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User disorientation related to instructional hypermedia programs

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Abstract

Instructional hypennedia programs seem to define the current trend in today's educational institutions. These multimedia programs, most often found on CD-Roms (compact disks, which can be read, but not written to), make use of the computer to coordinate and present text, graphics, audio, animation, and video within a single document. They are classified as "hype1media" because of the way in which the various elements can be accessed. Rather than being limited to a linear presentation, in which each element is dispensed in a predetermined sequence to all users, Yang and Moore (1995) define hypermedia as a "non-linear association of information .... [which have a linkage] based on [the] users' real-time decisions, not on a predete1mined sequence" (p. 4). Thus, the user of the program has the ability to select multiple paths through which to approach the information. This means that each user can independently decide both the flow of the presentation, and which portions of the material need to be attended to or disregarded.

User Disorientation Related to Instructional Hypermedia Programs

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CHAPTER 1

Introduction

Instructional hypermedia programs seem to define the current trend in today's educational institutions. These multimedia programs, most often found on CD-Roms (compact disks, which can be read, but not written to), make use of the computer to coordinate and present text, graphics, audio, animation, and video within a single document. They are classified as "hypermedia" because of the way in which the various elements can be accessed. Rather than being limited to a linear presentation, in which each element is dispensed in a predetermined sequence to all users, Yang and Moore (1995) define hypermedia as a "non-linear association of information.... [which have a linkage] based on [the] users' real-time decisions, not on a predetermined sequence" (p. 4). Thus, the user of the program has the ability to select multiple paths through which to approach the information. This means that each user can independently decide both the flow of the presentation, and which portions of the material need to be attended to or disregarded.

To clarify terms in this research report, each discrete informational screen in a hypermedia program shall be defined as a node, and the connections between these nodes shall be called links (Jonassen, 1989; Yang & Moore, 1995). Links are accessed when the user of the computer program presses the computer mouse button or a selected key stroke to click on a "hot" button from the screen. These buttons are generally represented by a graphic or hypertext. Hypertext is simply text which can be distinguished by its contrasting color on the screen, and which provides a link to a different screen (node) when clicked upon. Consequently, instructional hypermedia refers to a computerized multimedia program used for educational purposes, which allows the user to manipulate the presentation of the information contained within it by using links to access various nodes.

Rephrased, this means that the user has the ability to change the course of information to be viewed, depending on the purpose for which the program is being used. In addition, the rate at which the information is viewed can be determined by the user.

Purpose

The idea of providing the student with the ability to determine both the pace and the direction in which these lessons unfold may sound intriguing at first glance. However, problems are emerging from the uncontrolled environment provided by these programs (Beasley & Waugh, 1995; Plowman, 1996; Stanton & Baber, 1994). Although their educational potentials seem limitless, there appears to be a need for some sort of guidelines to exist which can assure the student that the chosen path will lead to goal fulfillment. The question becomes one of understanding how the user can best manipulate these programs. It appears that uniform, systematic design features need to be developed in order to assist the user in this manipulation. By standardizing the methods used to obtain information, the amount of time spent learning how to use various programs can be reduced, allowing the user to be more efficient and productive. It is the purpose of this paper to take a closer look at hypermedia programs, examining which of their components might cause the user to become "lost" during goal pursuit. Possible solutions related to overcoming these problems will then be investigated.

CHAPTER 2

Review of Literature

The incidence of disorientation associated with hypermedia usage points to several possible sources, each of which merits examination. For instance, contrasting learning theories appear to be integrated into the development of hypermedia programs. This may result in certain aspects of these programs being viewed as advantageous for some students, while limiting to others. (For instance, allowing the user complete control concerning the direction and rate at which a lesson is presented may either lead to increased learning or utter confusion, depending on how prepared that user is for making these decisions.) In addition, hypermedia, by its very definition, disrupts the basic linear flow of narration. Most students are familiar with temporal formats, in which one event necessarily follows another. Hypermedia, which may provide numerous links among informational nodes, disturbs this traditional way of comprehending the world. This ability to branch off into diverse directions leads to the problem of how to efficiently navigate through these links without becoming "lost" or confused. In order for users to successfully navigate hypermedia, designers of these programs must present clear, concise computer interface screens. These must allow the user to easily determine what options are available, how to make use of these options, and how to keep track of beneficial information once it is located. Unfortunately, inconsistencies exist concerning how this can be best accomplished. Thus, in order to examine the problem of user disorientation, all of these topics (learning theories, advantages and limitations of the programs, basic narrative, hypermedia navigation, and the definition of clear user interface) deserve investigation.

