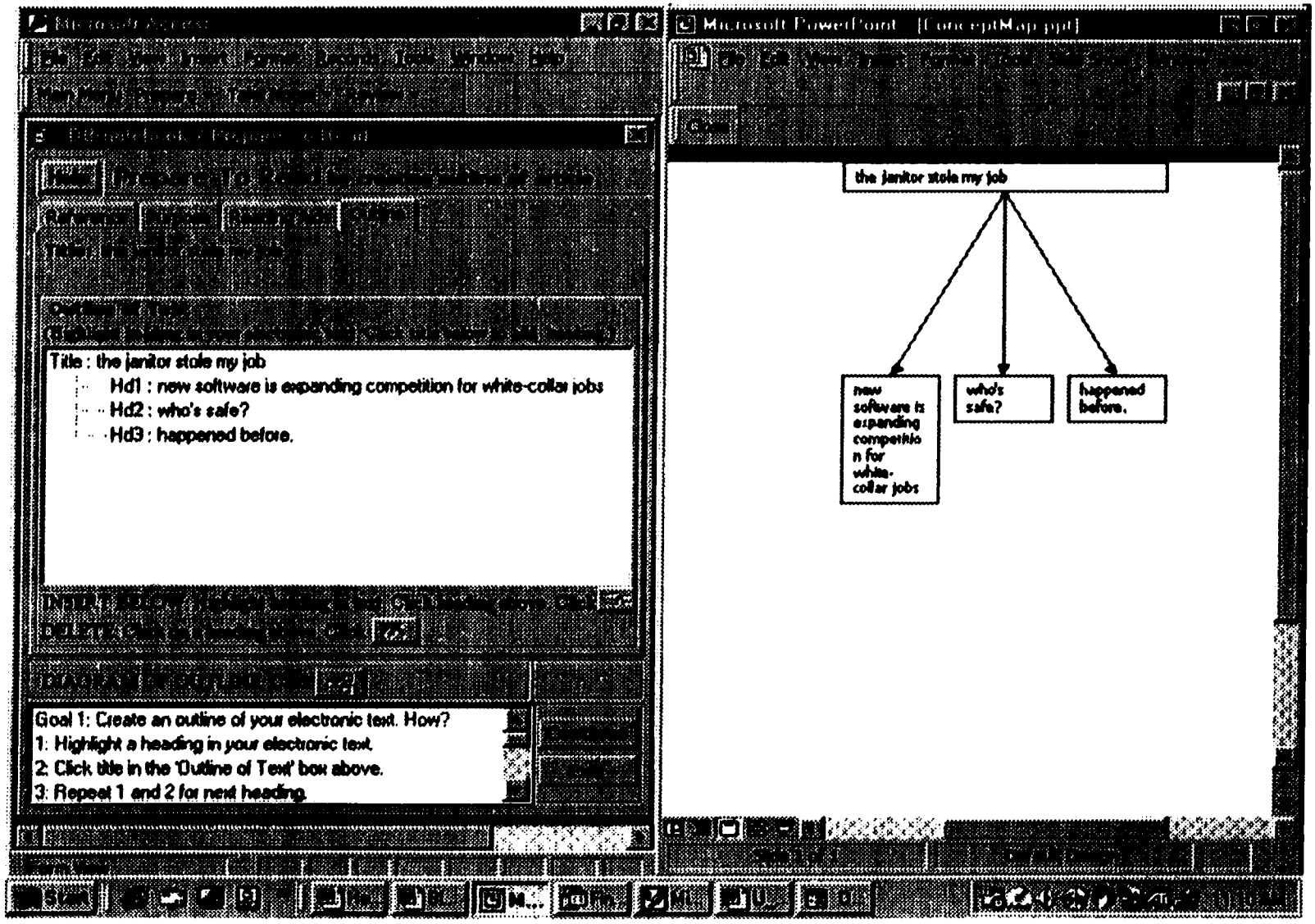
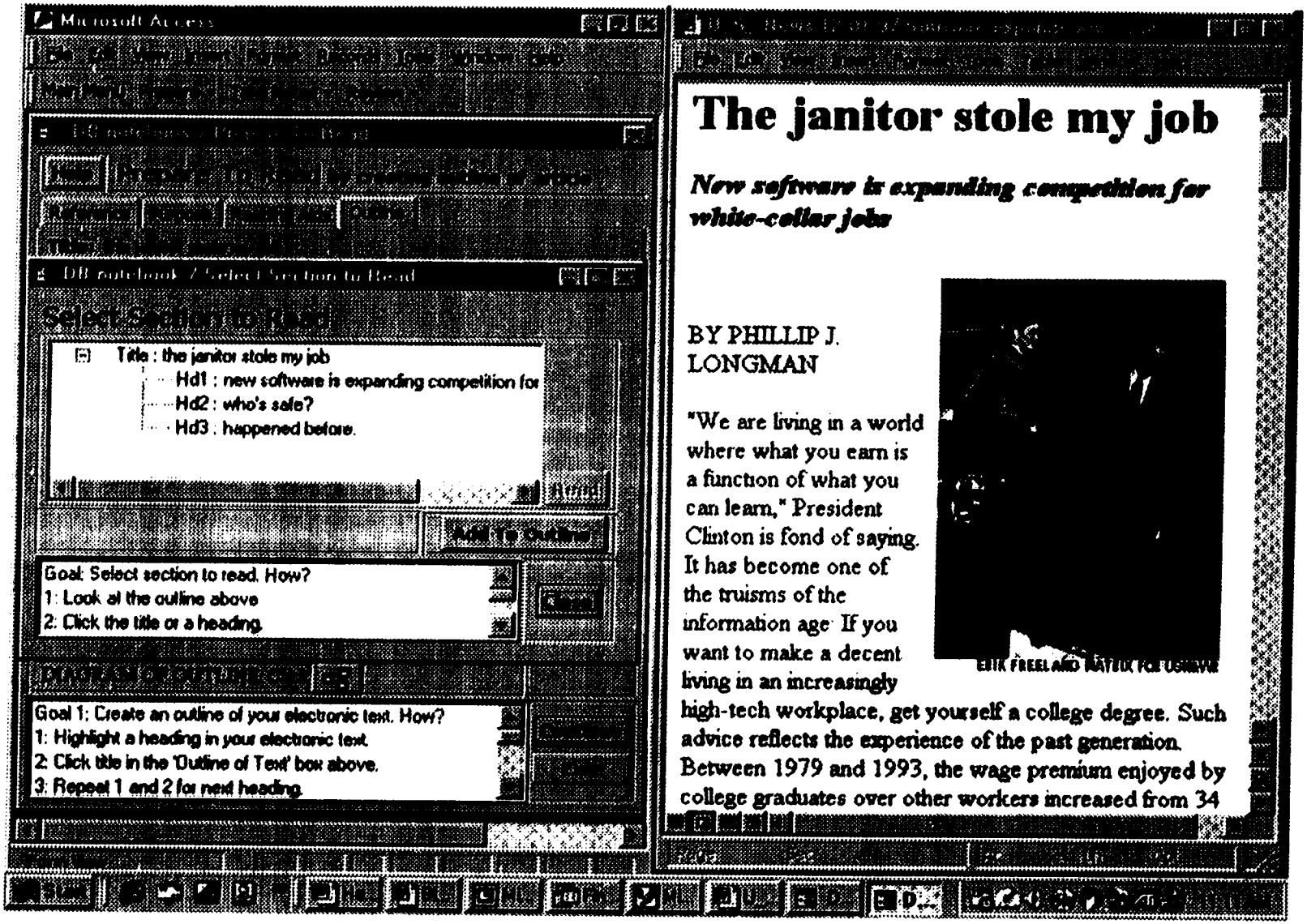

Microsoft PowerPoint [ConceptMap.ppt]
Title : the janitor stole my job
Hd1 : new software is expanding competition for white-collar jobs
Hd2 : who's safe?
Hd3 : happened before.
Goal 1: Create an outline of your electronic text. How?
1: Highlight a heading in your electronic text.
2: Click title in the 'Outline of Text' box above.
3: Repeat 1 and 2 for next heading.
the janitor stole my job
new software is expanding competitio n for white-collar jobs
who's safe?
happened before.


Microsoft Access
DB notebook / Select Section to Read
Select Section to Read
Title : the janitor stole my job
Hd1 : new software is expanding competition for
Hd2 : who's safe?
Hd3 : happened before.
Goal: Select section to read. How?
1: Look at the outline above
2: Click the title or a heading
Goal 1: Create an outline of your electronic text. How?
1: Highlight a heading in your electronic text.
2: Click title in the 'Outline of Text' box above.
3: Repeat 1 and 2 for next heading.
The janitor stole my job
New software is expanding competition for white-collar jobs
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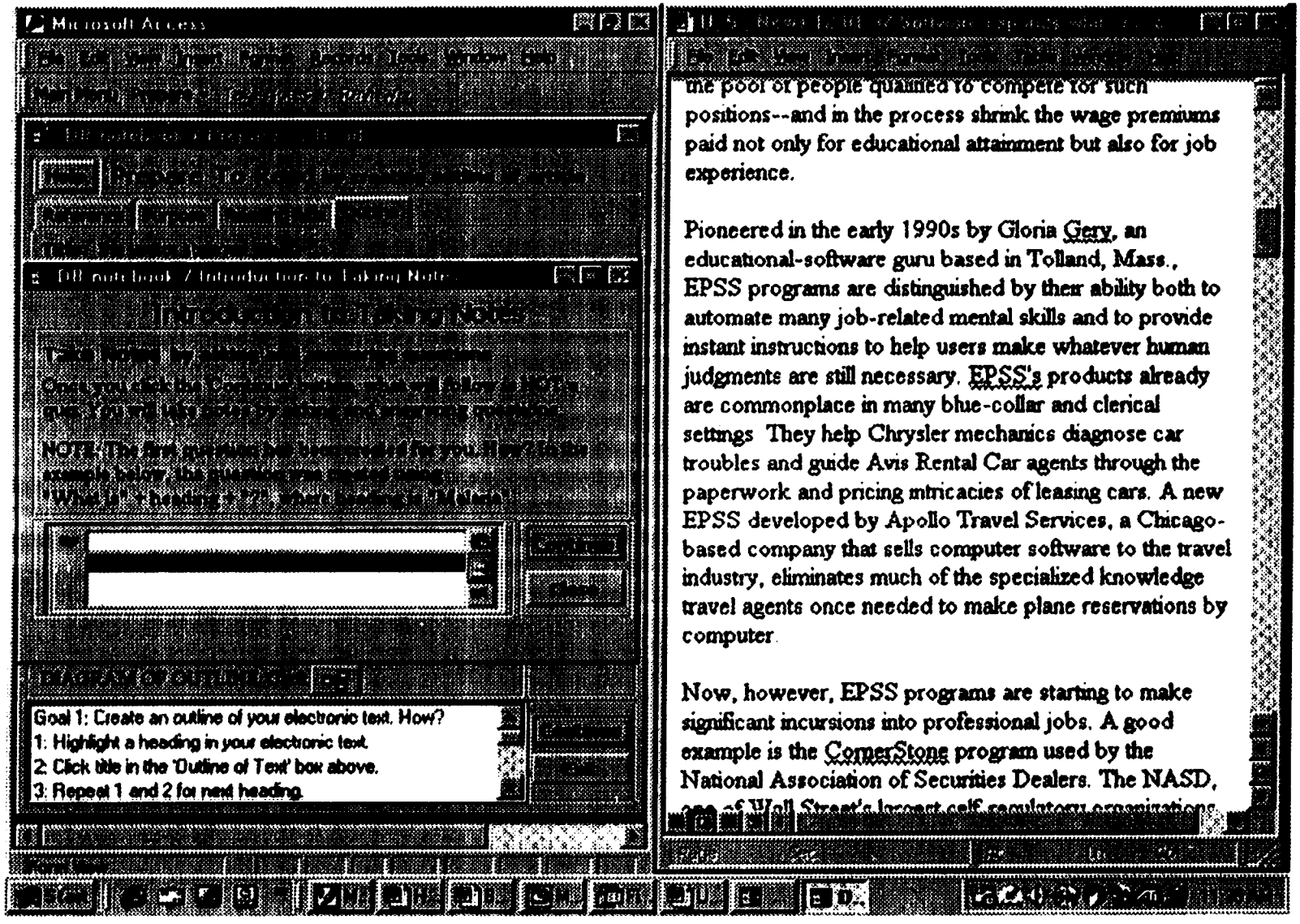
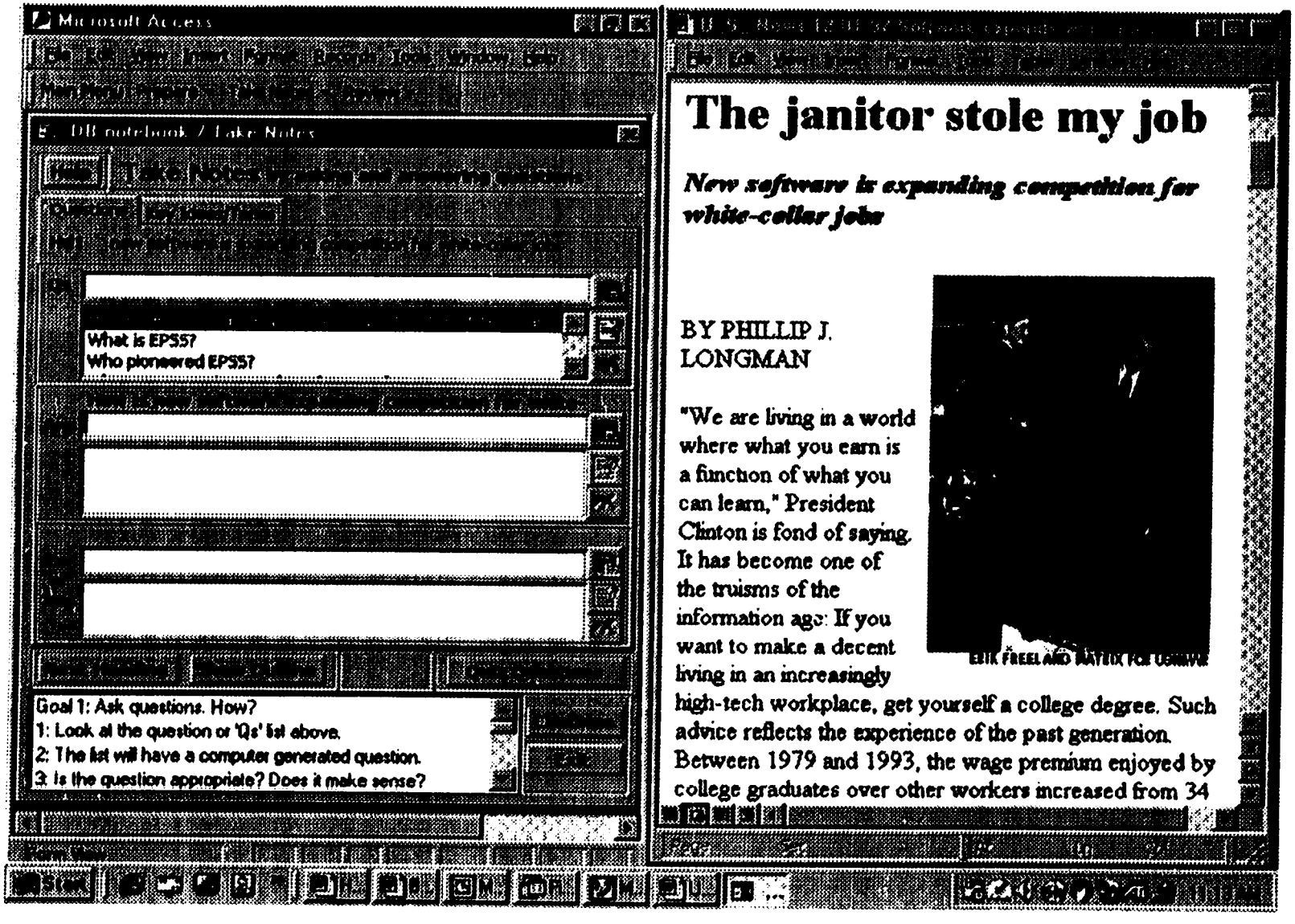


positions--and in the process shrink the wage premiums paid not only for educational attainment but also for job experience.

