DOCUMENT RESUME

ED 362 736 CE 064 803

TITLE	A Prototype for the Use of Hypermedia To Foster Higher Level Reasoning in Family and Consumer Education. Final Report.
INSTITUTION	Wisconsin Univ., Madison. Dept of Continuing and Vocational Education.
SPONS AGENCY	Wisconsin State Dept. of Public Instruction, Madison.
PUB DATE	92
NOTE	225p.
PUB TYPE	Guides - Non-Classroom Use (055)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	Annotated Bibliographies; *Computer Assisted Instruction; Computer Software; *Consumer Education; *Family Life Education; *Hypermedia; Instructional Development; Models; Optical Data Disks; Optical Disks; Secondary Education; *Thinking Skills
IDENTIFIERS	*Wisconsin

ABSTRACT

This guide outlines a prototype for using hypermedia to help students in secondary-level family and consumer education courses develop higher-level reasoning skills. Chapter 1 examines the nature and potential of hypermedia, with special emphasis on its relevance to family-focused curriculum efforts. The following aspects of designing a local prototype are covered in chapter 2: computer-assisted instruction versus computer-involved environments; assessment of hardware and software needs; equipment sharing; appropriate teacher and learner roles in computer-involved environments; equity and copyright issues related to using hypermedia; and specific uses of hypermedia. Discussed in chapter 3 are the following types of hypermedia-related hardware and software: microcomputer systems, input devices, output devices, hypermedia systems, multimedia devices, authoring systems, and sample hypermedia software packages. Chapter 4 presents stack guidelines and sample HyperCard stack designs for family and consumer education programs. The availability and use of computer technology in Wisconsin family and consumer education programs is analyzed in chapter 5. Concluding the guide are an annotated bibliography of 147 resources on hypermedia and a list of 14 sources for laserdiscs, CD-ROM, and hypermedia software. Several chapters also include substantial reference lists. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 362 736

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it
☐ Minor changes have been made to improve reproduction quality
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

A Prototype for the Use of Hypermedia to Foster Higher Level Reasoning in Family and Consumer Education

Final Report of a 1991-92 Project funded under
Title II, Part B of the
Carl D. Perkins Vocational and Applied Technology
Amendments of 1990 (P.L. 101-392)

Wendy L. Way, Project Director
Bette Bauer, Project Assistant
Department of Continuing and Vocational Education
University of Wisconsin-Madison

Project Consultants
Janice Atkinson, Wauzeka Public Schools
Virginia Dean, Oshkosh High School
Cindy Quilling, Menomonie Junior High School
Carol Zahorik, Steuben Middle School, Milwaukee

CE064803

TABLE OF CONTENTS

A Prototype for the Use of Hypermedia to
Foster Higher Level Reasoning in
Family and Consumer Education

Chapter 1: Hypermedia: Nature and Potential 1

Hypermedia Defined 1
Relevance of Hypermedia to Family-Focused Curriculum Efforts 3
Hypermedia and Traditional versus Family-Focus Program Approaches 5
The View of Learning 5
Role of Teacher and Learner 6
The Relation of Students to One Another 7
The Nature of Family and Consumer Education Content 7
Nature of Learners, Learning Goals and Patterns 9
Learner Assessment 10

References 11

Chapter 2: Designing a Local Prototype 14

Computer-Assisted Instruction VersusComputer Involved Environments 14
Asking the Right Questions 17
1. What Kind of Hardware and Software Will be Needed?. . . 17
2. How Should Hypermedia Equipment be Organized - Computer Laboratory or One Computer Classroom? 18
3. If There is Limited Equipment, How Should Sharing be Structured Among Students? 20
4. How Much Computer Expertise Will Be Needed to Use Hypertext/ Hypermedia Systems? Will we have enough? 22

5. What Are Appropriate Teacher and Learner Roles in Computer Involved Environments? 24
6. Are There Equity Issues Related to the Use of Hypermedia 25
7. How Much Do We Need to Worry About Copyright Issues? 26
8. What Specific Uses of Hypermedia Should Be Considered and in What Order? 27