Learning Theories

Before examining educational hypermedia programs further, it is important that the learning theories behind their creation be identified. Three basic learning theories,

Constructivism, Cognitivism, and Behaviorism, appear to be fundamental to the design of these programs. These same theories seem to be both pitted against each other and combined in many aspects of today's classrooms.

The Constructivist theory holds that learning is an on-going cognitive process, which takes place within the mind of the learner. The learner receives new information and then attempts to integrate it into a pre-existing knowledge base. Thus, learning outcomes cannot be predefined, for each person will assimilate the information differently. According to Brown, Hedberg, and Harper (1994), this theory accounts for the popularity of the student-centered learning environment and places the responsibility for learning directly on the student. The teacher is no longer viewed as simply a dispenser of knowledge, but more frequently portraits the role of a learning facilitator. Teachers who accept this resource role provide the tools for students to use in locating materials and information necessary for lesson completion. Teachers guide the learning process by helping their students develop strategies to link new information with prior knowledge and experiences. The students are asked to be original, to be creative, and to question the status quo. In other words, they are asked to "think for themselves," rather than to simply accept what they are told. They are encouraged to explore their own thoughts and to seek new relationships with information, rather than to just accept those which are pre-constructed and presented to them. Originality and higher order thinking skills are stressed, as the importance of rote memorization is down-played (Jacobson, Maouri, Mishra, & Kolar, 1995). The students are viewed as people to be empowered, so that they may actively contribute to the learning process. Furthermore, the students must feel they possess a direct need to access the information before real learning can occur. These ideas are evident in the self-determined structure of instructional hypermedia programs, which allow flexibility for the students to access only information which is pertinent to their individual learning needs.

Furthermore, the connections which link information throughout hypermedia programs may help the students grasp ways to incorporate this new knowledge with their own existing schemas, or knowledge structures (Becker & Dwyer, 1994).

Closely related in many aspects, is the Cognitive Learning Theory. This theory holds that the learner, upon receiving stimulation from the environment, undergoes a transformation of neural activity, so that important information is recorded in short-term memory. There, it can be used for immediate purposes and then forgotten, or it may be further encoded for storage in long-term memory. The ease of transformation to long-term memory is dependent on the amount of meaning the information has for the learner. If the information holds a lot of meaning, it can easily be transferred. However, if it does not, then this transformation will be difficult at best. Learning is considered to have occurred when information can be retrieved from long-term memory to short-term memory. Once this occurs, the information can either be combined with new information or be transformed into some form of action. From this theory, it becomes evident that the role of the teacher now involves helping the learners develop personally relevant meaning for new information, aiding in its transfer to long-term memory. Learning outcomes can, however, be pre-conceived. The focus for the teacher is simply to facilitate the incorporation of this information into the students' long-term memory. Again, the influence of this theory can be seen within the concepts of many instructional hypermedia formats. This influence includes, but is not limited to, programs which incorporate reviews of prior knowledge, techniques to aid in the transfer of skills (such as the use of acronyms or mnemonics), and various processes that allow the program to be individualized so that the learner will feel more closely related to the information (Hannafin & Peck, 1988).

On the other hand, Behaviorism also plays a primary role in today's instructional setting and in the development of educational hypermedia. According to Heinich, Molenda,

Russell, and Smaldino (1996), this theory, developed by B. F. Skinner, is based upon the belief that learning occurs due to a series of stimulus-response situations. If a stimulus is presented, and the student responds in a way which is deemed to be "correct", a reinforcement is administered that the student views positively. This reinforcement can range from a smile to a large sum of money, or anywhere in between. The key is that it must be interpreted positively by the learner. This reinforces the behavioral response and increases the likelihood of it occurring again. Conversely, if the "wrong" response is given, a negative reinforcement (something that the student views negatively) will occur, resulting in a decrease of the likelihood that this response will be repeated. From this theory comes the notion that the student's mind is a vessel, waiting to be filled. Learning is seen as a manipulated phenomenon that results from situations outside of the learner's mind (Chance, 1992). Brown, et al. (1994) define learning under this theory as "the formation of conditioned stimulus-response associations" (p. 13). The teacher is now viewed as both the dispenser of knowledge and the judge of what constitutes mastery of a given field of information. Learning outcomes are predetermined, and their accomplishment can easily be measured through student behavior. This theory has long held credence in the classroom, and can still be found in many of the day-to-day aspects of education. As previously stated, evidence of this theory is also apparent in many of the interactive hypermedia programs developed for instructional purposes. It accounts for such design features as the use of immediate feedback following the students' response and the justification of drill and practice programs. Lessons are broken into small, digestible units with distinct steps linking each part. Specific objectives can be set, and evaluations can be made concerning their fulfillment.