Pioneered in the early 1990s by Gloria Gery, an educational-software guru based in Tolland, Mass., EPSS programs are distinguished by their ability both to automate many job-related mental skills and to provide instant instructions to help users make whatever human judgments are still necessary. EPSS's products already are commonplace in many blue-collar and clerical settings They help Chrysler mechanics diagnose car troubles and guide Avis Rental Car agents through the paperwork and pricing intricacies of leasing cars. A new EPSS developed by Apollo Travel Services, a Chicago-based company that sells computer software to the travel industry, eliminates much of the specialized knowledge travel agents once needed to make plane reservations by computer.

Now, however, EPSS programs are starting to make significant incursions into professional jobs. A good example is the CornerStone program used by the National Association of Securities Dealers. The NASD,


Microsoft Access
DB notebook : Take Notes
What is EPSS?
Who pioneered EPSS?
Goal 1: Ask questions. How?
1: Look at the question or 'Qs' list above.
2: The list will have a computer generated question.
3: Is the question appropriate? Does it make sense?
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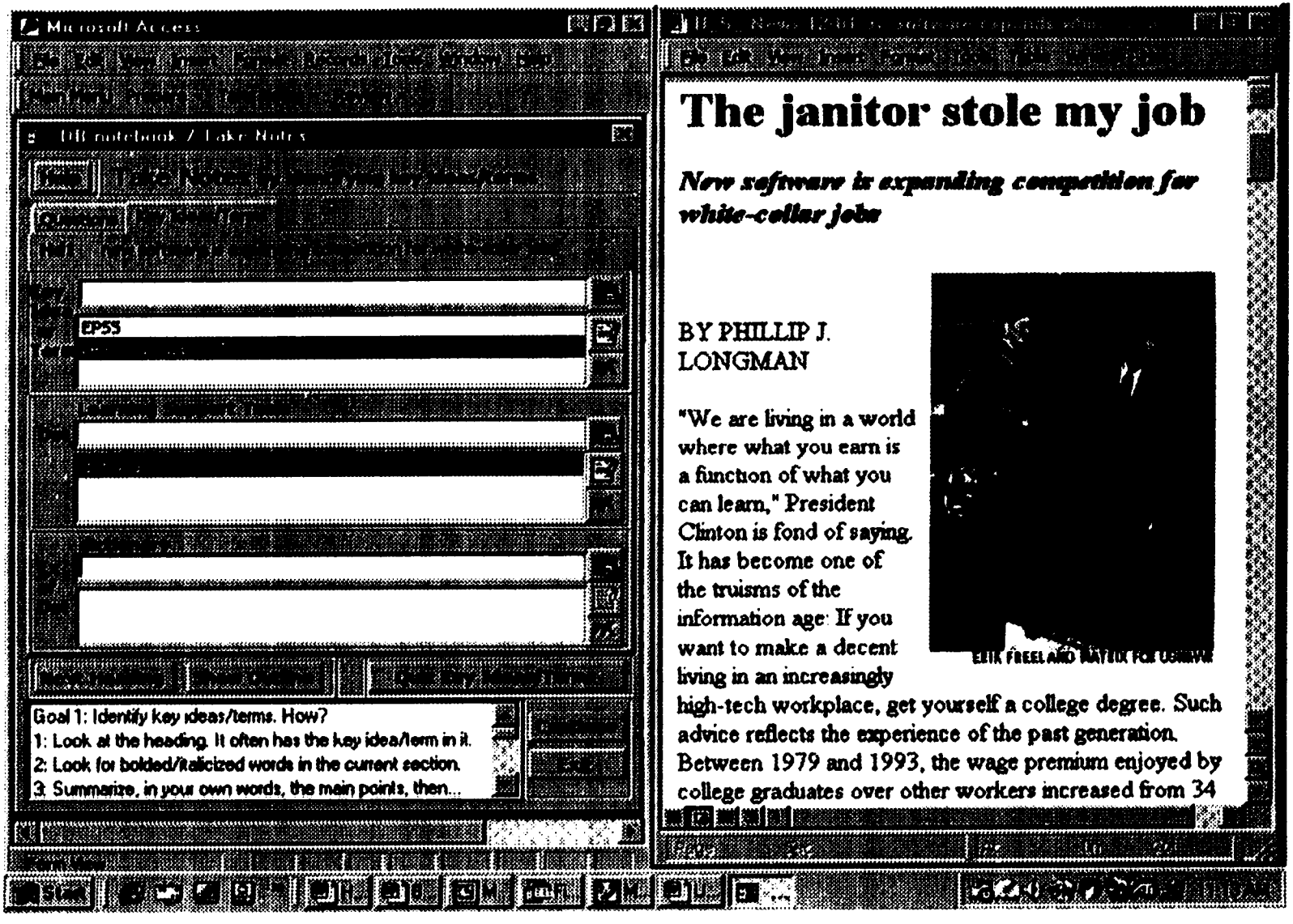
Microsoft Access
EPSS
Goal 1: Identify key ideas/terms. How?
1: Look at the heading. It often has the key idea/term in it.
2: Look for bolded/italicized words in the current section.
3: Summarize, in your own words, the main points, then...
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New software is expanding competition for white-collar jobs
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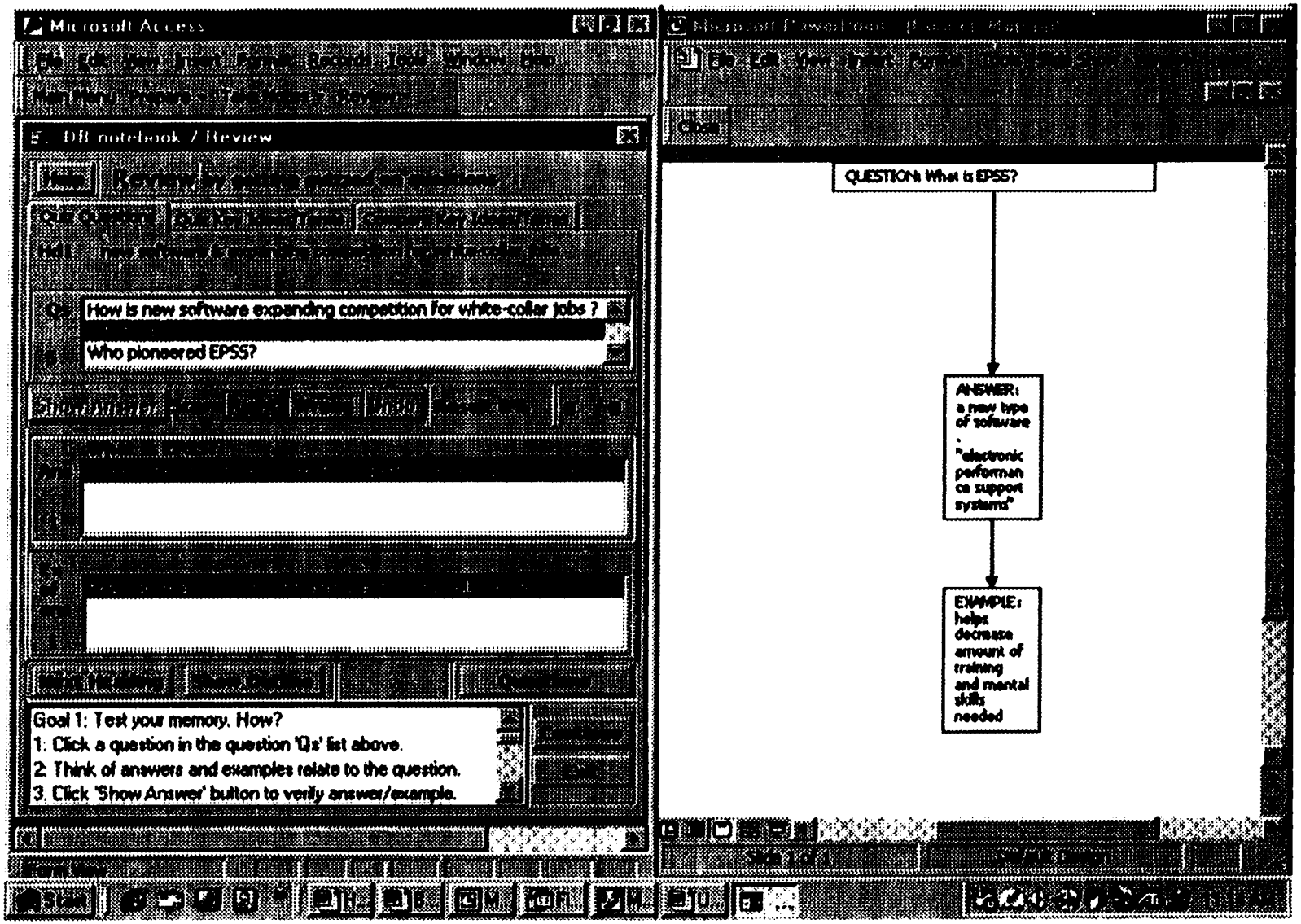
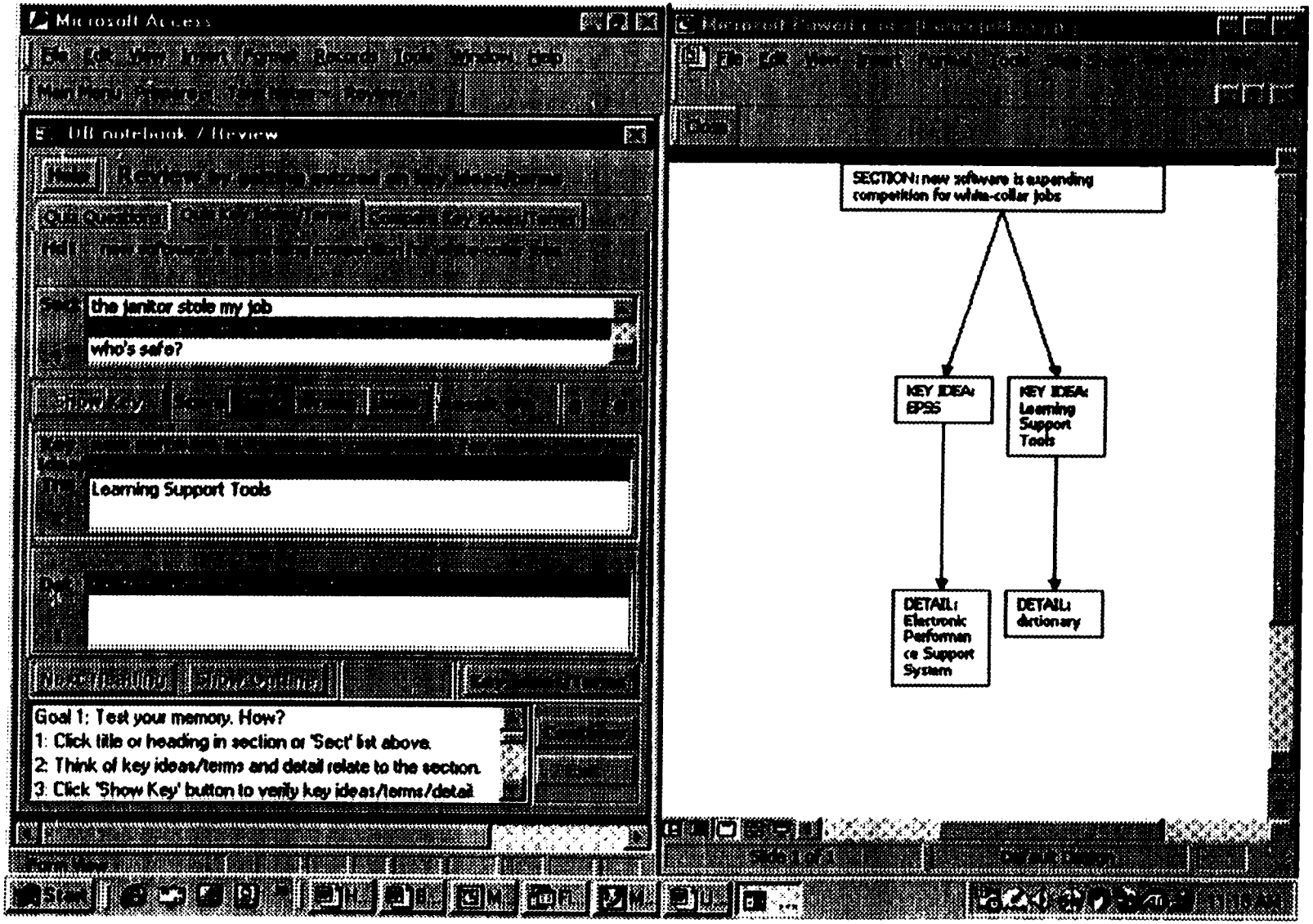
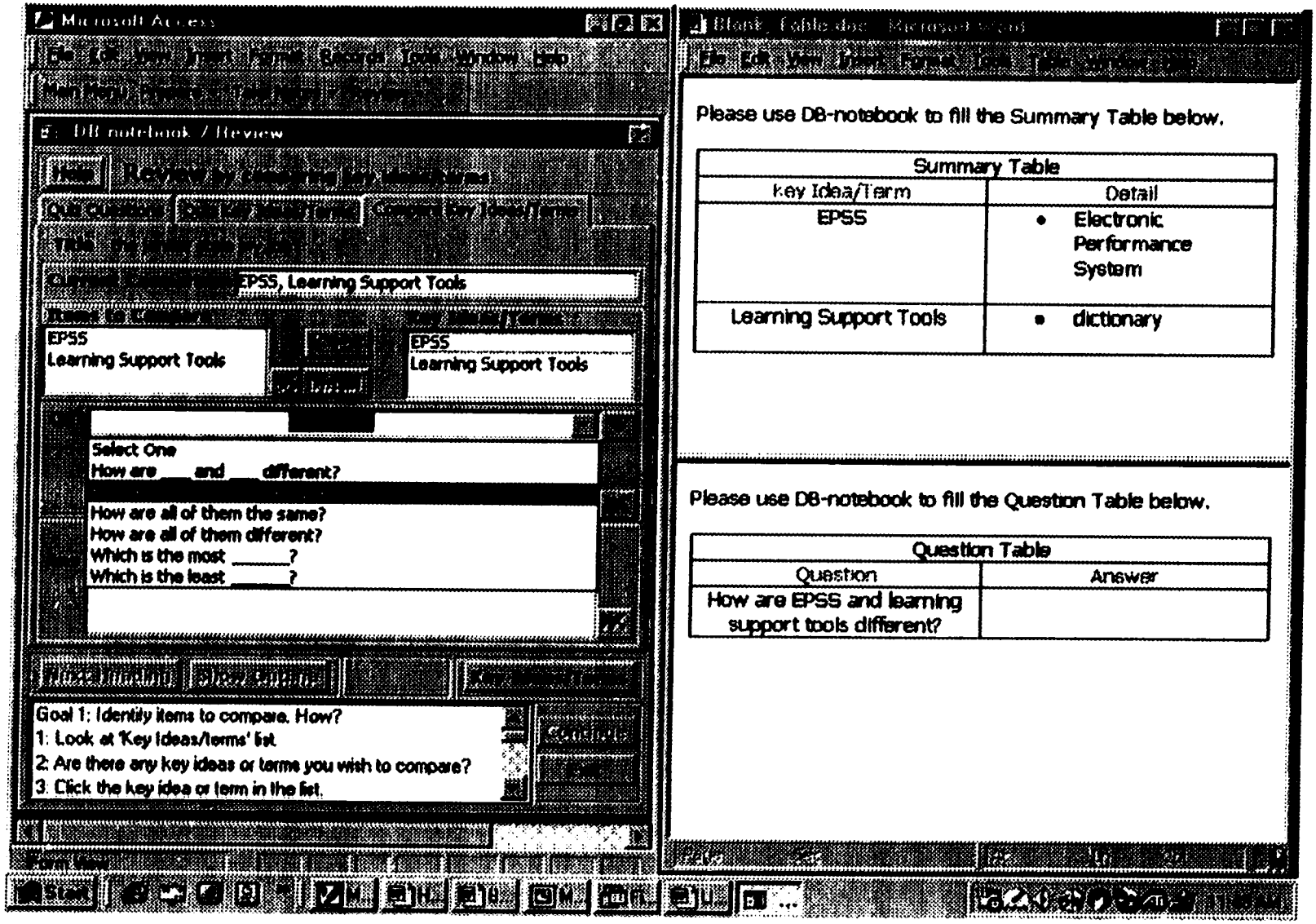

Microsoft Access
DB notebook / Review
How is new software expending competition for white-collar jobs ?
Who pioneered EPSS?
Goal 1: Test your memory. How?
1: Click a question in the question 'Qs' list above.
2: Think of answers and examples relate to the question.
3: Click 'Show Answer' button to verify answer/example.
QUESTION: What is EPSS?
ANSWER: a new type of software . "electronic performan ce support systems"
EXAMPLE: helps decrease amount of training and mental skills needed


Microsoft Access
DB notebook / Review
the janitor stole my job
who's safe?
Learning Support Tools
Goal 1: Test your memory. How?
1: Click title or heading in section or 'Sect' list above.
2: Think of key ideas/terms and detail relate to the section.
3: Click 'Show Key' button to verify key ideas/terms/detail.
SECTION: new software is expanding competition for white-collar jobs
KEY IDEA: EPSS
KEY IDEA: Learning Support Tools
DETAIL: Electronic Performan ce Support System
DETAIL: dictionary


EPSS, Learning Support Tools
EPSS
Learning Support Tools
EPSS
Learning Support Tools
Select One
How are ___ and ___ different?
How are all of them the same?
How are all of them different?
Which is the most _____?
Which is the least _____?
Goal 1: Identify items to compare. How?
1: Look at 'Key Ideas/Terms' list.
2: Are there any key ideas or terms you wish to compare?
3: Click the key idea or term in the list.
Please use DB-notebook to fill the Summary Table below.
Summary Table
Key Idea/Term
Detail
EPSS
• Electronic Performance System
Learning Support Tools
• dictionary
Please use DB-notebook to fill the Question Table below.
Question Table
Question
Answer
How are EPSS and learning support tools different?