References 30

Chapter 3: Hypermedia Related Hardware and Software 32

Microcomputer System 32
Input Devices 35
Output Devices 37
Hypermedia Systems 38
Multimedia Devices 40
Digital Multimedia Devices 41
Analog Multimedia Devices 43
Authoring Systems 47
Sample Hypermedia Software Packages 49

References 53
Further Information 55

Chapter 4 : Stack Guidelines and Sample HyperCard Stack Designs for Family and Consumer Education 56

Section I: General Stack Guidelines and Evaluation 58
Beginning Skills for Using HyperCard in the Classroom 59
Designing Cards and Stacks for Large Group Presentations 60
Designing Cards and Stacks for Individual and Small Group Use 62

Stack Evaluation Checklist 64
Section II: Sample Stacks 65
Learning Alternatives with Hypemedia: A HyperCard Stack Overview 66
Sample Student Tutorial Stacks 79
Continuing Concerns of the Family 80
Practical Reasoning 92
Family Systems of Action 106
Sample Student Assignment Stacks 113
Family Issues for Analysis 114
What Should Be Done About Balancing Work and Family? 116
Learning Options: Overview 136
Technician - Learning Option 146
Reporter - Learning Option 160
Researcher - Learning Option 164
Sample Student Investigative Project 166

Chapter 5: Availability and Use of Computer Technology in Wisconsin Family and Consumer Education Programs 174

Survey Overview 174
References 178
Computers in Family and Consumer Education Questionnaire 179
Computers in Family and Consumer Education Summary Data 183

Chapter 6: Bibliography of Hypermedia Resources 201

Hypermedia/Computer Texts 201
Literature Related to Hypermedia 205
Computers and Education Periodicals 216
Resources for Laserdiscs, CD-ROM and Hypermedia Software 218

Chapter 1
Hypermedia: Nature and Potential

Over the past several years, Wisconsin has been at the leading edge of a national movement to reconceptualize secondary-level family and consumer education curricula. Utilizing critical theory as the base, the newly developed curriculum framework focuses on helping learners develop the thinking, reasoning, and social abilities needed to become highly skilled and proactive participants in the complex and critical work of today's families.

New technologies, often termed hypermedia, appear to have great potential for enhancing recent state efforts to rethink traditional family and consumer education program content, and particularly the accompanying approaches to teaching and learning. This project was designed to analyze the usefulness of alternative hypermedia applications in attaining critical theory-based family focus curriculum goals, and to develop specific recommendations for the use of hypermedia hardware and software in family and consumer education instructional settings.

Hypermedia Defined

"Hypermedia" and "hypertext" are terms coined by computer philosopher Ted Nelson in 1965 to describe electronic environments which permit the nonlinear organization of, and access to, large amounts of information (Franklin & Kinnell, 1990). As traditionally used, "hypertext" implies a system for dealing with text only. Since many current computer-controlled systems also permit the nonlinear integration of graphics and photos, animation, sound, music, and video, some people prefer the use of the term "hypermedia." "Working with hypermedia implies working simultaneously in both the digital and analog worlds. Television, music and photograph images are all analog in nature. On the other hand, computers, their files, and their displays are digital" (Van Horn, 1991, p. 211). The terms "hypertext" and "hypermedia" are

actually often used interchangeably, but should not be confused with the term "multi-media," which may or may not permit the nonlinear organization of, and access to, ideas and information.

Hypermedia systems consist of both hardware and software that permit the construction of interactive electronic environments for teaching and learning. A typical system of hardware might include a computer, a computer-controllable video player, CD-ROM drive, videodisc player, and scanner.

HyperCard, which was released for the Macintosh computer in 1987, is a widely used piece of hypertext software designed for the creation of nonlinear and content-specific electronic knowledge environments through a central computer. Other hypertext software programs besides HyperCard are also available. Often, software besides the main hypertext program is needed to link the central computer in a hypermedia system with additional pieces of hardware. (Hypermedia hardware and software are discussed in greater detail later in the report.)

Hypertext software should not be confused with software designed for purposes of database management. Both are able to handle large amounts of information. However, while hypertext software works best when the information is interrelated and discursive, d-base programs are most appropriate for handling distinct pieces of information that can be categorized easily. Franklin and Kinnell (1990) suggest "think[ing] of hypertext as a telephone network in which any idea can potentially call any other idea, while a database is a [specific] warehouse of information that can be put together to form different products" (p. 8).