According to Hannafin and Peck (1988), "we do not fully understand how people learn" (p. 46). Thus, information is often drawn from many theories in an attempt to better

help the learner assimilate and use the knowledge presented. This combined approach is found in many of the instructional hypermedia programs currently on the market. Perhaps this, alone, is enough to begin the confusion. After all, each theory represents a different paradigm, or way of viewing the learning situation. Is it truly possible, one might ask, to cross these paradigms without the results becoming somewhat clouded? Is it acceptable to allow the student full reign in determining what to study, or does learning require guidance? Should learning be considered a cognitive (mental) process, but be built only on a series of behavioral reinforcement strategies? These are fundamental questions, not only for instructional hypermedia, but also for education in general. Research in this area appears to be lacking. Instead, it seems to be assumed that a combination of these theories will best serve to build the student's comprehension of new information. This appears to be the premise under which educational hypermedia is presently being created.

The Advantages and Limitations of Instructional Hypermedia

Instructional hypermedia appears to hold immense potential when it comes to improving the learning capabilities of the student. These programs may be individually customized, allowing the student to determine the pace and order of the information to be presented. This ability provides the programs with much more flexibility than is possible with linear presentations. Additionally, the multimedia format accommodates students with different learning styles. These students may now choose the preferred method for lesson presentation, deciding if they wish to read the material, hear it read to them, get a graphical representation of it, or any combination thereof (Brown et al., 1994).

Moreover, and this is a very important point, hypermedia programs require that the learner must now become actively involved in the learning process (Jonessen, 1989). Gone are the days when a student could sit idle, dozing through a daydream, while the teacher presents the lesson. Instead, the moment the student quits responding to a hypermedia

program, the program will also pause, patiently waiting for the student to return to the task at hand. The computerized system represents a tireless, non-judgmental teacher (Parham, 1993). It is not temperamental, nor does it mind repeating the same lesson over and over, as many times as the student may deem necessary for comprehension. Unlike the traditional classroom setting, in which the student may be embarrassed to repeatedly ask the instructor to explain a concept, hypermedia programs represent little risk to the learners' self-esteem. Problems arise in this utopia, however, when the program fails to be able to provide the student with the information needed for comprehension. If simply repeating the lesson does not clue the learner into what was previously misunderstood or what was not grasped the first time, the student may become discouraged, confused, or even angered. Again, the feeling of "lost" or of desperation may set in. To combat this, some sort of "help" function should be incorporated into the program. If this service is not adequate, the classroom teacher or some other form of instructional guidance tool needs to be available. This is extremely important, because, realistically speaking, while as many student questions as possible need to be anticipated and provided for by the program, it is unlikely that all of them could ever be accounted for.

Theoretically, the flexibility to investigate only the portions of the instructional hypermedia lesson which the learner feels are pertinent to individual goal achievement also gives that person a feeling of control over the lesson. This feeling of self-empowerment seems to account for an increase in learner motivation, which, in turn, results in an extended period of time which the student is willing to spend on the learning task (Becker & Dwyer, 1994). However, contrary to this popular belief, Jacobson et al. (1995) propose that high amounts of learner control cannot guarantee success for the lesson. They state that, "free exploration, if unguided, may result in confusion and disorientation with respect to goal [achievement]" (p. 349). They further speculate that it may be preferable to limit

learner control somewhat by supplementing the lesson with scaffolding techniques (e. g. worksheets, goal-setting ideas, etc.) to help guide the student through the lesson.

Still, features which appear to build learner autonomy sound advantageous, and there are other, equally lucrative, characteristics which promote the use of hypermedia programs. For example, these programs permit large quantities of information to be easily accessed. Video and/or animation may be used to communicate fluid processes which can otherwise be difficult to understand. Feedback can be instantaneous, as opposed to the delayed turn-around time commonly found in the traditional classroom. Programs can be used independently, reducing the student's demand on a teacher's time. Creative freedom can be unleashed as the student makes use of higher order thinking skills and builds problem-solving techniques. Again, the benefits of using these programs make them appear quite appealing.