Appendix C

Introductory Script With Accompanying Visual Aids, Consent Form, Reading and Evaluation Tasks, and Checklist (List of Criteria) for Usability and Aesthetics

Introductory Script Meant for Users

To keep each evaluation session more or less consistent, I'll be reading from a paper. Please don't let that stop you from asking questions. Ask me questions at any time.

I'll begin by giving you a brief introduction to DB-notebook. Then I'll provide you information about who is evaluating, and the focus and schedule of this evaluation session.

What is DB-notebook?

- Firstly, DB-notebook is a database. A database is a kind of "electronic filing cabinet" in which information can be stored in an organized manner and easily retrieved at a later date. DB-notebook is designed to store and retrieve a specific kind of information, namely, the notes readers' gather from reading material.

- Secondly, DB-notebook is what I call a "reading environment". That is, it provides a framework or a reading strategy and activities and tools that aim to facilitate reading, note taking and reviewing. All are meant to fit the reading task and reading material at hand.

For whom is DB-notebook meant?

It is meant for undergraduate students:

- Who feel like they often have difficulty understand written text.
- Who feel that they often have difficulty remembering relevant information from written text.
- Who feel like their reading skills could be improved or sharpened.
- Who have basic computer skills.

[Experts were also given the following information:

The undergraduate student can be:

- *A man or a woman*
- *A young or a mature student*
- *A full-time or part-time student*
- *In any program on condition that they are assigned to read content-based texts (i.e. focus is on getting information rather than problem-based texts (i.e. focus is on solving-problems).*

- *A second language student, but he/she must possess an excellent grasp of the English language.*
- *One who preferably has NOT attended any reading workshops at Concordia University.*

The undergraduate student should NOT have a:

- *Learning disability*
- *Physical condition (i.e. eye, back, hand or wrist problem)]*

Who is evaluating DB-notebook?

[Only users received this information]

➢ Two subject matter experts have been asked to evaluate DB-notebook.

a. One is a reading specialist.

b. The other is a usability and interface design specialist.

➢ About four students have also been asked to evaluate DB-notebook. You are one of these students.

Why are you here?

You are here to evaluate a prototype or draft version of DB-notebook. The current draft version of DB-notebook is limited to electronic text, such as text found on a computer rather than text in a hard-covered book.

So you will be asked to use DB-notebook to read an electronic or digital text found on the computer.

What will you evaluate?

You will evaluate:

- Task appropriateness (i.e. Are the activities useful?)
- usability (i.e. How easy is DB-notebook to use)
- aesthetics (i.e. Do you like how it looks?)
- level of satisfaction (how much were you satisfied with aspects of DB-notebook)

[Reading Expert was given the following reasons for evaluating:

While using DB-notebook you'll be asked to tell me whether the activities and tools provided are appropriate for:

- *the given reading task,*
- *reading material, and*
- *reader.*

You will also be asked about:

- *the ease of use and*
- *your level of satisfaction]*

[The usability and interface design expert was given the following reasons for evaluating:
While using DB-notebook you'll be asked to talk about:

- *Usability in terms of learnability, navigation, assistance and about ...*
- *Aesthetics in terms of appearance, interaction, enjoyment*

You'll also be asked about your level of satisfaction.]

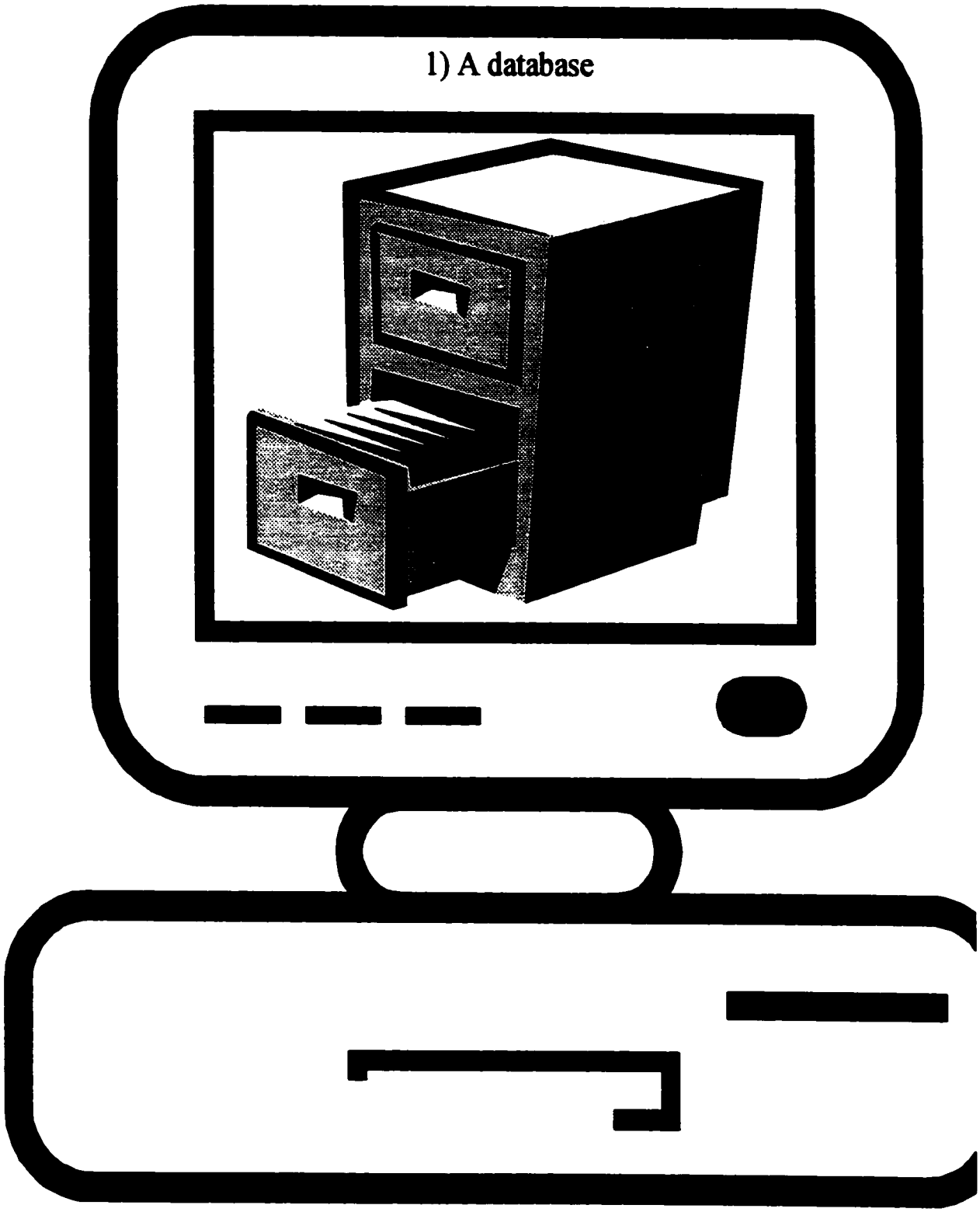
What's the schedule like?

The schedule I'm presenting you is meant to give you a tentative idea of how the next 3 hours will be broken up. *[The schedule varied from person to person]*

Time	Event
1:05-1:15	You'll be introduced to db-notebook and the evaluation session
1:15-1:25	I'll go over the consent form with you and you'll be asked to sign it.
1:25-1:35	Then, I'll give you a pre-questionnaire to complete. With the pre-questionnaire I get to know a little bit about who you are. After completing the pre-questionnaire you can take a break, if you wish.
1:35-1:45	If you are not familiar with a PC we'll take a brief look at the computer.
	Next, I'll go over the reading task and evaluation tasks with you.
1:45-3:30	At this point, you'll have the opportunity to use DB-notebook. You'll be asked to talk while using it. This will be recorded. NOTE: what you say will remain confidential. After having used DB-notebook you can take a break, if you wish.
3:30-4:00	Finally, I'll give you a post-questionnaire to complete. After completing the post-questionnaire you can leave.

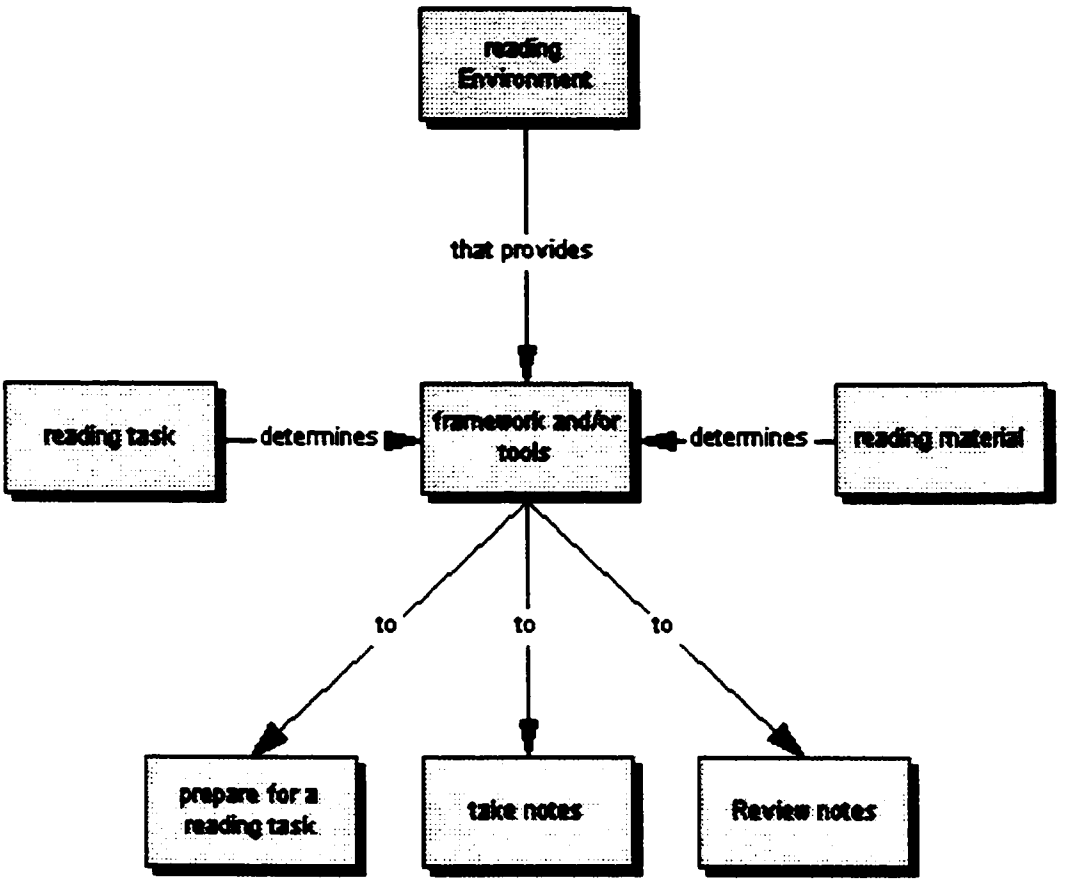
All this should last 3 hours.

What is DB-notebook?

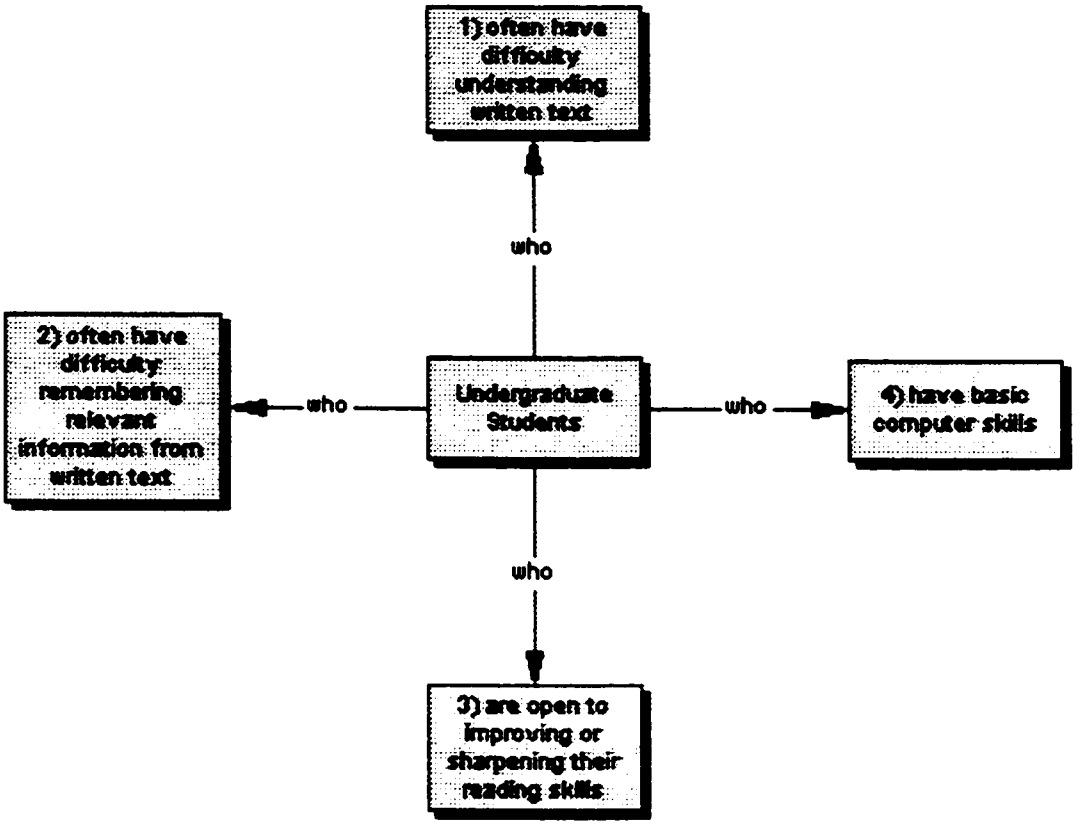


What is DB-notebook?