Hypermedia has a number of alternative instructional applications. It can be used by teachers for preparing and presenting assignments, keeping, showing and updating class notes, and making large group multimedia presentations. Hypermedia can also be used by individuals and small groups of students for review and research, or for authoring and making presentations. Hypermedia can be used in one-computer classrooms or in a computer laboratory setting.

Software is generally extremely user friendly and teachers and students do not need to have a great deal of computer expertise to make effective use of the technology as a teaching and learning tool (Campbell & Hanlon, 1990).

Relevance of Hypermedia to Family-Focused Curriculum Efforts

Research indicates that many of society's most serious problems either begin or end up in the family. Strong families are essential to individual and family well-being and are known to contribute to successful (and unsuccessful) functioning in school, the workplace, and the community. Family conditions and experiences are often linked, for example, to school performance and readiness, work attitudes and employability skills, and mental and physical health. Yet family work in contemporary U.S. society is exceedingly difficult because family concerns are complex and changing, and are not open to easy solution. Today's family work occurs within diverse and complex contexts characterized by, for example, demanding dual career work schedules; needs for care among larger numbers of older adults as well as dependent children; increasing diversity in family forms, including rising numbers of single parent, blended, and teenage families; escalating rates of drug abuse and gang membership; routine portrayals of violent behavior in entertainment media; expanding impacts of technology on daily life; rapid scientific advances related to health and well-being, and more prevalent and diverse messages related to specific family concerns from both public service and proprietary sources.

The significance of family functioning has never been more apparent. However, given present and projected conditions, it is no longer sufficient to teach students <u>what</u> to think and what to do about family issues and concerns. Family concerns are not as simple as they once were and they are not as easily addressed. In order to function proactively and responsibly as family members now and in the future, students need to know <u>how</u> to think and act in relation to family concerns, and how to do so both collaboratively and individually in both family contexts and community contexts.

Perhaps most importantly, today's students need opportunities to develop the expertise and confidence that will permit them to be reflective questioners and active constructors of their own knowledge, and to take responsibility for their own learning throughout the lifespan.

Much of the curriculum in Family and Consumer Education in the past has focused on developing skills needed for technical action in the family and/or on the job; the often unquestioned "how to" skills of, for example, meal planning and food preparation, child care, and family financial management. The revised critical science-based curriculum model points to the need to build skills for asking and answering questions about the meaning and desirability, as well as the performance, of various family actions. Such skills are necessary if families are to have the capacity to take communicative and emancipatory action (see Guide to Curriculum Planning . . . , 1987).

Communicative action refers to the process of clarifying and developing understanding of meanings associated with conditions and actions related to family functioning (it goes beyond just communicating about family issues). Emancipatory action involves identifying and examining conditions, sometimes including biases and distortions, that may be working against the development of full potential, and then, taking steps cooperatively and individually, to address those limiting conditions in the family and society.

The well established critical science-based educational goals for Family and Consumer Education in Wisconsin are consistent with numerous broader calls for educational reform (for example, the SCANS Report, 1991; America 2000; America's Choice: High Skills or Low Wages). It has become increasingly apparent that such substantive reform is going to require fundamental restructuring of schools and classrooms. Hypermedia applications contain a number of features that may facilitate the educational restructuring which is fundamental to achieving family-focused curriculum goals (Sheingold, 1991; Collins, 1991; David, 1991). For a discussion of critical science applied to family-related educational program

planning, and the Wisconsin family-focus curriculum goals, see Brown (1990), Guide to Curriculum Planning (1987), Home Economics Concepts . . . (1989), and Laster & Dohner, (1986). A discussion of thinking and reasoning skills relevant to critical science-based curricula can be found in these references also. Other particularly useful references regarding thinking skills have been authored by Brookfield (1988); Chaffee (1988); Paul (1990); Paul, Binker, Martin, & Adamson (1989); Paul, Binker, Martin, Vetrano, & Kreklau (1989); and Sternberg (1986).