Everything seems so perfect, and yet, the reality of the matter is that many educational hypermedia programs leave the student feeling confused and restrained. Somewhere down the self-directed pathway, many students find themselves experiencing the feeling which can best be described as simply being "lost". Easily compared to people physically lost in the forest, they do not know what to do next in order to achieve their goal. They may become disoriented within the program, forgetting which path they took to get to their present location and uncertain as to how to return to what was last familiar. They lose track of which unexplored command path might lead them in the desired direction, and which might result in deeper confusion. Alone in the woods without a compass (or with one, but unable to know how to use it!) can be a scary experience. Yet, this is, metaphorically, the scenario in which many users of educational hypermedia programs find themselves. Surely, there must be a reason why so many learners get lost, and there must be some clues as to how to prevent this reoccurrence. At the very least,

there need to be provisions made so that, should a person become lost in a program, the chances of finding the way back to the correct trail are maximized. Jacobson et al. (1995) suggest that "epistemic beliefs are important factors associated with learning for transfer in a hypertext environment" (p. 353). Both helping the students develop a positive attitude regarding the use of these programs and teaching them the basic skills necessary to physically maneuver through the programs may contribute to increased learning efficiency. This is an idea which deserves further exploration, with special emphasis placed upon how it might relate to user disorientation.

Basic Narrative

In order to better understand how a person can get lost in hypermedia, it is important to develop a basic understanding of narrative, and how it is influenced by hypertext. Remember, hypertext consists of a word or grouping of words (usually depicted on the screen by a variation in color from the surrounding text), which act as a link. Thus, by clicking on this hypertext, the learner will be transferred to a related node, or screen, within the program. Now, think about linear narration. Plowman (1996) suggests that evidence of linearity in narrative begins in early childhood. He claims that it is embedded in the stories told to young children, as well as in the films and television programs which they watch. Children learn to expect cause and effect relationships. They learn temporal formats from the stories which they hear. One situation leads directly to another, and soon this is how people learn to make sense out of their world. The concept of linear narration becomes so fundamental to comprehension that it becomes disturbing, should the flow of this narration be interrupted. (In fact, this is often why suspense/ thriller stories trouble the viewer so much. The story line fails to follow the standard pattern, or linear flow, and things do not end up the way the viewer thinks they should.) Thus, narrative depends on memory recall (what usually happens in this situation?), while also aiding the learner to

recall new situations (what should occur now?). In other words, comprehension can be thought of as being supported by and built upon the learners' use of narrative. Obviously, then, narrative is fundamental to the learners' understanding.

Now, consider hypermedia, which, according to Becker and Dwyer (1994), permits many suitable orderings of the text. Unity and coherence are disturbed, and the learner may become confused by the ordering of the informational screens and the multiple interpretations which they present. If no guides are given to direct the user, confusion may easily result. It is this confusion that is often simply called "lost". To further understand the concept of lost, it is imperative that narrative changes due to hyperlinks be further explored. In hypertext, the narrative can be altered or suspended at will, resulting in familiar linear reading skills no longer being transferable (Plowman, 1996). How students actually make sense of hypermedia is another area in need of extended research. It is evident that many students do not currently know how to accurately utilize interactive multimedia (hypermedia) programs. True, at least in theory, they have control over the direction of the narrative, but "the advantages of learner control are double-edged if greater freedom leads to loss of structure" (Plowman, 1996, p. 95). The frequent transitions available through hypermedia, as the learner switches between textual nodes or varies the presentation format among text, graphics, video, voice-overs, etc., can result in fragmentation of the narrative and in the learner becoming easily distracted from the original goal or line of thought (Yang & Moore, 1995). Increasing the number of short subtasks (links) accessed through hypermedia links increases fragmentation and the likelihood that the learner will eventually become "lost." Care must be taken during the design phase of these programs to assure that all subtasks directly relate to the global objective. Effort must also be made to ensure that the various routes are equally presented in a coherent manner.

Further research is needed to determine the degree to which it is necessary to preserve narrative flow during a hypermedia experience in order to maintain comprehension.