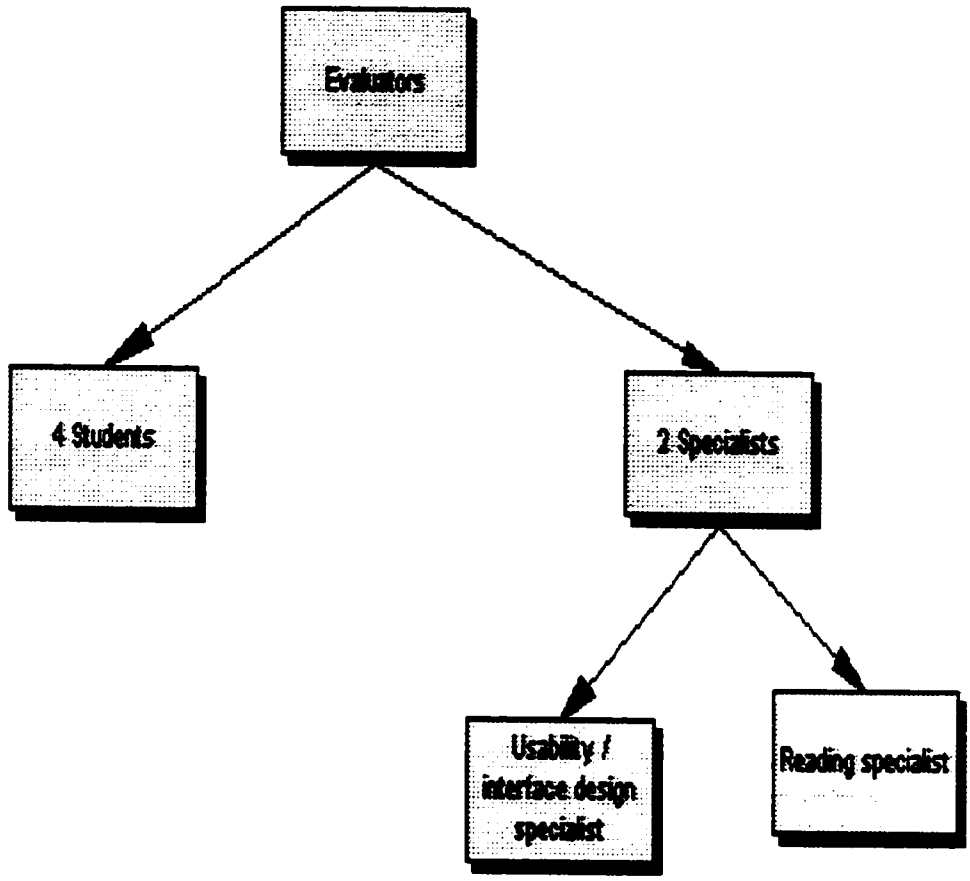
2) Reading Environment



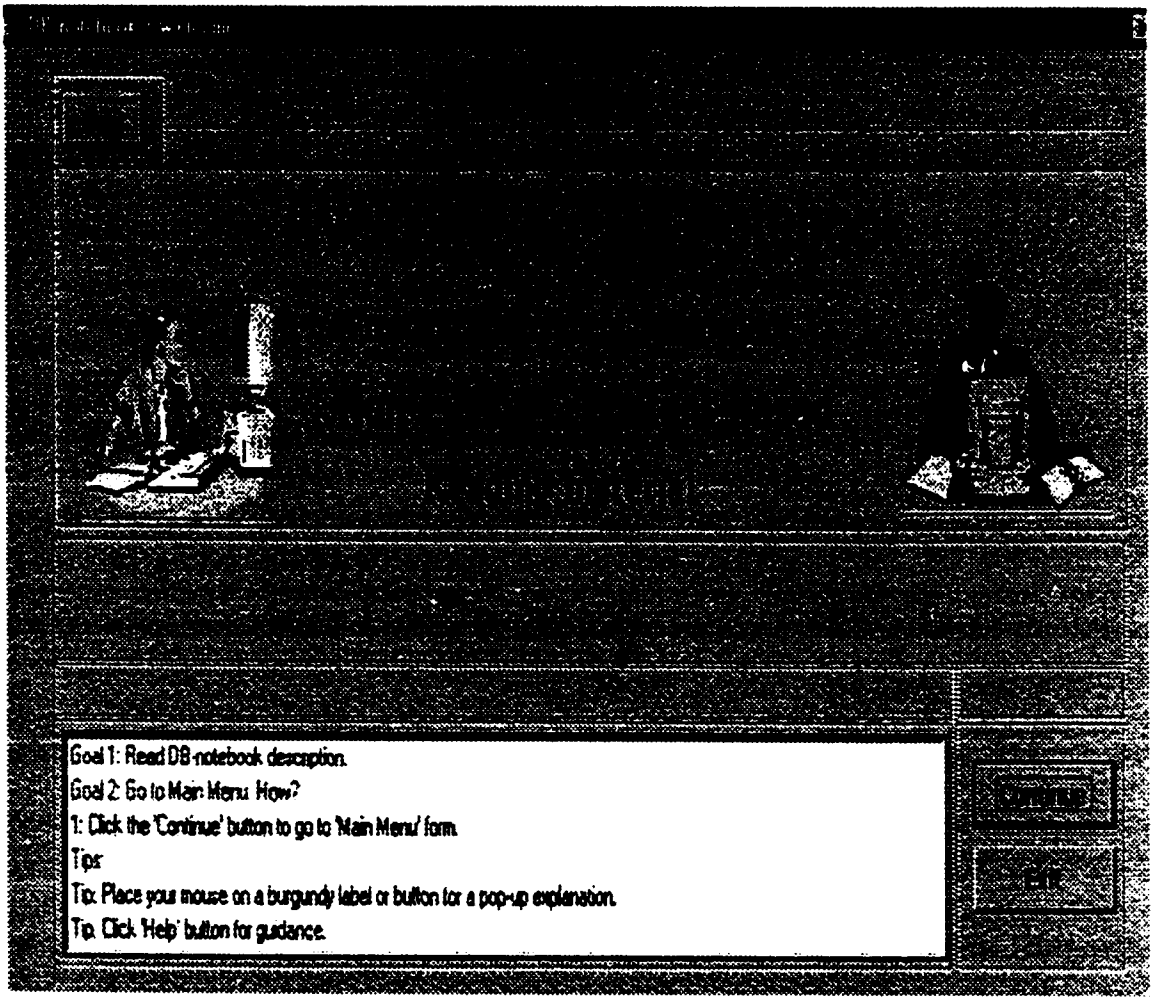
For whom is DB-notebook meant?



Who is evaluating DB-notebook?



Why are you here?



Focus of Evaluation

- Task appropriateness (i.e. Are the activities useful?)
- Usability (i.e. How easy is DB-notebook to use?)
- Aesthetics (i.e. Do you like how it looks?)
- Level of satisfaction (how satisfied with DB-notebook?)

What is the schedule like?

This is a tentative schedule.

Time	Event
1:05 – 1:15	Listen to introduction
1:15 – 1:25	Sign Consent form
1:25 – 1:35	Complete pre-questionnaire
1:35 – 1:45	Get introduced to computer, reading task and evaluation task
1:45 – 3:30	Use DB-notebook (will be observed and taped)
3:30 – 4:00	Complete post-questionnaire

CONSENT FORM TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in a program of research being conducted by Elizabeth Vinceller of Educational Technology of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to evaluate the content, usability and interface of DB-notebook, a prototype Microsoft Access database reading environment. Information about me, and my level of satisfaction and my attitude towards this prototype will also be gathered.

B. PROCEDURES

- The research will be conducted at Concordia University in the Library building.
- I will be asked to complete a pre-questionnaire and post-questionnaire.
- I will be asked to think aloud (speak) while I use DB-notebook. This will be recorded.
- I will be observed by the researcher while I use DB-notebook.
- Only the expert in usability and interface design will be asked to complete a checklist.
- I will be permitted to take breaks between tasks.
- The research should last no longer than three hours.
- No risks or discomfort should arise. If so, I am free to discontinue.
- My participation will remain confidential. That is, the researcher will know my identity, but it will NOT be disclosed.
- I will be paid at the end of the research (evaluation) session.

C. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime.
- I understand that NO payment will occur for discontinued research (evaluation) sessions.
- I understand that my participation in this study is CONFIDENTIAL (i.e., the researcher will know, but will not disclose my identity).
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT.
I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print) _____

SIGNATURE _____

WITNESS SIGNATURE _____

DATE _____

Reading Task

Imagine that one of your professors has given you the following reading assignment. NOTE: You will NOT be tested on the reading material.

> Read the Internet article entitled 'A Beginner's Guide to Independent Learning' for next class. I'd like you to get a good understanding of the article's content. You may be tested on it.

The reading material is already in the computer. The section called 'Evaluation Tasks' below will tell you what to do and where to find the Internet article.

Evaluation Tasks

The overall goal of this evaluation session is to use DB-notebook to accomplish the above reading task. To simplify things, this general goal has been broken down into specific tasks.

What follows on the next page are the tasks to complete. A description of what to talk about has also been included.

Number of task	Task to complete	What to talk about
Task 1	**Provide information** • Follow DB-notebook's instructions on how to continue. • Provide the information DB-notebook requires. • Look at task 2 before accessing your article on the computer.	• What you are doing and why? • Is there anything you would like to do but cannot? • Are there things you have to do but do not see a reason for doing it? • Does anything strike you as good, not so good, or irritating? *[Instead of the first question above, the reading expert was asked: How is each activity appropriate for the reading task, reading material, and reader?]*
Task 2	**Access Internet Article** • Follow DB-notebook's instructions on how to open an Internet Article. • The assigned Internet article is in the C:\Liz\ElectronicTexts\ a beginner's guide.doc • Look at task 3 before preparing to read.	
Task 3	**Complete the *prepare to read* activities** • Reference your electronic article • Identify purpose for reading • Identify reading aids available • Create an outline of your electronic text • Look at task 4 before continuing	
Task 4	**View the diagram of your text's outline** • View diagram of your outline • Follow DB-notebook's instructions on how to continue • Look at task 5 before taking notes	
Task 5	**Complete the *taking notes* activities for the title or heading you selected** • Ask and answer questions • Identify key ideas/terms • Look at task 6 before continuing or moving on to the next heading.	
Task 6	**Complete the *review* activities** (except *Compare key ideas/terms*) • Get quizzed on questions • Get quizzed on key ideas/terms • Go back to *Questions* form. Move to the next heading. Complete task 5 and then task 6. Repeat this until you have read the article.	
	Complete the *Compare key ideas/terms* • Once you have read the article, go to *Compare key ideas/terms*	
Task 7	**End your reading session** ➢ Once you have read the article, taken notes and reviewed them, exit DB-notebook.	

Please use the checklists below to evaluate DB-notebook.

Checklist for Usability:

- **Learnability**
  - How easy is DB-notebook to use?
  - How easy is it to learn?
  - How consistent is it in terms of colour, icons, layout and computer response.

- **Navigation**
  - How easily can a user get around DB-notebook?
  - Does the user know where he/she is at all time?
  - Does the user know where he/she can go at all time?
  - Can the user go where he/she wants easily?

- **Error correction**
  - How frequent are the error messages?
  - How useful are the error messages in correcting an error?

- **Assistance**
  - How helpful is the online help?
  - Is it limited?

Checklist for Aesthetics:

- **Appearance**
  - How does DB-notebook look?
  - Is it easy to see and read?
  - Is it cluttered or uncluttered?
  - Is it well organized?
  - Are there enough pictures? Are the available pictures useful?
  - What about colour? Layout?

- **Interaction**
  - How is DB-notebook's response time? (i.e. If a button is clicked does something happen right away?)
  - How is its processing time (i.e. in creating a diagram)?

- **Enjoyment**
  - How enjoyable is it to use?
  - Is it frustrating to use?
  - Would a user's interest level be maintained?
  - Would a user like to use this program again?

Appendix D

R E's, UIDE's, and Users' Pre-Questionnaires

This pre-questionnaire has been developed to gather some information about you and your experience.

Background information

Read each question and either write your answer in the space provided or place a tick in the appropriate box.

1) What is your job title?

---

2) How many years have you been working in this area?

---

3) What is your educational background?

---

4) Does part of your job involve helping undergraduate students improve their reading skills?

☐ Yes

☐ No

If yes, please answer 'a' and 'b'.

a) If yes, how do you help undergraduates improve their reading skills? (i.e. Do you meet with them? Do you conduct workshops? Etc.)

---

b) If yes, please rate your experience helping students improve their reading skills.

Not experienced	A little experienced	Moderately experienced	Experienced	Very experienced (Expert)

Before reading activities related to scenario #1

Please read the scenario below. Then read the instructions to complete the tables that follow next.

Scenario #1:

Imagine that an undergraduate student has come to see you for help. She complains that she is having difficulty understanding the texts her professor assigns the class to read. She is also having a hard time getting and remembering the important information.

Please look at the table below.

- The first column lists a number of **BEFORE** reading activities.
- The second column is reserved for your answer to question A. Answer question A by writing "Yes" if you think that the girl in scenario #1 is doing (always or most of the time) the activity specified on the left. Write "No" if she is probably NOT doing it (always or most of the time). Write "It depends" if you are unable to answer yes or no and please explain.
- The third column is reserved for your answer to question B. Answer question B by writing "Yes" if you think that the girl in scenario #1 should be doing (always or most of the time) the activity specified on the left to enhance comprehension and retention. Write "No" if she should NOT be doing it (always or most of the time). Write "It depends" if you are unable to answer yes or no and please explain.

BEFORE reading activities	**Question A** Do you think that the girl from scenario #1 is doing (always or most of the time) the activity specified on the left? Write "yes", "no", OR "It depends".	**Question B** Do you think that the girl from scenario #1 should be doing (always or most of the time) the activity specified on the left? Write "yes", "no", OR "It depends".
5) Before I start reading, I make sure I know why I am reading a text. (i.e. Is it just to understand or is it to solve problems? Etc.)		
6) Before I start reading, I check to see what reading aids are available in the text. (i.e. Are there headings? A summary? diagrams?)		
7) Before I start reading, I read the title and predict what the text will be about.		
8) Before I start reading, I read ALL the headings related to the text, if there are headings present.		
9) Before I start reading, I use the headings to create an outline of the text.		
10) Before I start reading, I read the heading and predict what the section will be about.		
11) Before I start reading, I think of questions I can answer while I read.		

12) Is there anything else she should or should not be doing before reading?

_____

While reading activities related to scenario #1

Please look at the table below.

- The first column lists a number of **WHILE** reading activities.
- The second column is reserved for your answer to question A. Answer question A by writing "Yes" if you think that the girl in scenario #1 is doing (always or most of the time) the activity specified on the left. Write "No" if she is probably NOT doing it (always or most of the time). Write "It depends" if you are unable to answer yes or no and please explain.
- The third column is reserved for your answer to question B. Answer question B by writing "Yes" if you think that the girl in scenario #1 should be doing (always or most of the time) the activity specified on the left to enhance comprehension and retention. Write "No" if she should NOT be doing it (always or most of the time). Write "It depends" if you are unable to answer yes or no and please explain.

WHILE reading activities	**Question A** Do you think that the girl from scenario #1 **is** doing (always or most of the time) the activity specified on the left? Write "yes", "no", OR "It depends".	**Question B** Do you think that the girl from scenario #1 **should** be doing (always or most of the time) the activity specified on the left? Write "yes", "no", OR "It depends".
13) When I read, I read every word. I don't skip any parts of the text.		
14) When I read, I focus on what appears to be important. I focus less or even skip the other stuff.		
15) As I read and encounter a word I'm not familiar with, I think I should stop and look it up.		
16) When I encounter a word I'm not familiar with, I first predict its meaning using the words around it.		
17) When I read, I underline, highlight and/or take notes of only the important words or phrases.		
18) When I read, I underline and/or highlight chunks of a paragraph.		
19) When I read, I take notes by copying a lot of information out of the text.		
20) After reading a part of a text, I put it in my own words.		
21) I think about the way the author organized the content.		

22) Is there anything else she should or should not be doing while reading?

_____

After reading activities related to scenario #1

Please look at the table below.

- The first column lists a number of **AFTER** reading activities.
- The second column is reserved for your answer to question A. Answer question A by writing "Yes" if you think that the girl in scenario #1 is doing (always or most of the time) the activity specified on the left. Write "No" if she is probably NOT doing it (always or most of the time). Write "It depends" if you are unable to answer yes or no and please explain.
- The third column is reserved for your answer to question B. Answer question B by writing "Yes" if you think that the girl in scenario #1 should be doing (always or most of the time) the activity specified on the left to enhance comprehension and retention. Write "No" if she should NOT be doing it (always or most of the time). Write "It depends" if you are unable to answer yes or no and please explain.

AFTER reading activities	**Question A** Do you think that the girl from scenario #1 **is** doing (always or most of the time) the activity specified on the left? Write "yes", "no", OR "It depends".	**Question B** Do you think that the girl from scenario #1 **should** be doing (always or most of the time) the activity specified on the left? Write "yes", "no", OR "It depends".
23) To review, I re-read the text I underlined and/or highlighted.		
24) To review, I re-read the notes I took.		
25) To review, I create and ask myself questions about the text.		
26) To review, I create something visual (i.e. a diagram, a table, etc.).		

