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ABSTRACT

An examination of the value of using more sophisticated computer programs in the language arts program led to the design and development of "Thinking Networks," which provide the teacher with a new tool for teaching through nonverbal representation. Using microcomputers to improve reading and writing instruction can incorporate the holistic approach to language learning, which emphasizes (1) the comprehending and composing of words, sentences, and paragraphs within the context of a complete discourse; (2) the synthesis of thinking; and (3) the use of language within real social contexts. The "Think Network Program" consists of software with which students can interact and, in keeping with the newest efforts to enhance the development of problem-solving, uses a graphic approach leading students to understand how a text is organized. It also ensures that students read complete stories or content area selections before booting up the disk. The comprehension work completed during network building shows students how the major and minor ideas of a reading selection are related. Other emerging holistic software programs are also requiring students to deal with whole units of text and to use decision-making, evaluation, and synthesis skills. (JK)

STRESSING HOLISTIC APPROACHES TO THE TEACHING OF READING AND WRITING USING MICROCOMPUTERS

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INTRODUCTION

"It can't be done!" I (Gene Geisert) told them. "Computers work best when they are used to assess student progress in meeting some pre-determined goal." For example, if the teacher wants to teach reading or writing, the first step in utilizing the computer would be to develop those objectives he/she wishes to teach. The objectives need to be in behavioral form in order to measure the successful completion of each specific task. The computer could help them keep track of student progress and prescribe individualized learning targets. While this approach has considerable merit, it was not what my audience wanted to hear. I had been asked to meet with a team of curriculum specialists from the New York City Schools to discuss possible ways of utilizing the microcomputer as a tool for teachers wanting to teach using heuristic strategeies. They were into holistic approaches to teaching and wanted the new technology to support them in their work. The longer I listened to them describe the concepts behind this global approach to thinking and learning, the more certain I became that what they wanted did not exist. I explained the reasons why I thought this was so and then drove back to my office at St. John's University.

I was, however, unable to put aside the problem with which I has been confronted! Would it be possible to design a new way of using the microcomputer to help students conceptualize and think at varying levels of abstraction? Could the microcomputer provide graphic visualizations which would improve reading comprehension? How might one go about designing a computer program which embodied the essential elements of a holistic approach? I was forced to accept the fact that I did not have answers to any of these important questions. Lacking the necessary knowledge to proceed further, I turned to a colleague who is one of the leading researchers in the field of holistic learning. Dr Richard Sinatra is Chairman, of the Division of Human Services coordinator of Graduate Reading Programs at St. John's, and his initial suggestion was that I read his book and attend one of his workshops on the topic. How can you hope to find any answers to your questions, when you don't even understand the basic tenets of the subject under study?" he inquired.

Following my participation as a student in Richard's class, I began sharing some ideas with him that were acquired a result of his class lectures and my additional readings. I quickly found that he had about the the same level of understanding about microcomputers that I previously had about reading. My suggestion was short and to the point. I suggested that he attend my workshop on the utilization of the microcomputer in administration and instruction. During this initial cross-pollination period, both Dr. Sinatra and I began some serious work on the viability of using microcomputers to improve the teaching of reading and writing.

Our initial foray into the world of instructional courseware led us into data collection activities to determine the types of software available for instruction uses, their appropriateness for the tasks at hand, and some assessment of teacher use of this new tool.We found that much of the initial software developed for the older models of computer equipment, lacked substance, and in general was poorly conceived and badly written.

EARLY SOFTWARE ATTEMPTS

With the development of increased sophistication and memory for the micro computer, more interesting and challenging software programs have appeared for instructional use on the educational marketplace. These programs present learning strategies and situations consistent with the long-valued notion of what a program ought to accomplish. A program like a basal reading program, an English series, or a writing program runs throughout the grades and is distinguished by an all encompassing scope and sequence. Not so with the numerous software programs that appeared throughout the 1970's and early 1980's. These first, second and third generation software programs, generally of the drill-and-practice, tutorial, and electronic workbook type, masqueraded under the concept of program, but in reality they focused on discrete, singular concepts of the reading and writing curriculum just as many popular skill books and boxed labs had done in the traditional classroom. For example, in many of the early cloze programs and vocabulary skills-content clues programs only one aspect of reading skill development is practiced over and over again on the one disk. The skill that is practiced has also been abstracted from the reading act, and one can justifiably suggest that these skills are ancillary to the real goals of reading, which are to seek and learn information and to immerse oneself in a pleasurable, exciting, or meaningful tale.