From a different perspective, it may be possible that this familiarity with a linear format is what allows navigation through hypermedia to occur in the first place. Plowman (1996) states, "breaking down the narrative into discrete units may make sense" (p. 96), even though this does disrupt the narrative flow. Yang and Moore (1995) agree that content may be better understood if it can be broken down into digestible chunks, and that by varying the presentation mode, understanding may be expedited. The important criterion seems to be that each link (fragmentation) logically follows the previous one, and that it adds to the knowledge base which the learner is trying to build. Jonessen (1989) indicates that the learner must accept responsibility for making certain that comprehension is taking place as navigation of the program progresses. In order for learning to occur, the student must not only feel that the narrative in coherent, but must also be able to integrate that narrative with prior knowledge. Fragmenting the narrative may be helpful in that it allows the text to unfold more rapidly, capturing the learners' interest and reducing tedium. However, while this has been suggested as a source of increased motivation for the learner to continue the lesson, it may not allow enough time for the student to reflect on the information being presented. Brown et al. (1994) claim that cognitive overload may be the result when a learner tries to follow more than one trail and remain oriented at the same time. While some students may be capable of handling several lines of reasoning at one time (a form of multi-tasking), many others may not be. Therefore, it makes little sense to incorporate this ability as an essential skill in the development of educational hypermedia programs.

Some programs have attempted to control narrative disruption by incorporating a narrator into the program. This narrator, which may or may not be depicted by a graphical

representation, takes the place of the teacher. The narrator assumes the role of leading the learner through the lesson. Research regarding the usefulness of this technique seems to be lacking.

Additional problems may arise if the student fails to have the background necessary to interpret new information presented in the program. Therefore, care needs to be taken to assure prerequisite learning has been met prior to the independent use of hypermedia programs. It becomes essential that programs either provide a review of this information, or, at least, initially state the necessary skills and/or information needed to successfully employ the program. Teacher intervention and the availability of supplementary materials may be used to aid the student in these areas, should a deficiency be found. However, it is critical that both the teacher and the student understand the need for this assistance if it does exist.

Hypermedia Navigation

The process by which the learner accesses information within a hypermedia program is often referred to as navigation. This represents another field to consider when trying to determine the causal factors that result in user disorientation. Requiring complex interactions to take place between the learner and the computer in order for navigation to occur can result in confusion and frustration by the student. The wider the array of possible links available to the learner, the more perplexing it will be for him/her to remain oriented while navigating the program. In fact, Beasley and Waugh (1995) define disorientation as "the degree of perceived feelings of 'lostness' in the learner while navigating in the hypermedia system" (p. 248). Obviously, then, navigational procedures need to be straight forward and require the minimum amount of effort (both mental and physical) possible.

Several types of navigational procedures are commonly incorporated into educational hypermedia programs. Parham (1993) suggests the use of electronic

bookmarks as a way of marking nodes which the student may find to contain information useful to his/her study. A "go to" option can then be incorporated within the program, allowing the student to access these screens at will. This avoids the time-consuming steps involved in retracing the original series of links used to locate these screens in the first place. Likewise, Aedo, Catenazzi, and Diaz (1996) indicate that it is important for programs to allow for navigation both backward to reexamine previous screens and forward to discover new nodes. Menus (either pop-up or pull-down) and hyperlinked, graphical buttons are two of the most common methods available for these navigational exercises. Backtracking, alone, however, can be costly in time and may be viewed as a form of error management (when the user forges ahead, does not find adequate new information, and then must reconsider previous steps until locating the last screen which was useful). As an alternative, discrete menu screens may be provided in the program. These screens are designed to contain a variety of preset buttons, which can link the user to a number of different screens upon request. Provisions are then made throughout the program so that the learner has the option of returning to the menu screen at will. According to Stanton and Baber (1994), however, this can also represent a time-consuming method for navigation, similar to back-tracking. More efficient techniques might be preferred and need to be contemplated.

Another method used for navigational purposes is described by Stanton and Baber (1994) as the guided tour. This technique reduces the navigational process to little more than electronic page turning, however, as the sequence of presentation is pre-determined in a linear progression. Since linearity results in loss of user control, however, this technique represents a direct move away from the ideas presented for defining an instructional hypermedia program. Thus, this technique is often deemed inferior to other methods in all but the simplest of programs.