Hypermedia systems have a number of characteristics that can serve as a backdrop for examining some of the most basic elements of traditional teaching-learning structures. Hypermedia can also be used as a set of tools to change to change basic teaching-learning elements in ways that are more likely to lead to achievement of family-focused curriculum goals. Some of the most important of these teaching-learning elements are: the predominant view of learning in the classroom; the role of the teacher and of the learner; the relation of students to one another; the nature of appropriate content for Family and Consumer Education; the attention given to diverse learner needs; and the nature of assessment.

Hypermedia and Traditional versus Family-Focus Program Approaches

Traditional educational approaches are contrasted below with some that are potentially more consistent with the family-focus approach.

The View of Learning

In recent years, a didactic view of education has characterized much of education in the United States, and Family and Consumer Education has not been an exception. In this view, learning is seen predominately as the transmission of information, and sometimes well-defined technical skills, from teacher to learner. The family-focused curriculum model

calls for a more constructivist view of education (consistent with the philosophies of the late John Dewey and Maria Montessori), however. In this view, learning is conceptualized more as a process of constructing one's own understandings and capabilities than as the simple acquisition of someone else's knowledge and skills.

As an authoring tool, hypermedia can be used to put learners in the educational driver's seat. Unlike other computer software, hypertext does not predict thinking; rather it serves to facilitate thinking (Nix, 1988).

Role of Teacher and Learner

Traditionally, teachers have been viewed as the primary source of knowledge within the school classroom and have functioned mainly as directors of learning. Compliance has been an important, albeit unwritten educational goal, and consequently, learners have tended to assume predominately passive intellectual roles. Both of these postures emphasize a dependence on teachers which is inconsistent with contemporary needs for lifelong learning and autonomous functioning in diverse and multiple work settings. Some educational scholars have argued recently that broader school structures, characterized by bureaucratic regimen, also foster passivity and dependence and that they do so among teachers as well as students (McCaslin & Good, 1992).

Teachers interested in achieving family focus curriculum goals will want to provide numerous opportunities for students to engage in active forms of learning. In such cases, the teacher would serve more as a facilitator of learning or collaborative learner, than as a director. Such opportunities would be designed to foster greater intellectual independence and personal initiative in learning among students. Hypermedia can be used to promote active engagement in learning by providing

more varied, realistic, and interactive learning resources and by giving learners greater control over learning opportunities and processes.

The Relation of Students to One Another

Past educational approaches have often been based upon individualistic and competitive goal structures. Homogeneity among student populations has also been typical of a majority of American classrooms. Today, however, school classrooms as well as family, work, and community contexts are becoming increasingly diverse and are requiring greater degrees of cooperative problem solution and action.

Family-focus learning goals suggest there is a need to provide opportunities for students to learn to work effectively with others in groups, as well as on their own. Collaborative learning opportunities can be structured to enable learners to pursue personal as well as group learning goals, and to capitalize on unique but often complementary learning styles and strengths. Communicative and emancipatory family action will be more likely to occur in families where members are comfortable with, and appreciative of, collaborative group effort and human diversity. Hypermedia can be used to facilitate learning by collaborative groups as well as by students independently.

The Nature of Family and Consumer Education Content

Traditional approaches to educational program content have emphasized separateness of content (a Cartesian-Newtonian view of the universe), rather than wholeness (a configuration paradigm). The six substantive family and consumer education areas, long used in Wisconsin and other states as the basis for Family and Consumer Education program planning, serve as a prominent example of this view (foods and nutrition, consumer science, family relationships, child development, living environments, clothing and textiles).

Classrooms structured around family focus curriculum goals will emphasize the whole of ideas and the interconnectedness of knowledge within that whole. Such an approach is consistent with utilizing continuing concerns of families (which may give attention to several traditional family and consumer subject areas simultaneously), rather than the six substantive areas, as the basis for curriculum organization. The emphasis on the interconnectedness of knowledge also points to the desirability of developing stronger and more extensive curriculum connections between family and consumer education program content and that traditionally addressed in other school subject areas both within vocational education and beyond. Hypertext and hypermedia applications can provide frameworks for connecting diverse symbols (e.g., text and sound) as well as diverse knowledge bases rapidly, and in new and varied ways.