27) Is there anything else she should or should not be doing after reading?

_____

Skills using a computer and using information technologies

How does each statement below apply to you? Please place a tick in the appropriate box.

	Always	Most of the time	Some of the time	Rarely	Never
28) I use a MAC.					
29) I use a PC.					
30) I use a word processor (i.e. to write papers).					
31) I use a drawing tool (i.e. to draw circles, square, arrows, etc.).					
32) I use a presentation tool (i.e. to create a slide presentation).					
33) I use the World Wide Web (Internet).					

Comfort level using a computer

Read the question and place a tick in the appropriate box.

34) Overall, how would you rate your level of comfort using a computer?

Not Comfortable	A little comfortable	Moderately comfortable	Comfortable	Very Comfortable

Use of a computer to take notes

Read each question and place a tick in the appropriate box. Please provide more information where requested.

35) Have you ever recommended to a student (undergraduate or other) to use a computer to *take notes* from reading material (i.e. a chapter, an article)?

☐ Yes

If yes, please specify how a computer could be used to take notes.

_____

☐ No

36) Do you think that computers (with the appropriate software) could be useful to *take notes* from reading material?

☐ Yes

☐ No

☐ I'm not sure

Please explain your answer.

_____

_____

_____

Use of a computer to review

Read each question and place a tick in the appropriate box. Please provide more information where requested.

37) Have you ever recommended to a student (undergraduate or other) to use a computer to *review* reading material (i.e. a chapter, an article)?

☐ Yes

If yes, please specify how a computer could be used to review.

_____

☐ No

38) Do you think that computers (with the appropriate software) could be useful to review reading material?

☐ Yes

☐ No

☐ I'm not sure

Please explain your answer.

_____

_____

_____

Feelings towards reading material displayed on a computer screen

Read the question and write your answer in the space provided.

39) How do you feel about reading a text (i.e. Internet article) on a computer screen? Please explain.

_____

_____

_____

This questionnaire has been developed to determine your experience in evaluating usability and interface design of computer software.

Background information

Read each question and either write your answer in the space provided or place a tick in the appropriate box.

1. What is your job title?

   _____

2. How many years have you been working in this area?

   _____

3. What is your educational background?

   _____

4. Does part of your job involve evaluating usability and/or interface design of computer software?

   ☐ Yes

   ☐ No

   If yes, please explain how you are involved in these activities. (i.e. Do you evaluate software produced by students?)

   _____

5. Please rate your experience evaluating computer software usability? Please place a tick in the appropriate box.

Not Experienced	A little Experienced	Moderately Experienced	Very Experienced	Expert

6. Please rate your experience evaluating computer software interface design? Please place a tick in the appropriate box.

Not Experienced	A little Experienced	Moderately Experienced	Very Experienced	Expert

7. How would you rate your comfort level using a computer? Please place a tick in the appropriate box.

Not Comfortable	A little Comfortable	Moderately Comfortable	Very Comfortable

This pre-questionnaire has been developed to gather some information about you.

Background information

Read each question and either write your answer in the space provided or place a tick in the appropriate box. Please provide more information where requested.

1) How old are you? _____ years old.

2) What is your gender?
   - ☐ Female
   - ☐ Male

3) Are you left handed or right handed?
   - ☐ Left handed
   - ☐ Right handed
   - ☐ Ambidextrous (i.e. I use my left and right hand equally)

4) Is English your first language?
   - ☐ Yes
   - ☐ No

     If no, what is your first language? _____

5) In which program are you currently? (i.e. Education) _____

6) Are you an undergraduate or graduate student?
   - ☐ An undergraduate student (i.e. I'm going for a Bachelor's degree)
   - ☐ A graduate student (i.e. I'm going for a Master's degree)
   - ☐ Other. Please specify: _____

7) In which year are you? (i.e. first year)_____ year.

8) What is your student status?
   - ☐ Full-time student (i.e. 4 or more courses per semester)
   - ☐ Part-time student (i.e. 3 or less courses per semester)

School Related Reading

Read the question and place a tick in the appropriate box.

9) How much time do you usually spend reading for your courses?

- ☐ I usually spend more time than I had planned to spend
- ☐ I usually spend the time I had planned to spend
- ☐ I usually spend less time than I had planned to spend
- ☐ I usually have NO time to read it
- ☐ I'm not sure

10) How often do you have difficulty understanding an assigned text?

Always	Most of the time	Some of the time	Rarely	Never

11) How often do you have difficulty remembering the important ideas a while after reading an assigned text?

Always	Most of the time	Some of the time	Rarely	Never

Before reading activities

What do you do before you start reading? Read each statement below and place a tick in the appropriate box.

	Always	Most of the time	Some of the time	Rarely	Never
12) Before I start reading, I make sure I know why I am reading a text. (i.e. Is it just to understand or is it to solve problems? Etc.)					
13) Before I start reading, I check to see what reading aids are available in the text. (i.e. Are there headings? A summary? diagrams?)					
14) Before I start reading, I read the title and predict what the text will be about.					
15) Before I start reading, I read ALL the headings related to the text, if there are headings present.					
16) Before I start reading, I use the headings to create an outline of the text.					
17) Before I start reading, I read the heading and predict what the section will be about.					
18) Before I start reading, I think of questions I can answer while I read.					

19) Is there anything else you do before you start to read? _____

_____

While reading activities

What do you do while you read? Read each statement below and place a tick in the appropriate box.

	Always	Most of the time	Some of the time	Rarely	Never
20) When I read, I read every word. I don't skip any parts of the text.					
21) When I read, I focus on what appears to be important. I focus less or even skip the other stuff.					
22) As I read and encounter a word I'm not familiar with, I think I should stop and look it up.					
23) When I encounter a word I'm not familiar with, I first predict its meaning using the words around it.					
24) When I read, I underline, highlight and/or take notes of only the important words or phrases.					
25) When I read, I underline and/or highlight chunks of a paragraph.					
26) When I read, I take notes by copying a lot of information out of the text.					
27) After reading a part of a text, I put it in my own words.					
28) I think about the way the author organized the content.					

29) Is there anything else you do while you read? _____

_____

After reading activities

What do you do to review? Read each statement below and place a tick in the appropriate box.

	Always	Most of the time	Some of the time	Rarely	Never
30) To review, I re-read the text I underlined and/or highlighted.					
31) To review, I re-read the notes I took.					
32) To review, I create and ask myself questions about the text.					
33) To review, I create something visual (i.e. a diagram, a table, etc.).					
34) I feel that the review strategies I use prepare me for tests.					

35) Is there anything else you do to review? _____

_____

Knowledge about reading and reading strategies

Read the question and place a tick in the appropriate box. Please provide detail where requested.

36) Have you attended any reading workshops offered at Concordia?

☐ Yes

☐ No

37) Do you know what a concept map is? (It is also known as web map, mind map)?

☐ Yes

If yes, for what purpose have you used it (if you have used it)?

_____

☐ No

Skills using a computer and using information technologies

How does each statement below apply to you? Please place a tick in the appropriate box.

	Always	Most of the time	Some of the time	Rarely	Never
38) I use a MAC.					
39) I use a PC.					
40) I use a word processor (i.e. to write papers).					
41) I use a drawing tool (i.e. to draw circles, square, arrows, etc.).					
42) I use a presentation tool (i.e. to create a slide presentation).					
43) I use the World Wide Web (Internet).					

Comfort level using a computer

Read the question and place a tick in the appropriate box.

44) Overall, how would you rate your level of comfort using a computer?

Not comfortable	A little comfortable	Moderately comfortable	Comfortable	Very Comfortable

Use of a computer to take notes

Read each question and place a tick in the appropriate box. Please provide more information where requested.

45) Have you ever used a computer to *take notes* from reading material (i.e. chapter, article)?

☐ Yes

If yes, please specify how you used the computer to take notes.

_____

☐ No

46) Do you think that computers (with the appropriate software) could be useful to *take notes* from reading material?

☐ Yes

☐ No

☐ I'm not sure

Please explain your answer.

_____

_____

_____

Use of a computer to review

Read each question and place a tick in the appropriate box. Please provide more information where requested.

47) Have you used a computer to *review* reading material (i.e. chapter, article)?

☐ Yes

If yes, please specify how you used the computer to review.

_____

☐ No

48) Do you think that computers (with the appropriate software) could be useful to review reading material?

☐ Yes

☐ No

☐ I'm not sure

Please explain your answer.

_____

_____

_____

Feelings towards reading material displayed on a computer screen

Read the question and write your answer in the space provided.

49) How do you feel about reading a text (i.e. Internet article) on a computer screen? Please explain.

_____

_____

_____

Appendix E

RE's, UIDE's, and Users' Post-Questionnaires

This post-questionnaire has been developed to document your experience with DB-notebook.

General questions on DB-notebook

Please give your views on DB-notebook by answering the questions below in the spaces provided. There are no right or wrong answers.

1) What did you like *best* about DB-notebook? Please explain.

2) What did you like *least* about DB-notebook? Please explain.

3) Which parts of DB-notebook did you find *confusing* or *difficult* to understand? Please explain.

4) Which parts of DB-notebook did you find particularly *irritating* although they did not cause major problems? Please explain.

5) What were the most common *mistakes* you made when using DB-notebook? Please explain.

6) What *changes* would you make to DB-notebook to make it better from the user's point of view? Please explain.

7) Is there anything else about DB-notebook you would like to add?

Reading Task and General Reading Strategy or Method

The following box contains the reading task, that is, a generic reading task used in evaluating DB-notebook.

Reading Task

Read the article entitled "X" for next class. I'd like you to get a good understanding of the article's content. You may be tested on it.

Note: "X" can be replaced by any title. For the evaluation of DB-notebook, the article was entitled "A beginner's guide to independent learning".

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
8) I think that the reading task stated above (without considering the medium of the article) is representative of what undergraduate students might receive as course work.	1	2	3	4	5
9) I think that the purpose of the reading task stated above is to understand the article's content and retain the relevant information.	1	2	3	4	5
10) I think that the SQ3R (survey, question, recite, recall, review) method is an appropriate reading strategy or method for the reading task stated above.	1	2	3	4	5

Task support

The aim of this section is find out your views about *task support*. That is, how useful are the activities offered by DB-notebook and how useful is DB-notebook as a whole in completing the given reading task? Please read the directives and answer accordingly.

How useful are the *prepare to read* activities?

Read the question and rate the individual activities by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *prepare to read* activities offered by DB-notebook in preparing you for the given reading task?

	Not useful	A little useful	Moderately useful	Useful	Very useful
11) Identify subject matter of the text (go to *Reference* form)					
12) Identify purpose for reading the text (go to *Purpose* form)					
13) Identify reading aids available in the text (go to *Reading Aids*)					
14) Use headings to create an outline of the text (go to *Outline* form)					

15) What changes would you make to the *prepare to read* activities offered by DB-notebook to help better prepare for the given reading task?

_____

_____

_____

16) Overall, how would you rate the *prepare to read* activities offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How useful are the *note taking* activities?

Read the question and rate the individual activities by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *note taking* activities offered by DB-notebook in enhancing comprehension and retention of written text?

	Not useful	A little useful	Moderately useful	Useful	Very useful
17) Ask and answer questions (go to *Questions* form)					
18) Identify key ideas and/or terms (go to *Key Ideas/Terms*)					

19) What changes would you make to the *note taking* activities to make them better at enhancing comprehension and retention of written text?

_____

_____

_____

20) Overall, how would you rate the *note taking* activities offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How useful are the *review* activities?

Read the question and rate the individual activities by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How ***useful*** did you find the *review* activities offered by DB-notebook in enhancing comprehension and retention of written text?

	Not useful	A little useful	Moderately useful	Useful	Very useful
21) Get quizzed on questions (go to *Quiz Questions*)					
22) Get quizzed on key ideas / terms (go to *Quiz Key Ideas /Terms*)					
23) Compare key ideas/terms (go to *Compare Key Ideas /Terms*)					

24) What changes would you make to the *review* activities to make them better at enhancing comprehension and retention of written text?

_____

_____

_____

25) Overall, how would you rate the *review* activities offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How useful are the *visual outputs* (i.e. the diagrams and tables DB-notebook produces)?

Read the question and rate the individual items by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *visual outputs* offered by DB-notebook in enhancing comprehension and retention of written text?

	Not useful	A little useful	Moderately useful	Useful	Very useful
26) Linear outline of the text (go to *Outline* form)					
27) Diagram of the text's outline (go to *Outline* form and click *Diagram of Outline* button)					
28) Diagram of questions, answers, examples (go to *Quiz Questions* form. Select question and click *Show Answer* button)					
29) Diagram of section, key ideas/terms, details, examples (go to *Quiz Key Ideas/Terms* form. Select section and click *Show Key* button)					
30) Table of key ideas/terms and detail (go to *Compare Key Ideas/Terms* form.)					
31) Table of questions and answers (go to *Compare Key Ideas/Terms* form.)					

32) What changes would you make to the *visual outputs* to make them better at enhancing comprehension and retention of written text?

_____

_____

_____

33) Overall, how would you rate the *visual outputs* offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How satisfactory is DB-notebook as a whole?

Read each question and either rate by placing a tick in the appropriate box or write your answer in the space provided.

34) How *satisfactory* is *DB-notebook*, as a whole, in helping to enhance comprehension of written text.

Not Satisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

35) How *satisfactory* is *DB-notebook* , as a whole, in helping to enhance retention of written text.

Not satisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

36) What changes would you make to *DB-notebook* to make it better enhance comprehension and retention of written text?

_____

_____

_____

DB-notebook and the reader

Read the question and place a tick in the appropriate box. Please provide an explanation.

37) In your opinion, for whom is DB-notebook appropriate?

- ☐ It is appropriate ONLY for readers who have difficulty with comprehension and rentention of written text.
- ☐ It is appropriate ONLY for readers who do NOT have difficulty with comprehension and rentention of written text.
- ☐ It is appropriate for both the above types of readers.
- ☐ It is NOT appropriate for either of the above types of readers.
- ☐ I'm not sure.

Please explain your answer.

_____

_____

Other questions about DB-notebook

Read each question and rate by placing a tick in the appropriate box. Please provide an explanation where requested.

38) How much time do you think you spent reading the given article using DB-notebook?

Less than usual	About usual	More than usual	I'm not sure

39) Did DB-notebook get you to look at the big picture? That is, did it help you focus on the overall idea(s) of the article rather than the details?

Not At all	A little	Not more than usual	Quite a bit	A lot

Please explain your answer.

_____

_____

40) Did DB-notebook help you become more aware of the reading process (i.e. the steps that can be taken to accomplish a reading task)?

Not At all	A little	Not more than usual	Quite a bit	A lot

Please explain your answer.

_____

_____

Use of a computer to take notes and/or to review

Read each question and place a tick in the appropriate box. Please provide an explanation.

41) Do you think that computers (with DB-notebook or other such software) could be useful to *take notes* from reading material?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Please explain your answer.

_____

_____

42) Do you think that computers (with DB-notebook or other such software) could be useful to review reading material?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Please explain your answer.

_____

_____

Electronic texts and DB-notebook

Read each question and write your answer in the space provided.

43) How do you feel about reading a text on a computer screen using DB-notebook? Please explain.

_____

_____

_____

44) What changes would you make to DB-notebook to make texts on the computer (i.e. Internet articles) more useful and enjoyable to read?

_____

_____

_____

Paper-based text and software like DB-notebook

Read the question and place a tick in the appropriate box. Please provide an explanation.

45) Should something like DB-notebook be available to help students read paper-based text (i.e. hard or soft covered books)?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Please explain your answer.

_____

_____

Thank you very much for your input.

This post-questionnaire has been developed to document your experience with DB-notebook.

General questions on DB-notebook

Please give your views on DB-notebook by answering the questions below in the spaces provided. There are no right or wrong answers.

1) What did you like *best* about DB-notebook? Please explain.

2) What did you like *least* about DB-notebook? Please explain.

3) Which parts of DB-notebook did you find *confusing* or *difficult* to understand? Please explain.

4) Which parts of DB-notebook did you find particularly *irritating* although they did not cause major problems? Please explain.