Still another method of navigation, designed to help the student remain oriented while exploring a hypermedia program, is represented by the use of cognitive maps. These are graphical representations, which most often take the form of either a scatter (cluster) map or of a hierarchical map (Yang & Moore, 1995). Research by Beasley and Waugh (1995) indicates that the hierarchical map is to be preferred of these two choices. However, even though these maps may be capable of indicating the student's location within the program at any given time, this still may not be enough information to guide the student as to what step should be taken next (Stanton & Baber, 1994). Moreover, highly complex programs may become too diversified to accurately be represented by a map that could be used for these purposes.

One characteristic, which most of these forms of navigation have in common, is that they often incorporate the use of graphical interfaces (screens which allow the student to interact with the computer program by clicking on pictures or graphics). Since these screens require less typing and less reading than would strictly textual interfaces, the chances of quicker, more accurate navigation are increased. Consequently, graphic interfaces appear to be preferred. Studies indicate that developing some form of standardization for the construction of such screens would be beneficial. This would allow learners the freedom of not having to memorize a new form of interface every time a different program is utilized (Stanton & Baber, 1994). Exactly what form these screens would take represents still another area in need of research. It is important to keep in mind, however, that any computer interactions the learner might need to use in order to navigate through a program be consistent with the that learner's abilities and skill levels.

Clear User Interface

Research often refers to the importance of having a clear, concise computer-user interface in order to prevent the user of hypermedia programs from becoming lost during

navigation (Clark, 1996; McAlpine & Weston, 1994; Nichols & Ridley,1996; Parham, 1993; Smaldino & Smaldino, 1992; Stanton & Baber, 1994; Steiner & Moher, 1994; Yang & Moore, 1995). Despite this cry for a precise user interface, consistency is lacking concerning what exactly constitutes "clear and concise." There does, however, appear to be some conformity regarding the categories which need to be addressed. McAlpine and Weston (1994) provide names for these categories, by dividing them into such groups as presentation attributes, language attributes, content attributes, and instructional design attributes. These names simplify discussion purposes, and so, although not necessarily used in their original format, shall be borrowed for this report.

Presentation Attributes

This category refers to the actual physical design attributes of the user interface. These include the importance of consistent, readable type fonts, sizes, and styles to be used throughout the program. Pleasing color combinations, which also allow for easy interpretation, are equally important. Adequate white space (the area left blank on the screen) must be provided, so as not to overwhelm the reader with too much information on any one screen (Clark, 1996; Hannafin & Peck, 1988; Yang & Moore, 1995). Graphics and scanned pictures need to be of a high resolution, so that they are easily comprehended. Sound and narration must also be of high fidelity (be clear and crisp). Another characteristic which is repeatedly cited in research, involves the importance of consistent button placement and usage. Clark (1996) emphasizes the necessity of creating all buttons so that they are large enough to be easily accessed, and the significance of informing the user of the availability of any invisible buttons. Hannafin and Peck (1988) stress the importance of ensuring that special effects and/or sounds associated with button implementation supplement the use of that button, and not be superfluous. They also emphasize that button placement should be consistent throughout programs, allowing the

user to instinctively know where to look on the screen for availability of certain functions. Luskin (1996) discusses semantics, the study of meaning in language, and points out that strong consideration should be given to the choice of words used during interface. He sites the use of the word, "quit," to represent this theory. Since quitting is usually associated with giving up, a term which carries a negative connotation, it might not be a good choice. The word, "end," holds a more positive connotation and might, therefore, be preferable to use.

Strongly related to the idea of semantics and choosing appropriate words to regulate commands, is the notion that branching options should be clearly designated. Icons, or whatever objects serve to mark navigational buttons, should be clearly delineated so that the purpose of these buttons is obvious. Semiotics, the study of signs and symbols used for communication purposes, needs to be explored (Luskin, 1996). By understanding how people use semiotics, program designers can prevent ambiguous symbols on buttons, reducing the chances of misinterpretation and confusion by the user. Some form of standardization across programs would be convenient. If such design features would become established, users could save time by not having to re-interpret what each button and command means every time they switch programs.

To summarize these ideas, instructional hypermedia screens needs to be logically designed. These designs then need to undergo rigorous testing to make certain that users who are unfamiliar with the layout plans will also find them intuitively simple to use. Keeping in mind that the main purpose of these programs is to help the learner complete a task or access information for problem-solving applications, tutorials should be incorporated for aiding in learner recall. Tutorials could also be developed for the purpose of teaching the user the fundamentals of using the hardware and software involved. Standardization of these characteristics would surely help the learner remain better

oriented and decrease the number of students who become "lost."