Traditional approaches to educational program content have also tended to address thinking and reasoning skills as a collorary part of content, rather than as a central component of it. In the family focus curriculum model, intellectual skills are viewed as an explicit component of content (together with subject matter). Thus, teachers will want to provide meaningful opportunities for students to examine and practice reasoning strategies needed to confront and deal with complex family concerns within realistic contexts. Practical reasoning is a broad intellectual strategy that has been suggested as a framework for organizing thinking skills instruction in family and consumer education (see sample curriculum modules). It involves examining the context, as well as valued ends, alternative means, and consequences associated with possible actions related to specific family concerns. In conceptualizing program content, the intellectual processes involved in reasoning reflectively about practical problems are just as important as the subject matter.

Hypermedia can serve as cognition enhancers that foster advanced reasoning about family issues and concerns. They may do so by making routine mechanics easier (for example, by assisting with database management, data analysis, or data presentation) and by facilitating the knowledge creation and re-creation that makes short to long-term knowledge transfer more likely to occur (Dede, 1989).

Nature of Learners, Learning Goals, and Patterns

Headway has been made in recent years in structuring learning environments to meet unique educational needs of learners. However, most of secondary education has traditionally been based on a pattern of fairly fixed educational goals for all. Helping an increasingly diverse student population develop the skills and abilities needed to deal proactively with complex family concerns and issues in increasingly complex environments suggests a need for more flexible educational goals, and teaching and learning strategies that will enable students to achieve them.

Traditional singular, and often linear, patterns of teaching will not likely serve to nurture and challenge all learners. Multiple approaches, including both linear and nonlinear, will likely be more effective in actively engaging a greater proportion of the student population in learning that is personally meaningful, and effective in developing the capacity for family action.

Unlike the most commonly used computer and media applications, hypermedia software and hardware permit the nonlinear access to, and organization of, information. Hypermedia can be used to individualize the pace and time of learning as well as learning goals and the instructional materials made available to students.

Learner Assessment

The appropriate assessment of student learning has been a topic of continuing debate among both scholars and practitioners. Recent literature indicates a growing awareness of need for development of more "authentic" approaches to evaluation; approaches which will better assess the extent to which learners can apply knowledge and skills in real-world problem situations.

The need for such approaches to evaluating teaching and learning in family and consumer education programs is readily apparent. Recall of information is no guarantee of the ability to make reflective judgements about issues such as handling disagreements and/or anger in the family, guiding the intellectual development of children, balancing work and family, and/or assuring one's economic well-being.

Hypermedia can be used as tools for the demonstration of student learning in a number of ways. Among these are simulation, self-evaluation, and visual displays. Hypermedia can allow students to carry out tasks that cannot actually be done in school; reflect on their performance by soliciting feedback and/or comparing performance with that of others; and by displaying what they have learned so that others may also benefit (Collins, 1991a and b; Bransford, et al., 1989; Collins & Brown, 1988).

Hypermedia systems and applications will certainly not be the answer to all of the challenges in structuring effective Family and Consumer Education programs. Nevertheless, existing research, and practice in select instructional areas, suggest that the technology has great potential for enhancing educational efforts to empower families, and to build occupational skills for persons interested in family services career areas.

References

America 2000: An education strategy. (1991). Washington, DC: U.S. Department of Education.

America's choice: High skills or low wages! (1990). Rochester, NY: National Center on Education and the Economy.

Bransford, J.D. et al. (1989). New approaches to instruction: Because wisdom can't be told. In S. Vosniadou and A. Ortony, Eds. Similarity and Analogical Reasoning (pp. 470-97). New York: Cambridge University Press.

Brookfield, S.D. (1988). Developing critical thinkers. San Francisco: Jossey-Bass.

Campbell, R. and Hanlon, P. (1990). Hypercard: A new heal in the classroom. In S. Ambron and K. Hooper (Eds.), Learning with Interactive Multimedia (pp. 258-286). Redmond, WA: Microsoft Press.

Chaffee, J. (1988). Thinking critically. Boston, MA: Houghton Mifflin.

Collins, A. (1991a). Cognitive apprenticeship and instructional technology. In L. Idol and B.F. Jones, Eds, Dimensions of Thinking and Cognitive Instruction (pp. 121-138). Hillsdale, NJ: Erlbaum.

Collins, A. (1991b). The role of computer technology in restructuring schools. Phi Delta Kappan, 73(1), 28-36.