5) What were the most common *mistakes* you made when using DB-notebook? Please explain.

6) What *changes* would you make to DB-notebook to make it better from the user's point of view? Please explain.

7) Is there anything else about DB-notebook you would like to add?

Usability

Please rate DB-notebook in terms of learnability, navigation, error correction, assistance and overall usability by placing a tick in the appropriate box. Please add recommendations for changes in the spaces provided.

Learnability

8) How would you rate DB-notebook in terms of *learnability* (i.e. DB-notebook's ease of use and its ease of learning)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

9) What changes would you make to DB-notebook to make it easier to use and learn?

_____

_____

_____

_____

_____

_____

_____

_____

Navigation

10) How would you rate DB-notebook in terms of *navigation* (i.e. the ease of finding your way around DB-notebook)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

11) What changes would you make to DB-notebook to make it easier for a user to find his/her way around in it?

_____

_____

_____

_____

_____

_____

_____

_____

Usability

Error correction

12) How would you rate DB-notebook in terms of *error correction* (i.e. How frequent are the errors? How easy are they to correct?)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

13) What changes would you make to DB-notebook in terms of *error correction*?

Assistance

14) How would you rate DB-notebook in terms of *assistance* (i.e. DB-notebook's online help)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

What changes would you make to DB-notebook's online help to make it more helpful?

Overall satisfaction with usability

15) How would you rate DB-notebook in terms of *usability*?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

16) Is there anything else about *usability* you would like to add?

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Aesthetics

Please rate DB-notebook in terms of appearance, interaction, enjoyment, and overall aesthetics by placing a tick in the appropriate box. Please add recommendations for changes in the spaces provided.

Appearance

17) How would you rate DB-notebook in terms of its *appearance* (i.e. how does it look)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

What changes would you make to DB-notebook to make its appearance more visually appealing and informative?

_____

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Interaction

18) How would you rate DB-notebook in terms of *interaction* (i.e. DB-notebook's response time and processing time)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

What changes would you make to DB-notebook to make its response time and processing time more acceptable?

_____

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Aesthetics

Enjoyment

19) How would you rate DB-notebook in terms of *enjoyment* (i.e. DB-notebook's ability to maintain interest)?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

What changes would you make to DB-notebook's online help to make it more enjoyable?

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Overall satisfaction with aesthetics

20) How would you rate DB-notebook in terms of *aesthetics*?

Very Unsatisfactory	Moderately Unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

21) Is there anything else about *aesthetics* you would like to add?

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Thank you very much for your input.

This post-questionnaire has been developed to document your experience with DB-notebook.

General questions on DB-notebook

Please give your views on DB-notebook by answering the questions below in the spaces provided. There are no right or wrong answers.

1) What did you like *best* about DB-notebook? Please explain.

2) What did you like *least* about DB-notebook? Please explain.

3) Which parts of DB-notebook did you find *confusing* or *difficult* to understand? Please explain.

4) Which parts of DB-notebook did you find particularly *irritating* although they did not cause major problems? Please explain.

5) What were the most common *mistakes* you made when using DB-notebook? Please explain.

6) What *changes* would you make to DB-notebook to make it better from the user's point of view? Please explain.

7) Is there anything else about DB-notebook you would like to add?

Task support

The aim of this section is find out your views about *task support*. That is, how useful are the activities offered by DB-notebook and how useful is DB-notebook as a whole in completing the given reading task? Please read the directives and answer accordingly.

How useful are the *prepare to read* activities?

Read the question and rate the individual activities by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *prepare to read* activities offered by DB-notebook in preparing you for the given reading task?

	Not useful	A little useful	Moderately useful	Useful	Very useful
8) Identify subject matter of the text (go to *Reference* form)					
9) Identify purpose for reading the text (go to *Purpose* form)					
10) Identify reading aids available in the text (go to *Reading Aids*)					
11) Use headings to create an outline of the text (go to *Outline* form)					

12) What changes would you make to the *prepare to read* activities offered by DB-notebook to help better prepare for the given reading task?

_____

_____

_____

13) Overall, how would you rate the *prepare to read* activities offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How useful are the *note taking* activities?

Read the question and rate the individual activities by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *note taking* activities offered by DB-notebook in enhancing comprehension and retention of written text?

	Not useful	A little useful	Moderately useful	Useful	Very useful
14) Ask and answer questions (go to *Questions* form)					
15) Identify key ideas and/or terms (go to *Key Ideas/Terms*)					

16) What changes would you make to the *note taking* activities to make them better at enhancing comprehension and retention of written text?

_____

_____

_____

17) Overall, how would you rate the *note taking* activities offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How useful are the *review* activities?

Read the question and rate the individual activities by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *review* activities offered by DB-notebook in enhancing comprehension and retention of written text?

	Not useful	A little useful	Moderately useful	Useful	Very useful
18) Get quizzed on questions (go to *Quiz Questions*)					
19) Get quizzed on key ideas / terms (go to *Quiz Key Ideas /Terms*)					
20) Compare key ideas/terms (go to *Compare Key Ideas /Terms*)					

21) What changes would you make to the *review* activities to make them better at enhancing comprehension and retention of written text?

_____

_____

_____

22) Overall, how would you rate the *review* activities offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How useful are the *visual outputs* (i.e. the diagrams and tables DB-notebook produces)?

Read the question and rate the individual items by placing a tick in the appropriate box. You may go back and look at DB-notebook.

How *useful* did you find the *visual outputs* offered by DB-notebook in enhancing comprehension and retention of written text?

	Not useful	A little useful	Moderately useful	Useful	Very useful
23) Linear outline of the text (go to *Outline* form)					
24) Diagram of the text's outline (go to *Outline* form and click *Diagram of Outline* button)					
25) Diagram of questions, answers, examples (go to *Quiz Questions* form. Select question and click *Show Answer* button)					
26) Diagram of section, key ideas/terms, details, examples (go to *Quiz Key Ideas/Terms* form. Select section and click *Show Key* button)					
27) Table of key ideas/terms and detail (go to *Compare Key Ideas/Terms* form.)					
28) Table of questions and answers (go to *Compare Key Ideas/Terms* form.)					

29) What changes would you make to the *visual outputs* to make them better at enhancing comprehension and retention of written text?

_____

_____

_____

30) Overall, how would you rate the *visual outputs* offered by DB-notebook.

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

How satisfactory is DB-notebook as a whole?

Read each question and either rate by placing a tick in the appropriate box or write your answer in the space provided.

31) How *satisfactory* is *DB-notebook*, as a whole, in helping to enhance comprehension of written text.

Not Satisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

32) How *satisfactory* is *DB-notebook* , as a whole, in helping to enhance retention of written text.

Not satisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

33) What changes would you make to *DB-notebook* to make it better enhance comprehension and retention of written text?

_____

_____

_____

Other questions about DB-notebook

Read each question and rate by placing a tick in the appropriate box. Please provide an explanation where requested.

34) How much time do you think you spent reading the given article using DB-notebook?

Less than usual	About usual	More than usual	I'm not sure

35) Did DB-notebook get you to look at the big picture? That is, did it help you focus on the overall idea(s) of the article rather than the details?

Not At all	A little	Not more than usual	Quite a bit	A lot

Please explain your answer

_____

_____

36) Did DB-notebook help you become more aware of the reading process (i.e. the steps that can be taken to accomplish a reading task)?

Not At all	A little	Not more than usual	Quite a bit	A lot

Please explain your answer.

_____

_____

Use of a computer to take notes and/or to review

Read each question and place a tick in the appropriate box. Please provide an explanation.

37) Do you think that computers (with DB-notebook or other such software) could be useful to *take notes* from reading material?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Please explain your answer.

_____

_____

38) Do you think that computers (with DB-notebook or other such software) could be useful to review reading material?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Please explain your answer.

_____

_____

Electronic texts and DB-notebook

Read each question and write your answer in the space provided.

39) How do you feel about reading a text on a computer screen using DB-notebook? Please explain.

_____

_____

_____

40) What changes would you make to DB-notebook to make texts on the computer (i.e. Internet articles) more useful and enjoyable to read?

_____

_____

_____

Paper-based text and software like DB-notebook

Read the question and place a tick in the appropriate box. Please provide an explanation.

41) Should something like DB-notebook be available to help students read paper-based text (i.e. hard or soft covered books)?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Please explain your answer.

_____

_____

Usability

The aim of this section is find out your views about usability. That is, how easy is DB-notebook to use and learn? How easily can you find your way around it? How helpful is the online help? Please read the directives and answer accordingly.

Learnability : How easy is DB-notebook to use and learn?

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
42) I found DB-notebook unnecessarily complex.	1	2	3	4	5
43) I found DB-notebook easy to use.	1	2	3	4	5
44) I think that I would need the support of a technical person to be able to use DB-notebook.	1	2	3	4	5
45) I thought there was too much inconsistency of such things as layout, color computer response in DB-notebook.	1	2	3	4	5
46) I would imagine that most people would learn to use DB-notebook very quickly.	1	2	3	4	5
47) I felt very confident using DB-notebook.	1	2	3	4	5
48) I needed to learn a lot of things before I could get going with DB-notebook.	1	2	3	4	5
49) It was clear what I needed to do to complete a form at all times.	1	2	3	4	5

50) Overall, how would you rate DB-notebook in terms of learnability (i.e. DB-notebook's ease of use and its ease of learning)?

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

51) What changes would you make to DB-notebook to make it easier to use and learn?

_____

_____

_____

Usability

Navigation : How easily can you find your way around DB-notebook?

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
52) I found it unnecessarily difficult to get around DB-notebook.	1	2	3	4	5
53) I knew in which part of DB-notebook I was at all times.	1	2	3	4	5
54) I felt lost in DB-notebook.	1	2	3	4	5
55) I knew where I could go at all times.	1	2	3	4	5
56) I was able to go where I wanted at all times.	1	2	3	4	5

57) Overall, how would you rate DB-notebook in terms of navigation (i.e. the ease of finding your way around DB-notebook)?

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

58) What changes would you make to DB-notebook to make it easier to find your way around in it?

_____

_____

_____

Assistance : How helpful is the online help?

Place a tick in the appropriate box.

59) Did you ever use the online help (i.e. clicked the 'Help' button.)?

☐ Yes

If yes, please go to question 60 and continue.

☐ No

If no, please go to question 66 and continue.

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
60) I found the online help extremely limited.	1	2	3	4	5
61) The online help answered all my questions.	1	2	3	4	5
62) I found the online help useless.	1	2	3	4	5
63) I would like the help in hard-copy form rather than on the computer.	1	2	3	4	5

64) Overall, how would you rate DB-notebook in terms of assistance (i.e. the online help)?

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

65) What changes would you make to DB-notebook's online help to make it helpful?

_____

_____

_____

Aesthetics

The aim of this section is find out your views about aesthetics. How does DB-notebook look? How is its response time? How much fun is it to use? Please read the directives and answer accordingly.

Appearance: How does DB-notebook look?

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
66) I found the content on the computer screen easy to see and read.	1	2	3	4	5
67) I felt overloaded by all the things on the computer screen.	1	2	3	4	5
68) I found that the content on the computer screen was logically organized.	1	2	3	4	5
69) I found that pictures and other visual aids were lacking.	1	2	3	4	5
70) I liked having the computer screen divided in two. (i.e. Where DB-notebook is on the left hand side and the electronic text is on the right hand side.)	1	2	3	4	5

71) Overall, how would you rate DB-notebook in terms of how it looks?

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

72) What changes would you make to DB-notebook to make it visually appealing?

_____

_____

_____

Aesthetics

Interaction : How is DB-notebook's response time?

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
73) I found DB-notebook a drag to use because it was slow in responding.	1	2	3	4	5
74) I found DB-notebook quick in responding to my actions. (i.e. When I clicked a button something happened right away).	1	2	3	4	5
75) I found DB-notebook quick in processing information (i.e. in creating a diagram , a table, etc.).	1	2	3	4	5

76) Overall, how would you rate DB-notebook in terms of its response time?

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

Enjoyment : how much fun is it to use DB-notebook?

How does each statement below apply to you? Please place a tick in the appropriate box.

	Strongly Disagree				Strongly Agree
77) I got bored using DB-notebook?	1	2	3	4	5
78) I was interested in using DB-notebook throughout the reading task.	1	2	3	4	5
79) I felt frustrated using DB-notebook.	1	2	3	4	5
80) I think I would like to use DB-notebook frequently. (i.e. To read text in electronic form.)	1	2	3	4	5
81) I would recommend DB-notebook to others. (i.e. To read text in electronic form.)	1	2	3	4	5

82) Overall, how would you rate DB-notebook in terms of enjoyment?

Very unsatisfactory	Moderately unsatisfactory	Neutral	Moderately satisfactory	Very satisfactory

83) What changes would you make to DB-notebook to make it more enjoyable for you and/or others to use?

_____

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_____

Thank you very much for your input.

Appendix F

Users' Responses Regarding the Frequency Content of Text is Understood/Retained, and RE's and Users' Responses Regarding Reading Activities (Strategies) Used

Table 14

Pre-Questionnaire: Users' Responses Regarding the Frequency Content of Text is Understood and Retained

Questions	U1	U2	U3	U4	U5
How often do you have difficulty understanding an assigned text?	Always	Rarely	Some of the time	Rarely	Rarely
How often do you have difficulty remembering the important ideas a while after reading an assigned text?	Rarely	Some of the time	Most of the time	Rarely	Some of the time

Table 15

Pre-Questionnaire: Users' Responses Regarding the Use of Before-, While-, and After-Reading Activities (Strategies)

Before-Reading Activities	RE (Skilled Readers)	RE (Less Skilled Readers)	U1	U2	U3	U4	U5
Before I start reading, I make sure I know why I am reading a text. (i.e. Is it just to understand or is it to solve problems? Etc.)	Always / most of the time	Rarely or never	Always	Rarely	Some of the time	Always	Always
Before I start reading, I check to see what reading aids are available in the text (i.e. Are there headings? A summary? Diagrams?)	Always / most of the time	Rarely or never	Most of the time	Never	Always	Rarely	Some of the time
Before I start reading, I read the title and predict what the text will be about.	Always / most of the time	It depends. Maybe she does this but can't predict much.	Always	Rarely	Most of the time	Most of the time	Always

	RE (Skilled Readers)	RE (Less Skilled Readers)	U1	U2	U3	U4	U5
Before I start reading, I read ALL the headings related to the text, if there are headings present.	It depends. Maybe she should not if there are many headings. Also does "read" mean to skim over them or to read in a slower manner?	Rarely or never	Most of the time	Never	Most of the time	Rarely	Most of the time
Before I start reading, I use the headings to create an outline of the text.	It depends. Not always necessary. It depends on the complexity of the task/material.	Rarely or never	Most of the time	Never	Rarely	Never	Some of the time
Before I start reading, I read the heading and predict what the section will be about.	Always / most of the time	It depends.	Most of the time	Never	Rarely	Most of the time	Always

	RE (Skilled Readers)	RE (Less Skilled Readers)	U1	U2	U3	U4	U5
Before I start reading I think of questions I can answer while I read.	It depends. It depends on the complexity of the material.	It depends.	Most of the time	Rarely	Rarely	Most of the time	Some of the time
While-Reading Activities	**RE (Skilled Reader)**	**RE (Less Skilled Reader)**	**U1**	**U2**	**U3**	**U4**	**U5**
When I read, I read every word. I don't skip any parts of the text.	Rarely or never	Always or most of the time	Most of the time	Always	Always	Some of the time	Never
When I read, I focus on what appears to be important. I focus less or even skip the other stuff.	Always or most of the time	Rarely, never	Most of the time	Most of the time	Rarely	Never	Some of the time
As I read and encounter word I'm not familiar with, I think I should stop and look it up.	Rarely or never	Always or most of the time	Most of the time	Rarely	Some of the time	Some of the time	Most of the time
When I encounter a word I'm not familiar with, I first predict its meaning using the words around it.	Always or most of the time	Rarely or never	Most of the time	Always	Most of the time	Always	Always