What we wanted was a program that was consistent with the notion of a "holistic program." One that presented instruction in whole units and in which reading and writing are the natural vehicles to accomplish the thinking demands inherent in the program; a program in which skill development is embedded within the larger whole - the larger whole being the entire text's adventure, simulation, or creative composition in which the learner is involved. Interestingly, if one leafs through the pages of a computer software catalogue, you will find programs listed under headings such as Thinking, Enrichment, or Games, but rarely under Reading and Writing. Before describing the result of our combined efforts, let's examine the essential characteristics of a holistic program as opposed to a more traditional approach.

A first major feature of a holistic language arts program concerns the sequence of instruction (Samuels, 1980). That is, the holistic approach begins instruction with the largest units of language and moves to the smallest units while the subskill or parts approach to written language instruction begins with the smaller or isolated parts, gradually moving to larger and more complex units. According to Samuels, the latter approach looks at specific tasks and specific unit sizes before instruction would

begin, followed by consideration of how skill sequences would be implemented as students increase their skills.

Many software publishers may have taken a good hard look at the subskill approach to written literacy and arrived at the conclusion that it is much easier and profitable to publish at a subskill level rather than at a holistic one. For instance, a beginning reading program can be based on the learning of the 140 or so phoneme/grapheme relationships that exist in the English language before words, sentences, or meaningful stories are read. A beginning writing program can focus on the mastery of producing the alphabet letters, or the spelling of limitless words, or on learning the names of the parts of sentences before even one original sentence is written by a student.

In most drill-and-practice, tutorial and first generation CAI software programming we see this sub-skills rationale in operation. Of course, the reason for this is understandable. The programmers of the 70's looked into the educational marketplace and witnessed the criterial referenced, diagnostic/prescriptive, mastery learning beliefs entrenched in the American school system. Believing they would aid the learning process inherent in these approaches, they produced software that modeled the pages of written text found in these approaches. Early programmers merely transferred extant instructional techniques into a new technology . . . and added the buzz words "motivational" and "futuristic" to their packaging.

However, holistic learning, particularly in the language arts, is more than the sequencing of the instruction notion expressed by Samuels . There are three more essential components of holistic learning that influence how learners learn to think as they mature through the grades. These components focus on the nature of meaning within language expression, on the nature of thinking generated through language involvement, and on the social and functional ways that language is used by the human species.

Meaning is affected by the completeness of a unit of language. Within the holistic view of language learning, comprehending and composing words, sentences, and paragraphs should be done within the context of a complete discourse. Moffett and Wagner (1983) have used the term "discourse" to designate a whole unit of language used for a specified purpose. A discourse then becomes a conversation, a lecture, a letter or journal, a poem, a short story, a composition, an ad, or even a label on a particular product. It is the largest unit of language in which a complete message exists between the sender and receiver. Thus the "show and tell" activity of primary grade children represents a complete language context; while for a group of 11th graders in an electronics class, a flow chart of an electrical circuit communicates a whole verbal/nonverbal discourse, immediately comprehended by all who have the relevant background.

Within the holistic view of language learning, reading and writing words, sentences and paragraphs should be done within the context of a complete discourse. When substructures alone are used as the learning units, readers and writers forgo a sense of relevance and connectedness, two characteristics that are inherent in a complete discourse. If discourse then is the superstructure of the communication context, the paragraph, the sentence, and finally the word itself with its own letters and sound/symbol clusters are the substructures . Thus, individual word meanings are dependent upon their locale in the sentence of which they are a part, individual sentence meanings are dependent upon their placement in a paragraph, and individual paragraph meanings are dependent upon the purpose, direction and intent of the discourse.

The third aspect of a holistic approach is that the thinking of synthesis is encouraged. This mode of thinking contrasts with that of analysis which is generated through a parts-specific approach to language instruction, particularly during skills approaches to reading and writing. During analysis, separation occurs such as when a word is broken into its component parts or when a sentence is analyzed to determine the names of the functional parts. The rationale is that after repeated attempts of decoding words or analyzing sentences, students will learn how to read new words and write original sentences on their own. But, if one listens to the complaints of teachers through the grades, continued preoccupation with analysis has not yielded great literacy success.