Collins, A. and Brown, J.S. (1988). The computer as a tool for learning through reflection. In H. Mandl and A. Lesgold, Eds., Learning Issues for Intelligent Tutoring Systems (pp. 1-18). New York: Springer.

David, J.L. (1991). Restructuring and technology: Partners in change. Phi Delta Kappan, 73(1), 37-40, 78+.

Dede, C. (1989). The evolution of information technology: Implications for curriculum. Educational Leadership, 47(1), 23-26.

Franklin, C. and Kinnell, S.K. (1990). Hypertext/hypermedia in schools: A resource book. Santa Barbara, CA: ABC-CLIO.

Guide to curriculum planning in home economics. (1987). Madison, WI: Wisconsin Department of Public Instruction.

Home economics concepts: A base for curriculum development. (1989). Alexandria, VA: American Home Economics Association.

Laster, J.F. and Dohner, R.E., Eds. (1986). Vocational home economics curriculum: State of the field. Peoria, IL: Bennett & McKnight Publishing Co., Division of Macmillan, Inc.

McCaslin, M. and Good, T.L. (1992). Compliant cognition: The misalliance of management and instructional goals in current school reform. Educational Researcher, 21(3), 4-17.

Nix, D. (1988). Should computers know what you can do with them? In R.O. McClintick, Ed. Computing & Education: The Second Frontier (pp. 67-79). New York: Teachers College Press.

Paul, R. (1990). Critical thinking: What every person needs to survive in a rapidly changing world. Rohnert Park, CA: Center for Critical Thinking and Moral critique, Sonoma State University.

Paul, R., Binker, A.J.A., Martin, D., and Adamson, K. (1989). Critical thinking handbook: High school. Rohnert Park, CA: Center for Critical Thinking and Moral Critique, Sonoma State University.

Paul, R., Binker, A.J.A., Martin, D., Vetrano, C., and Kreklau, H. (1989). Critical thinking handbook: 6th-9th grades. Rohnert Park, CA: Center for Critical Thinking and Moral Critique, Sonoma State University.

Secretary's Commission on Achieving Necessary Skills (SCANS). What work requires of schools: A SCANS report for America 2000. Washington, DC: U.S. Department of Labor.

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. Phi Delta Kappan, 73(1), 17-27.

Sternberg, R.J. ((1986). Intelligence applied: Understanding and increasing your intellectual skills. New York: Harcourt Brace Jovanovich.

Van Horn, R. (1991). Advanced technology in education: An introduction to videodiscs, robotics, optical memory, peripherals, new software tools, and high-tech staff development. Pacific grove, CA: Brooks/Cole Publishing Co.

Chapter 2
Designing a Local Prototype

Schools have invested heavily in computer equipment in recent years and computers are now much more readily available to Family and Consumer Education teachers than they have been in the past. In 1987, Petrich reported the results of a 1986 study of 225 randomly selected Wisconsin FCE teachers. Results indicated only 4 percent of the teachers then had a computer in their own department and/or classroom. More than a third (37%) of these same teachers indicated there was no computer available to them in their entire school building. The results of a study conducted as a part of this project (described more fully further in the report) suggest that over 50% of Wisconsin FCE teachers now have a computer available in their own classroom(s) and are using them as aides to instruction for purposes such as dietary analysis, loan amortization simulations, review of basic fiber facts, and word processing.

Computer-Assisted Instruction VersusComputer Involved Environments

Hypertext/hypermedia systems can be used for some of the same purposes as other varieties of computer hardware and software. For example, hypertext authoring software can serve as a tool for use by the teacher for the teacher (e.g., keeping grade or supply records or generating classroom forms) or by the teacher for students (e.g., preparing flexible multimedia presentations or demonstrations for large groups, preparing tutorials for individual or small group use, or maintaining collections of information on topics for student use). These are important instructional applications and the features of hypertext and hypermedia such as nonlinear access, multimedia options, and large storage capacities often make them more powerful and flexible than traditional software and hardware tools for these purposes.

The greatest potential of hypertext/hypermedia for fostering higher order thinking skills and thus furthering achievement of family-focus curriculum goals, however, lies not as much in its usefulness for computer-managed or computer-assisted instruction (CMI or CAI) as in its applicability for creating what have been termed Computer Involved Environments (CIE) (Pogrow, 1987).