	RE (Skilled Readers)	RE (Less Skilled Readers)	U1	U2	U3	U4	U5
When I read, I underline, highlight and/or take notes of only the important words or phrases.	It depends if she can determine the important parts.	Rarely or never	Always	Most of the time	Rarely	Most of the time	Some of the time
When I read, I underline and/or highlight chunks of a paragraph.	Rarely or never	Always or most of the time	Always	Some of the time	Rarely	Never	Always
When I read, I take notes by copying a lot of information out of the text.	Rarely or never. She should be putting it into her own words.	It depends. She may be doing this.	Rarely	Never	Rarely	Rarely	Never
After reading a part of a text, I put it in my own words.	Always or most of the time	Rarely or never	Most of the time	Rarely	Never	Rarely	Rarely
I think about the way the author organized the content.	Always or most of the time	Rarely or never	Most of the time	Rarely	Never	Most of the time	Some of the time

After-reading activities	RE (Skilled Readers)	RE (Less Skilled Readers)	U1	U2	U3	U4	U5
To review, I re-read the text I underlined and/or highlighted.	It depends. She should do more than re-read (i.e. self-test).	It depends. She may do this but it may not help.	Always	Always	Rarely	Always	Always
To review, I re-read the notes I took.	It depends if they were good notes written in her own words.	Rarely or never	Always	Rarely	Rarely	Always	Most of the time
To review, I create and ask myself questions about the text.	Always or most of the time	Rarely or never	Always	Rarely	Rarely	Rarely	Some of the time
To review, I create something visual (i.e. a diagram, a table, etc.).	Always or most of the time	Rarely or never	Some of the time	Never	Rarely	Rarely	Some of the time
I feel that the review strategies I use prepare me for tests.			Always	Most of the time	Rarely (she re-reads the text and puts it into practice)	Always (She re-reads text if there is time)	Some of the time

Appendix G

Evaluation of Utility

Table 16

Post-Questionnaire: RE's and Users' Responses Regarding Time Spent Using DB-notebook

Questions	RE	U1	U2	U3	U4	U5
How much time do you think you spent reading the given article using DB-notebook?	More than usual	I'm not sure	More than usual	About usual	About usual	More than usual

Table 17

Post-Questionnaire: RE's and Users' Responses Related to the "Big Picture" and the Reading Process

Questions	RE	U1	U2	U3	U4	U5
Did DB-notebook get you to look at the big picture? That is, did it help you focus on the overall idea(s) of the article rather than the details?	A little	Not at all	Quite a bit	A lot	Not more than usual	Quite a bit
Did DB-notebook help you become more aware of the reading process (i.e. the steps that can be taken to accomplish a reading task)?	A little	A little	Not more than usual	Quite a bit	Not more than usual	Not more than usual

Table 18

Post-Questionnaire: RE's and Users' Level of Satisfaction With the Enhancement of Comprehension and Retention

	RE	U1	U2	U3	U4	U5
Level of satisfaction with DB-notebook, as a whole, in enhancing comprehension of written text	Moderately satisfactory	Moderately unsatisfactory	Moderately satisfactory	Moderately satisfactory	Moderately satisfactory	Neutral
Level of satisfaction with DB-notebook, as a whole, in enhancing retention of written text	Neutral	Moderately unsatisfactory	Moderately satisfactory	Moderately satisfactory	Moderately satisfactory	Moderately satisfactory

Table 19

Post-Questionnaire: RE's and Users' Level of Satisfaction With the Activities and the Outputs Offered in DB-notebook

	RE	U1	U2	U3	U4	U5
Overall satisfaction with "prepare to read" activities	Moderately satisfactory	Moderately unsatisfactory	Moderately satisfactory	Very Satisfactory	Between moderately and very satisfactory	Very satisfactory
Overall satisfaction with "note taking" activities	Moderately satisfactory	Moderately unsatisfactory	Moderately satisfactory	Moderately satisfactory	Very satisfactory	Moderately satisfactory
Overall satisfaction with "review" activities	Moderately satisfactory	Moderately unsatisfactory	Moderately unsatisfactory	Moderately unsatisfactory	Moderately satisfactory	Moderately unsatisfactory
Overall satisfaction with visual outputs	Moderately satisfactory	N/R	Moderately satisfactory	Very satisfactory	Neutral	Very satisfactory

Note: N/R means no response.

Table 20

Post-Questionnaire: RE's and Users' Evaluation of Utility of the Activities and the Outputs Offered in DB-notebook

List of "Prepare to Read" Activities	RE	U1	U2	U3	U4	U5
Identify subject matter of the text	Useful	A little useful	Useful	Useful	Useful	Useful
Identify purpose for reading the text	Useful	Not useful	A little useful	A little useful	Moderately useful	Useful
Identify reading aids available in the text	Useful	A little useful	Not useful	Useful	Useful	Moderately useful
Use headings to create an outline of the text	Moderately useful	Useful	Very useful	Very useful	Very useful	Very useful
List of "Note Taking" Activities	**RE**	**U1**	**U2**	**U3**	**U4**	**U5**
Ask and answer questions	Moderately useful	A little useful	Useful	A little useful	N/R	Useful
Identify key ideas and/or terms	Between moderately useful and Useful	Moderately useful	A little useful	A little useful	Very useful	Useful

List of "Review" Activities	RE	U1	U2	U3	U4	U5
Get quizzed on questions	Moderately useful	A little useful	A little useful	A little useful	A little useful	Not useful
Get quizzed on key ideas/terms	Moderately useful	A little useful	A little useful	A little useful	Useful	Not useful
Compare key ideas/terms	Moderately useful	A little useful	Useful	A little useful	Useful	Moderately useful
List of Visual Outputs	**RE**	**U1**	**U2**	**U3**	**U4**	**U5**
Linear outline of the text	A little useful	A little useful	Very useful	Useful	Very useful	Very useful
Diagram of the text's outline	Useful	Useful	Useful	Very useful	Moderately useful	Very useful
Diagram of questions, answers, examples	Moderately useful	N/R	Not useful	Very useful	A little useful	Useful

	RE	U1	U2	U3	U4	U5
Diagram of section, key ideas/terms, details, examples	Moderately useful	N/R	A little useful	Moderately useful	A little useful	Useful
Table of key ideas/terms and detail	Moderately useful	N/R	Moderately useful	Moderately useful	A little useful	Useful
Table of questions and answers	Moderately useful	N/R	Not useful	Moderately useful	A little useful	Useful

Note: N/R means no response.

Comments and Problems Observed Regarding Utility

"Prepare to Read" Activities

Comments and Problems Observed Regarding Utility

Specific to Group 1:

- The diagram or concept map of the outline of the reading material was nice, but it was not noticed the first time through.

Specific to Group 2: No information was found.

Specific to Group 3: No information was found.

"Note Taking" Activities

Comments and Problems Observed Regarding Utility

Specific to Group 1:

- If the evaluator had known how to use the "note taking" part of DB-notebook, she would have recorded more key terms.
- Abbreviations used on buttons were not always clear (i.e., "det" for detail).

Specific to Group 2: No information was found.

Specific to Group 3:

- The two activities (i.e., questions and key ideas/terms) in the "note taking" part of DB-notebook were similar.

"Review" Activities

Comments and Problems Observed Regarding Utility

Specific to Group 1:

- The usefulness of the "review" activities would improve with the reader's familiarity with DB-notebook.

Specific to Group 2: No information was found.

Specific to Group 3:

- The purpose of quizzing was not clear.
- The idea of comparing key ideas/terms was not clear because the user did not normally do it.
- The user would use the "compare key ideas/terms" part of DB-notebook only with a topic that was unfamiliar.

Visual Outputs

Comments and Problems Observed Regarding Utility

Specific to Group 1: No information was found.

Specific to Group 2: No information was found.

Specific to Group 3:

- The tables displayed in the compare ideas/terms part of DB-notebook are interesting.

Common to Two or All Three Groups:

- Visual outputs may not be effective for people who do not learn visually.

Suggestions for Improving Utility

"Prepare to Read" Activities

Suggestions for Improving Utility

Specific to Group 1:

- It would be nice to be able to access the Internet or Microsoft Word ™ via DB-notebook. Like this one can get data about the author and take notes.

Specific to Group 2:

- Have a "why" button that, when clicked, will provide an explanation of why the user is doing a particular thing.

Specific to Group 3:

- During the activity involving the identification of the reading purpose, the user should be given more information as to why this is important to do as a reader.
- The "prepare to read" part could be more clear-cut. It could be a questionnaire of sorts that includes everything needed for MLA or APA documentation (i.e., year, publisher).

Common to Two or All Three Groups:

- The given reading material contains bolded words that could be seen as sub-headings. It would be nice if sub-headings could be added in the outline.

"Note Taking" Activities

Suggestions for Improving Utility

Specific to Group 1:

- It would be helpful to have a place where definitions could be entered. Then, as a review activity, definitions could be matched to key terms.
- An example showing how to use DB-notebook would be helpful.

Specific to Group 2:

- The two activities are so similar that by doing one, it fulfills the other. Maybe there should only be one.

Specific to Group 3:

- Make the "example of detail" box less restrictive in terms of the information that must be entered there. Label it, instead, as "further notes."
- Have "identify key ideas/terms" set as the default and make "ask and answer questions" optional.

Common to Two or All Three Groups:

- The "note taking" part of DB-notebook should be more flexible, if possible. It was very structured (i.e., a place to enter key terms, a place for details, and a place for examples).

"Review" Activities

Suggestions for Improving Utility

Specific to Group 1:

- It should be easier to input the comparison questions.

Specific to Group 2:

- You do not need the "review" part of DB-notebook except for the comparison activity, which could be put into the "note taking" part of the prototype instead.

Specific to Group 3:

- It would be nice to have a fill in the blank quiz with computer scoring preferably. It could offer hints.
- Add more information about why it is useful to compare and explain how it can be done.

Visual Outputs

Suggestions for Improving Utility

Specific to Group 1:

- Try to make the screen less confusing by using a different color for the instruction box at the bottom left of the screen.

Specific to Group 2:

- Questions do not need to be visually represented.

Specific to Group 3:

- The graphics should be a little better.
- Perhaps have one big tree eventually.

Utility in General

General Comments Concerning Utility

Specific to Group 1: No information was found.

Specific to Group 2: Not information was found.

Specific to Group 3:

- It would be nice if the program could lead users through it.
- Allow for a practice run.
- Make the help button more accessible. Moreover, have a button that, once pressed, tells the user what the next step ought to be.

Common to Two or All Three Groups:

- DB-notebook should be clearer and easier to use. Any confusion, whatsoever, in the program is going to affect comprehension and retention of the text.

Appendix H

Evaluation of Usability

Table 21

Post-Questionnaire: UIDE's and Users' Level of Satisfaction with Usability

Usability	UIDE	U1	U2	U3	U4	U5
Learnability	Moderately unsatisfactory	Moderately unsatisfactory	Moderately satisfactory	Moderately unsatisfactory	Moderately unsatisfactory	Moderately satisfactory
Navigation	Moderately unsatisfactory	Moderately unsatisfactory	Moderately satisfactory	Neutral	Neutral	Very Satisfactory
Assistance	Very satisfactory	Moderately satisfactory	N/A	Moderately unsatisfactory	N/A	N/A

Note: N/A means not applicable.

Table 22

Post-Questionnaire: Users' Responses to Different Aspects of Learnability, Navigation, and Assistance

Learnability	U1	U2	U3	U4	U5
I found DB-notebook unnecessarily complex.	Disagree	Agree	Neutral	Agree	Neutral
I found DB-notebook easy to use.	Strongly Disagree	Strongly agree	Disagree	Disagree	Agree
I think that I would need the support of a technical person to be able to use DB-notebook.	Disagree	Disagree	Agree	Neutral	Strongly disagree
I thought there was too much inconsistency of such things as layout, colour, computer response in DB-notebook.	Strongly agree	Strongly disagree	Agree	Neutral	Strongly disagree
I would imagine that most people would learn to use DB-notebook very quickly.	Strongly disagree	Strongly agree	Neutral	Disagree	Agree

	U1	U2	U3	U4	U5
I felt very confident using DB-notebook.	Strongly disagree	Agree	Disagree	Disagree	Neutral
I needed to learn a lot of things before I could get going with DB-notebook.	Strongly disagree	Strongly disagree	Agree	Neutral	Strongly disagree
It was clear what I needed to do to complete a form at all times.	Strongly disagree	Agree	Disagree	Disagree	Agree
Navigation	**U1**	**U2**	**U3**	**U4**	**U5**
I found it unnecessarily difficult to get around DB-notebook.	Disagree	Disagree	Neutral	Disagree	Strongly Disagree
I knew in which part of DB-notebook I was at all times.	Strongly disagree	Neutral	Disagree	Neutral	Agree
I felt lost in DB-notebook.	Strongly agree	Disagree	Agree	N/R	Strongly disagree
I knew where to could go at all times.	N/R	Neutral	Neutral	Disagree	Agree
I was able to go where I wanted at all times.	Neutral	N/R	Disagree	Disagree	Agree

Assistance	U1	U2	U3	U4	U5
I found the online help extremely limited.	Strongly disagree	N/A	Neutral	N/A	N/A
The online help answered all my questions.	Neutral	N/A	Agree	N/A	N/A
I found the online help useless.	Neutral	N/A	Disagree	N/A	N/A
I would like the help in hard-copy form rather than on the computer.	Disagree	N/A	Strongly agree	N/A	N/A

Note: N/R means no response and N/A means not applicable.

Comments and Problems Observed Regarding Usability

Learnability

"Prepare to Read" Activities - Comments and Problems Regarding Usability

Specific to Group 1:

- There was a spelling error in the "open file" form.
- The box used to enter a new subject matter was too complicated.
- The combination of text box (i.e., box to enter information) and list box (i.e., box to view information) was not clear. For instance, when the user entered an author in the text box, she thought it had disappeared. Instead it had gone to the list box so it could be viewed.
- The difference between current authors and existing authors was not clear.
- The user expected to be able to drag-and-drop items from one place to another. At present, this cannot be done in DB-notebook.
- It was not evident that the "arrow" button had to be clicked after a reading aid had been highlighted in the "existing reading aids" list.
- The explanations that were provided for the individual reading aids (i.e., heading, bolded terms) were not clear.
- It was not apparent how to create an outline of the text. This is because it was not clear that the word "title" in the white box had to be clicked. This white box normally displays text. Therefore, the action of clicking this box went against the user's expectation. What had to be clicked should have been highlighted.
- The way to enter data was not consistent everywhere. For example, the method to enter headings was different from the method to enter questions.
- The ability to view the outline of the text as a diagram (i.e., concept map) was not obvious.
- The reason for the diagram of the outline of the text was not apparent.

Specific to Group 2:

- In the main menu form, the purpose of the white box, which displayed the Internet articles and books, was not obvious.
- Once an electronic text was opened, it was not clear what to do.
- The form used to enter a new subject matter was not intuitive. After the "add" button was clicked the form remained. The user, however, expected it to close automatically. It did not and the user was at a loss.
- For some reason, the concept map of the outline of the text was not created.

Specific to Group 3:

- In the form where the reading material was identified, the type of reading material had to be selected before the medium. If this order was not followed, the computer did not accept the user's response. Order should not matter, so this bug needs to be fixed.
- The icon used to indicate the paste feature was not meaningful to the user.
- The explanations given for the individual reading aids (i.e., heading, bolded terms) were not clear.
- When creating the outline of a text, it was not clear whether all the headings needed to be added or just a few.

Common to Two or All Three Groups:

- Instructions on top of controls (i.e., boxes to enter text) were read instead of the directives in the instruction box.
- The purpose of the instruction box at the bottom of DB-notebook was not obvious at the start. It was also often forgotten.

- The "open file" button was hard to locate. One reason was because the user was expecting it to be in DB-notebook, but it was in Microsoft Word™
- Once the electronic text was opened, the user thought it was time to read. DB-notebook was forgotten.
- The edit feature of Microsoft Word™ was almost used to cut and paste instead of DB-notebooks "paste" button.
- It was not clear how to enter a new subject matter. For example, the user was tempted to enter the subject matter in the given subject matter drop-down list. However, this was not permitted.
- An outline, which allowed one to jump to different headings, was not intuitive to use. It was not clear that a "read" button had to be clicked. In addition, this button was deactivated until a heading was clicked. This made it harder to see the "read" button, if no heading was clicked.

"Note Taking" Activities - Comments and Problems Regarding Usability

Specific to Group 1:

- The layout was not consistent in all forms. For instance, the form that introduced the user to the "note taking" part of the prototype did not possess an instruction box like the other forms.
- The icons (i.e., icons for edit, paste, and delete) used in the "note taking" part of the prototype, were not meaningful. That is, it was not obvious what they do.