Synthesis, on the other hand, requires a search for connectedness on the part of the student. It becomes a discovery of the nature of relations among different things. This thinking occurs, for instance, during the reading of a narrative work in which the reader sees how characters and plots interact with one another to bring a sense of enjoyment and fulfillment in the story design. It occurs during writing when the writer composes sentences with particular work arrangements that convey the message the writer is visualizing. Synthesis requires the higher thought processes of evaluation, justification, classifying, grouping, and perceiving how things are alike or different without being told that they are so.

Synthesis is a powerful thought process because in each discovery of relation or in each creation of structure such as a sentence, a composition, a drawing, a play or a graphic design, the individual gives something of him or herself. The idea is not there until it is intuitively perceived. Teachers can point out how a combination of sounds make a word, how the combination of functional parts make a sentence, and how a main idea of a paragraph can be found, but the meaning and relationship of each part to the whole is not there until it is synthesized by each student.

Finally, holistic uses of language focus on how language will be used in real social contexts. Functions of language in this view are more important than its forms, especially in early reading and writing instruction. This is a highly important consideration in language learning, having powerful implications for the reading and writing curriculum. What it means, for instance, is that the novice writer, be it an elementary pupil or a college student, will be encouraged to write for meaning and purpose as a means to communicate and interact with peers rather than study and practice correct forms of written language conventions. In this social context, the learning of language comes with the use of language and with the increasing understanding of how language structures can be transformed in different ways, on different occasions and for different audiences. Children do not learn language as an abstraction, as an end unto itself, but as a process to achieve other ends, like getting another drink of juice, learning to distinguish cats from dogs, or striving to enjoy a story from a book."(Smith, 1982)

Goodman (1979) adds that reading and writing must be regarded as an extension of natural development and learned in the same way that the oral language is learned. Literacy must always involve whole, real, natural, and relevant tasks. Translated to the classroom, this means that teachers must engage youngsters in <u>real</u> functional uses of language - to label, to chart, to inform, to stimulate imagination, and to develop story sense.

Given this context, the program which we eventually developed is a breakthrough in the the teaching of reading and writing. Using the microcomputer as a basic tool for the teacher, we have designed software which interacts with students and shows them how to attack problems in an organized manner. We called the courseware "Thinking Networks for Reading and Writing." Thinking Networks combines the reading or text and the writing of discourse with the best of microcomputer technology. In Thinking Networks, students conceptualize and think at varying levels of abstraction. Basic thinking operations such as sequencing, describing, comparing, contrasting, and classifying occur naturally within the program. Higher level thought processes such as applications of new word meanings, synthesis, composing and organizing through written discourse occur when students restructure text and write original compositions. The networking component of Thinking Networks makes use of nonverbal design features to lead students to understand how text is organized.

This emphasis on a graphic approach is in keeping with the newest efforts to enhance the development of problem-solving skills. As Alfred Bork, a pioneer in the field of computers in education, stated, "We want students to be able to use their knowledge to create new knowledge! Again, existing modes of teaching are inadequate: the old approach is to show the student (in lecture and textbook) many polished examples of worked problems, giving little insight into how problems are practically solved. Interactive computing can make a major contribution to this objective. A central problem is to show students how to organize and attack the problem. Here graphical visualization is important: the flowchart of any successful attempt must begin with what is given, must end with what is to be found, and must exhibit logically, plausible intermediate steps. A common student difficulty is a failure to generate such a "map" or series of maps, of possible processes and directions We also encourage students to represent the situation, including the given information, through a diagram. If the student is working the problem at a terminal, with the computer dialogue assisting with this problem and also approaching the general heuristics of problem solving, these visual modes are important."

In Thinking Networks students are led through the constructing of network relationships via graphic "maps" so they can both see and understand how different types of text structures are organized. This nonverbal use of graphics supports leading conceptual viewpoints on the various levels of thought process that occur through language. The problem in the past with a nonverbal approach to teaching is that we have not been skillful in the use of visual images in education.

Bork continues, "Humans were more skillful in this direction before the development of writing, because learning depended more at that time on graphics that it does now. Most of us are the successes of a highly verbal education system, so it's not surprising that the main abilities of most present-day teachers lie in verbal directions. We tend to be clumsy in employing iconic information in educational environments, and can expect a long, slow learning cycle before we can develop good capabilities."