Language Attributes

This category refers to the actual use of language throughout the program. McAlpine and Weston (1994) suggest that both the vocabulary used and the complexity of sentence structure be appropriate for the intended audience. This information should be based not only upon age appropriateness, but should also take into consideration the cultural background and the previous experiences and knowledge of the targeted audience. The amount of redundancy incorporated in teaching the lesson should, likewise, be based upon the characteristics of the audience. It is important to use terms which the audience is capable of understanding, taking care to define any words which might not be familiar to them. The use of jargon or unfamiliar vocabulary may easily contribute to the likelihood of the user getting lost within the program.

Content Attributes

This group of characteristics concerns the importance of accurate, current content in instructional hypermedia programs. Stating the objectives of the lesson, if appropriate for the intended use of the program, allows the student to direct attention toward a final goal. (This is beneficial, because, without a specific objective, the student has no way to really gauge mastery of the lesson.) Logical presentation of related material throughout the program also helps the user remain focused and lessens the likelihood of getting lost. On-line "help" or search functions are beneficial, so that, should the user become confused, assistance is readily available (Nichols & Ridley, 1996). Steiner and Moher (1994) further suggest that, whenever appropriate, some form of closure activity should be provided.

Instructional Design Attributes

Both Smaldino and Smaldino (1992) and McAlpine and Weston (1994) strongly urge the use of the instructional design perspective during the design and development of

hypermedia programs. Carefully adhering to the various steps involved in an instructional design program may remove many of the problems currently plaguing hypermedia programs today. Heinich et al. (1996) define instructional development as, "the process of analyzing needs, determining what content must be mastered, establishing educational goals, designing materials to help reach the objectives, and trying out and revising the program according to learner achievement" (p. 410). Instructional development requires time and energy during the developmental phases of any program, but results in a well-thought-out and tested product. Vague or misleading references can be cleared up and problem areas within the program can be redefined. It is hard to predict the behaviors of users, but the more thought that is given to the various possibilities for user responses, the more likely the program will be a success once it is finished.

CHAPTER 3

Summary

Instructional hypermedia software programs incorporate hyper-linked, rather than linear, presentations of information. Although potentially beneficial, this may also result in the user experiencing a sense of frustration and confusion. To combat these feelings, research consistently calls for a need to implement some form of standardized model concerning both the design of clear, concise computer user interface and of navigational procedures. In addition, it is suggested that steps be taken to provide the learner with on-line help and search functions. Mental effort is wasted when students are forced to learn a new system for interacting with every program.

Hypermedia programs are capable of providing exciting learning experiences for the user. As previously stated, they allow information to be accessed in a non-linear, multimedia format. This presents the learner with the opportunity to thoroughly examine desired topics, tailoring the learning process to meet individual needs. This capability can serve to both motivate the learner and increase the efficiency rate with which information is acquired. Conversely, if the student is not provided with clear instructions concerning how to navigate through the program, the increased number of choices available for exploration can become baffling. The use of hypermedia may be especially confusing because it changes the basic way narrative has been taught in the past. Again, this points to the need for guidance to be provided to the student so that accurate navigation can be accomplished. Learning goals must be established and discussed with the student prior to using the programs in order to help the student remain focused on the lesson at hand.

As with all instructional materials, the design and development of educational hypermedia demands careful adherence to the steps involved in the instructional design process. In fact, collaboration of computer programmers, graphic designers, instructional

designers, and psychologists may well be required in order to effectively produce this complex form of educational software. Not only must the programs be capable of running smoothly and accurately, but they must also be designed so that users can easily interpret how to operate them.

Educational hypermedia programs represent an exciting tool for incorporating knowledge. It is important to remember, however, that technology is simply that: a tool. In order for these programs to be truly beneficial, students must first become familiar with techniques involved in running the hardware (computers) on which they will be used. Then they must be given enough time to learn the logistics of how to use the programs. It is only at this point that the students can really begin to devote their time and energies to researching and learning the information presented through this type of software. While each program deserves to be creatively developed, standardization involving locations of navigational tools would ease the burden of learning which the student must currently face. Development of these programs is on the rise. The time has come to step back and investigate what needs to be done in order to make them more productive and effective.

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