Specific to Group 2:

- An example was entered by the user but could not be seen. This did not always happen.
- The program bombed in the "key ideas/terms" part of DB-notebook. The reason is not clear.

Specific to Group 3:

- The user expected to see information (i.e., a question) in a text box, but it was blank because the information was in the list box.
- On entering the "note taking" form of DB-notebook, a flashing prompt was presented and appeared to indicate that a question must be entered, but it was not necessarily the case. This was confusing.
- When one returned to a form (i.e., the questions form), the information under focus was no longer the same as when one left the form.
- In the form where key ideas/terms were identified, the label associated with the "example of detail" was wrong.

Common to Two or All Three Groups:

- The forms, which introduced the "note taking" and "review" part of DB-notebook, were not clear and, therefore, ignored. The picture given in one of these forms was also misleading because it looked like it could be clicked.
- The "note taking" part of DB-notebook was too disjointed (i.e., box for questions, answers, and examples). User forgot to use the separate boxes. In once case, the user entered answers where questions were supposed to be entered.
- In the "note taking" part of DB-notebook, it was not obvious how to add information. For instance, the user had to press the "enter" key. Instead, the user clicked the "paste" button on the prototype, but it worked.
- It was not obvious that more than one question or key idea/term could be entered. It was not apparent how the text box (i.e., the place to enter data) and the list box (i.e., the place to view data) worked.

- It was not clear that the notes entered had to correspond to the section (i.e.., heading) one was in. For instance, if DB-notebook indicated that the user was in the introduction section of the text, then the user had to take notes pertaining to the introduction section. This did not always happen. Sometimes the user was in one section in DB-notebook and reading another section in the text.
- It was not obvious how to edit questions or key ideas/terms. That is, once a question was modified, it was not clear that the "edit" button had to be clicked. The word "edit" was misleading.
- Abbreviations used were not always clear (i.e., "det" for detail).

"Review" Activities - Comments and Problems Regarding Usability

Specific to Group 1:

- It was not clear what had to be done in the "quiz" part of DB-notebook.
- The user thought that questions and terms could be entered in the "quiz" part of DB-notebook. This was not the case.
- The "comparing key ideas/terms" part of the prototype was overwhelming.
- What had to be compared was not made apparent.

Specific to Group 2:

- The user appeared to pay more attention to the quality of notes when she saw them in the tables displayed in the "compare key ideas/terms" part of the prototype.

Specific to Group 3:

- It was not apparent where the questions, displayed in the "quiz" part of DB-notebook, came from.

- It was not clear what one had to do in the "compare key ideas/terms" part of DB-notebook.
- It was not clear what one had to do after having completed the "compare key ideas/terms" part of DB-notebook.
- The program bombed in the "compare ideas/terms" part of DB-notebook. The online help was opened when the user deleted some information in DB-notebook and the program bombed.

Common to Two or All Three Groups:

- The "quiz" part of DB-notebook only displayed information that had been previously entered for a particular section (i.e., heading). If no information had been added for a section, then no information would be displayed for that section. This was misleading and some users thought that what they entered had disappeared.

Navigation

Comments and Problems Regarding Usability

Specific to Group 1:

- The toolbar was not clearly identified. It blended in with the toolbar from Microsoft Access™. However, once the user knew it was there, he or she could navigate easily.
- It was not always apparent where one was in DB-notebook. For example, an evaluator entered key terms where questions should have been added.

Specific to Group 2: No information was found.

Specific to Group 3: No information was found.

Common to Two or All Three Groups:

- It was not clear how to go back at all times.

Assistance

Comments and Problems Regarding Usability

Specific to Group 1:

- The online help was very clear.
- The directives given in the online help did not always match the evaluators' expectations. Consequently, the instructions had to be read carefully and a number of times.
- The online help did not appear to be helpful.
- In the online help, it was not clear how to go back to the list of help questions.

Specific to Group 2: No information was found.

Specific to Group 3: No information was found.

Suggestions for Improving Usability

Learnability

"Prepare to Read" Activities - Suggestions for Improving Usability

Specific to Group 1:

- It would be nice to modify the title once it has been entered.
- The box used to enter a new subject matter should be simplified. For example, simply provide a place to enter the subject and an "add" button to click.

Specific to Group 2:

- Bullets and numbers should be added to the list of reading aids.
- Small paragraphs should be added to the list of reading aids.

Specific to Group 3:

- The explanations given for the individual reading aids (i.e., heading, bolded terms) are not clear. A suggestion is to have "what is" questions with answers.

Common to Two or All Three Groups:

- Allow sub-headings, in addition to headings, to be added. Like that, bolded terms, which act like sub-headings, can be handled.
- The "open file" button was hard to locate. One reason was because the user was expecting it to be in DB-notebook, but it was in Microsoft Word™. A suggestion would be to put the button in DB-notebook.

- Once the electronic text was opened, the user thought it was time to read. DB-notebook was forgotten. A message should be displayed to inform the user not to start reading but to continue with DB-notebook.
- An outline, which allowed one to jump to different headings, was not intuitive to use. It was not clear that a "read" button had to be clicked. In addition, this button was deactivated until a heading was clicked. This made it harder to see the "read" button, if no heading was clicked. A suggestion would be to remove the "read" button and just go directly to the heading that was clicked.

"Note Taking" Activities - Suggestions for Improving Usability

Specific to Group 1:

- The "note taking" part of DB-notebook should not be broken down so much (i.e., box for question, box for answer, and box for example).
- The "note taking" part of the prototype should be less structured because it is not always obvious how information should be categorized.
- The notes taken should be put onto one page. The user should then be able to move those notes around on this page.
- Note-taking should be made easier by adding such features as cut, paste, copy, and underlining.
- Buttons should possess meaningful icons or labels.
- User should be able to highlight important questions and key terms and grey out the rest.
- Detail (e.g., answer, example) should go directly underneath general item (e.g., question, key term).
- It would be nice to be able to summarize the entire article.

Specific to Group 2:

- A drag-and-drop feature would be nice.
- To show where one is, it would be nice if text can be darkened in the electronic text.
- The user felt like she had to enter an example. It would be good to indicate that this is optional.
- The order of the terms or ideas entered in the "note taking" part of DB-notebook should not be organized alphabetically, but in the order they are entered.

Specific to Group 3:

- Instead of entering examples in the "note taking" part of DB-notebook, it would be nice to enter personalized information.

Common to Two or All Three Groups:

- It was not obvious how to edit questions or key ideas/terms. That is, once a question was modified, it was not clear that the "edit" button had to be clicked. The word "edit" was misleading. A suggestion would be to change the word "edit" to "make changes".
- It would be nice to be able to enter longer text such as paragraphs.
- The text is hard to read on the screen. It would be nice if it could take up the whole screen instead of only half.

"Review" Activities - Suggestions for Improving Usability

Specific to Group 1:

- The "quiz" part of the prototype allows users to view results (i.e., see percentage of questions answered correctly). It would be useful if the users could view their score related to each section (i.e., heading) so as to determine which section needs more attention.

Specific to Group 2:

- The result displayed in the "quiz" part of DB-notebook should not just indicate the percentage of correct answers (if there are many points to a question). It should also tell how many points were right and wrong.

Specific to Group 3:

- In the "quiz" part of DB-notebook (e.g., quiz questions), it would be more enjoyable to write down answers than just guess at them. It could be like a game.

Navigation

Suggestions for Improving Usability

Specific to Group 1:

- A navigational map may be useful to show where one is and where one can go.

Specific to Group 2:

- Have fewer tools to work with.
- Make screens less busy.

Specific to Group 3:

- Perhaps put the help button beside the instruction box.
- Provide a map of some sorts.
- If there was a "go back" button and a "next" button, it would have been simpler.

Assistance

Suggestions for Improving Usability

Specific to Group 1:

- In the online help, it was not clear how to go back to the list of help questions. A back arrow, on top of the screen shot (i.e., picture of the screen), may be helpful.

Specific to Group 2: No information was found.

Specific to Group 3: No information was found.

Usability in General

General Comments Concerning Usability

Specific to Group 1:

- A promotional or introductory slide presentation of the prototype would be nice.
- A paper explaining the important parts of the prototype would be nice.
- It would be nice if the Internet could be accessed.
- A spell check, like that found in Microsoft Word™, would be useful.

Specific to Group 2:

- Have an introduction with step-by-step instructions.
- Have a help icon.
- Have a place to type a question that could then be looked up in the online help.
- Have less information on the screens.
- Simplify DB-notebook by having fewer steps in each part.
- Make screens less busy.

Specific to Group 3

- Simplify DB-notebook. Create a few key tools and make those highly flexible.
- It would be nice to have a help icon to lead the user through the program.
- It would be nice to have a pop up icon with audio as the online help.
- Add a glossary in which terms can be entered.

Appendix I

Evaluation of Aesthetics

Table 23

Post-Questionnaire: UIDE's and Users' Level of Satisfaction With Aesthetics

Aesthetics	UIDE	U1	U2	U3	U4	U5
Appearance	Moderately satisfactory	Moderately unsatisfactory	Moderately satisfactory	Neutral	Moderately satisfactory	Neutral
Interaction	Neutral	Moderately satisfactory	Moderately satisfactory	Moderately satisfactory	Very satisfactory	Very satisfactory
Enjoyment	Neutral	Neutral	Neutral	Very satisfactory	Moderately satisfactory	Neutral

Table 24

Post-Questionnaire: Users' Responses to Different Aspects of Appearance, Interaction, and Enjoyment

Appearance	U1	U2	U3	U4	U5
I found the content on the computer screen easy to see and read.	Strongly disagree	Agree	Disagree	Agree	Agree
I felt overloaded by all the things on the computer screen.	Strongly agree	Neutral	Agree	Neutral	Neutral
I found that the content on the computer screen was logically organized.	Disagree	Agree	Disagree	Agree	Strongly agree
I found that pictures and other visual aids were lacking.	Strongly agree	Disagree	Strongly disagree	Disagree	Strongly agree
I liked having the computer screen divided in two. (i.e. Where DB-notebook is on the left hand side and the electronic text is on the right hand side.)	Neutral	Strongly agree	Neutral	Strongly agree	Strongly agree
Interaction	**U1**	**U2**	**U3**	**U4**	**U5**
I found DB-notebook a drag to use because it was slow in responding.	Disagree	Disagree	Strongly disagree	Strongly disagree	Neutral
I found DB-notebook quick in responding to my actions. (i.e. When I clicked a button something happened right away).	Strongly agree	Agree	Strongly agree	Strongly disagree	Agree

	U1	U2	U3	U4	U5
I found DB-notebook quick in processing information (i.e. in creating a diagram, a table, etc.).	Strongly agree	Agree	Neutral	Strongly Disagree	Agree
Enjoyment	**U1**	**U2**	**U3**	**U4**	**U5**
I got bored of using DB-notebook.	Strongly agree	Disagree	Strongly disagree	Disagree	Disagree
I was interested in using DB-notebook throughout the reading task.	Neutral	Agree	Strongly agree	Neutral	Neutral
I felt frustrated using DB-notebook.	Neutral (some parts)	N/R	Neutral	NR (at times)	Disagree
I think I would like to use DB-notebook frequently. (i.e. To read text in electronic form.)	Agree	Strongly disagree	Strongly agree	Disagree	Strongly disagree
I would recommend DB-notebook to others. (i.e. To read text in electronic form.)	Agree (if improved)	Neutral	Strongly agree	Agree	Neutral

Note: N/R means no response. Extra comments by the users are indicated in parentheses.

Comments and Problems Observed Regarding Aesthetics

Appearance

Comments and Problems Observed Regarding Aesthetics

Specific to Group 1:

- There were too many things to look at on the screen (i.e., DB-notebook and electronic text). This was confusing.
- The eyes were drawn to the electronic text. Consequently, DB-notebook was sometimes forgotten.
- The smaller pop up form blended in with the larger form below. Since buttons look active in both forms, it was difficult to know what to click.
- The tabs that provided localized movement were not noticed because they blended in with the background.

Specific to Group 2:

- DB-notebook looked fine. You can make software look only so interesting. The prototype is designed to be more of a learning tool than anything else.

Specific to Group 3: No information was found.

Common to Two or All Three Groups:

- A picture provided in one of the forms (i.e., introducing the "ask and answer questions" part of DB-notebook) looked like it could be clicked.
- The outline, which allowed one to jump to different headings, looked like the form where an outline of a text could be created. As a result, the user tried to add a heading, but could not.

Interaction

No information was found.

Enjoyment

Comments and Problems Observed Regarding Aesthetics

Specific to Group 1:

- DB-notebook is not a game and, therefore, would not be used as a form of entertainment, but I think it is a useful tool.

Specific to Group 2:

- It is not pleasant to be stuck in front of a computer taking notes.
- Reading techniques presently used are fine as is.
- I would recommend the prototype to people who enjoy working on computers and who want to take notes more effectively.

Specific to Group 3:

- I do not want to use a different note-taking system. I would not change mine.
- The prototype would be recommended to people who find it hard to read and take notes.

Suggestions for Improving Aesthetics

Appearance

Suggestions for Improving Aesthetics

Specific to Group 1:

- The computer screen should be less cluttered.
- The split screen in DB-notebook (i.e., DB-notebook on the left and the electronic text on the right) was a bit off putting. A larger page is preferable.
- The smaller pop up form blended in with the larger form below. Since buttons looked active in both forms, it was difficult to know what to click. A suggestion would be to deactivate the buttons on the bottom form so the user does not think that they can be clicked.

Specific to Group 2: No information was found.

Specific to Group 3:

- Consider adding animation, graphics, and pictures of target group.
- Consider adding more color and more illustrations.

Interaction

No information was found.

Enjoyment

No information was found.

Appendix J

Strengths and Weaknesses

Strengths, Weaknesses, and General Comments

Strengths

Comments Concerning Strengths

Specific to Group 1:

- The idea of a tool that addresses the complex task of teaching reading efficiency is a good one.

Specific to Group 2:

- The best thing about DB-notebook was the ability to create an outline of the text.

Specific to Group 3:

- The idea of organizing notes is good.
- It was great having the workstation screen next to the text screen.

Common to Two or All Three Groups:

- The diagrams were the best part of the prototype.

Weaknesses

Comments Concerning Weaknesses

Specific to Group 1:

- The prototype was difficult to use without help.
- The instruction box on DB-notebook was difficult to understand.
- It was irritating to have to scroll through the instruction box.

- A common mistake made was not reading the instruction, word-by-word, in the instruction box.
- It was not apparent how one could go to the next step.
- The main toolbar was not noticeable, so it was not clear how to navigate through the prototype.
- The goals of the activities were not made obvious at the start.
- When two forms were opened (i.e., a small form over a larger one), it was not clear which box to click. Furthermore, it appeared that the controls (i.e., buttons) on the larger could be clicked, but this was not the case.
- The prototype was not always consistent. For example, the method to enter a title was different from the method to enter a heading.

Specific to Group 2:

- The screens were busy.
- One could get lost in all the boxes that popped up. It was not clear how to go back.
- It was confusing going back and forth from the "prepare to read" activities to the "review" activities.
- The "compare key ideas/terms" part of DB-notebook was irritating.
- There seemed to be too many tools, but this may be because of people's different preferences.
- The concept is interesting, but using this tool might make the note-taking process tedious and longer than writing out notes.

Specific to Group 3:

- It was not clear what the next step should be.
- What was expected of the user in certain tasks was not made evident.

- The user did not always know what to fill out first (i.e., when the order of things counted).
- The prototype did not always explain why something was important to do.
- The "quiz" part was too self-motivated and it was irritating.

Common to Two or All Three Groups:

- Directives were not always found and the instruction box was often forgotten.
- The "ask and answer questions" part was similar to the "identify key ideas/terms" part of DB-notebook.

General

General Comments

Specific to Group 1:

- The given electronic text was long.
- The user usually likes to add notes in her books.
- The user usually writes key words and summaries in the margin of the reading material.
- More time was spent on completing DB-notebook's activities and less time was spent on the actual reading experience.
- DB-notebook was leading the reading task.
- A lot of the focus was on lifting text from the electronic reading material.

Specific to Group 2:

- The user does not like to type too much.

Specific to Group 3:

- Scrolling through electronic text is irritating.

- The user felt like she must enter information to satisfy the computer.
- The user felt like she had to answer the questions provided by the computer.
- The user prefers to type than cut and paste.