These ideas served to help in the design of Thinking Networks which provided the teacher with a new tool for teaching through nonverbal representation. We used graphic configurations in a unique, interactive way. In Thinking Networks for Reading and Writing (Think Network, Inc. P.O. Box 6214, NYC 10128), graphic displays known as semantic networks or semantic maps help students understand and write the various styles of written discourse. The program is based on a holistic rationale and insures that students read complete stories or content area selections before booting-up the program disk. It provides vocabulary skill development after student reading and network building, and uses the graphic display as a nonverbal, holistic model in a major style of written discourse.

The comprehension work completed during network building shows students how the major and minor ideas of a reading selection are related to each other. Then, using the network configuration alone to show how major and minor ideas will be developed in a forthcoming composition or essay, the student writes or word processes an original work. Synthesis is encouraged because the ideas and organizational relationships expressed in the written work are student generated. With a printer hook-up, the Thinking Network program provides a total program approach to the reading and writing of discourse. Teacher and peer interaction is most helpful during the Author Apprentice and Creative Writer stages of the program since drafts can be edited and revised via the screen or hard-copy mode. As the reader can note, in this approach, graphics are combined with holistic reading and writing strategies in a whole-brain, integrated language arts computer approach.

OTHER HOLISTIC SOFTWARE

Other holistic software programs that both resurrect the concept of "program" and that contain the characteristics of holistic instructional emphasis are beginning to appear. In these programs, the student deals with whole units of text and uses the thinking of decision making, evaluation, and synthesis. In fact, the student must immediately comprehend and act upon knowledge, often requiring the higher cognitive processes of Bloom's Cognitive Taxonomy (Bloom, 1956) to be engaged before that of the lower level cognitive thinking processes. This is the software generation of text adventures, simulations, composition production, and interactive graphics.

In the text adventures produced by Grolier Educational Software (Sherman Turnpike, Danbury, Connecticut 06816), interactions are established among the computer software, the student/user, reading sources, and the teacher as critical manager. In Treasure Hunter and The Secrets of Science Island, the student must consult reference books included in the packaging in order to solve the computer text adventure. In Hospital and Farewell Alaska, also by Grolier, the student is motivated to seek information in the Encyclopedia Americana in order to complete any number of text adventures.

In the exciting simulation of Santa Fe Trail, Lincoln's Decisions, and Annam, produced by Educational Activities, Inc. (P.O. Box 461 Coram, New York 11727), the student must make high level projections, judgments, and decisions. In the Santa Fe Trail, the student becomes a trader in the years of the developing west and must make numerous decisions prior to and during the journey in order to deliver goods to market in Santa Fe, New Mexico. Based upon historical facts which students can read prior to or during the adventure, this program becomes even more interactive when done as a group or a whole class activity. In Lincoln's Decisions, the student takes on President Lincoln's role and at major turning points of history, is challenged to duplicate the President's decisions. The student's understanding of the Civil War period is enhanced by content reading from the screen while he/she is challenged by the decision making posed by the software program.

Use of word processing programs is one of the most powerful ways in which holistic language interaction is developed. The student produces first by getting thoughts expressed on the visible screen and then learns to polish language conventions and style. For example, Thinking Networks for Reading and Writing uses a graphic configuration called a semantic network to help students produce one or more first drafts of a forthcoming composition before using the work processing component. Milliken Publishing Company, 1100 Research Blvd., P.O. Box 21579, St. Louis, MO 63132-0579) in addition to an excellent word processing program, has produced The Writing Workshop. The Workshop adds prewriting and postwriting tools to the word processor pachage. The word processing component, like any good word processor, allows students to generate, modify, replace, and transfer text. With the prewriting component, students can plan and organize compositions using one of three structured environments: Brainstorming, Branching or Nutshelling. The word processor then provides students the opportunity to expand the prewriting plans and outlines into creative compositions. Finally, the postwriting feature helps students to revise and correct their work by highlighting possible errors or areas of weakness.

CONCLUSION

This paper has examined the value of using more sophisticated computer programs in the language arts program. The value of these programs is that they proceed from a holistic base and involve users in high level thinking skills from the moment of disk insertion. Teaching and writing become necessary, relevant processes to accomplish the holistic objectives of these programs. These objectives are to stimulate imaginative projection, force conclusions based on earlier decisions, compose original and organized written works, and to read for excitement and anticipation.

So it appears that I was mistaken when I said it can't be done! It is being done by Think Network and others. Basic research conducted by Dr. Richard Sinatra, at St. John's University indicates that both reading and writing improves when the Think Network graphic outline is used to help students organize their thoughts prior to writing a composition. It can be anticipated that additional research will soon be available from other publishers.

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