In computer involved environments, computers and authoring software are used by individuals and small groups of students for themselves, and also for the teacher and entire classroom. Learners have a good deal more control and interact more with each other and with the teacher in these environments than in traditional classrooms. There is more interest in the learning processes facilitated by the computer (e.g., what the students themselves can do with computers and how they may facilitate efforts to reason about issues) than in the learning products resulting from computer use (what specific content will be "mastered" using the computer or what specific analyses performed). Such environments are consistent with the cognitive view of learning, in which the active role of the learner, including learner control, are seen as main determinants of learning (Ryba & Anderson, 1990).

Computer involved environments are much more likely to produce learning that reflects deeper conceptual understanding, and the ability to reason about complex issues that do not have just one correct solution. Lengel and Collins (1990) have called this promoting wisdom, the top of the educational pyramid, which is accomplished only after learners have had an opportunity to wrestle with knowledge; to turn data into meaningful pieces of information, and then personal ideas.

A recent survey of over 3200 public elementary and secondary schools by Apple Computer (Lengel & Collins, 1990) suggests that few schools today are making use of computer involved environments. Schools are known to progress through a series of developmental stages in the adoption and use of technology. These stages are (Lengel & Collins, 1990, pp. 195-196):

1. The P Stage - emphasis is on teaching programming and the computer itself is the object of instruction. The computer is a relatively peculiar item in the school and often is seen as the personal property of one or a small group of teachers involved in the initial introduction.

2. The D Stage - the computer is used mainly for drill and practice in regular subject areas and computers are more widely diffused throughout the school. There is often disappointment about what computers can actually do relative to instruction and student learning.

3. The T Stage - Computers are used as productivity tools, tailored to individual students, teachers, and the curriculum. There is a movement aware from use in direct instruction to more use for general purposes such as word processing, database management, and telecommunications.

Most schools today are in the D stage, according to the Apple research. However, they are predicting the next two stages will be:

4. The T2 Stage - Schools will use more powerful hypertext/hypermedia tools such as HyperCard software and CD-ROM and laserdisc databases that permit the nonlinear organization of, and access to, large amounts of information in many forms (e.g., text, audio, video) throughout the curriculum and operations.

5. The U Stage - Computers will be ubiquitous in schools; used for everything. They will also be unobtrusive and uneventful.

Research conducted as part of the present project indicates that computers in Wisconsin Family and Consumer Education classrooms are indeed being used mainly in a manner consistent with the D and/or T stages described by Lengel & Collins. As outlined in the study results presented later in this document, Family and Consumer Education teachers reported that computers were most frequently used by individual students for short-term projects such as dietary analysis and loan amortization, for drill and practice, such as

review of basic fiber facts, and for word processing by themselves and their students. But computer involved environments, using hypermedia to promote active learner involvement, more collaborative group effort, and greater intellectual wrestling with complex issues, should not be difficult to create. There are a number of options for doing so and several factors that should be considered. The remainder of this chapter outlines the major questions and issues that will need to be addressed.

Asking the Right Questions

Half the job of creating an effective computer involved learning environment with hypermedia in Family and Consumer Education is becoming familiar with the right questions to ask about what is needed to get started. The issues include not only selection (or appropriation) of suitable hardware and software but also alternative ways of structuring activity within the learning setting. Relevant questions (and some beginning answers) are outlined below:

1. What Kind of Hardware and Software Will Be Needed?

It is possible to design extremely elaborate (and powerful!) hardware and software systems with the technology that is readily available today. The core of such systems is a personal computer and it is possible to begin creating a hypertext-based computer involved environment with nothing more than just a computer - and appropriate software. Hypermedia systems may also include other pieces of hardware such as a CD-ROM (compact disc - read only memory) player (to play audio CD's or CD's containing still images, text and sound); a scanner to import images, a videodisc player for nonlinear access to video and still images, a video cassette recorder (VCR), and a monitor.

Hypermedia authoring software is available for the Apple II line of computers, MS-DOS/IBM or compatible computers, and for the Macintosh line. Many people believe that Macintosh computers and

the HyperCard software that has been packaged with them since 1987 is the benchmark against which other systems should be compared (Franklin & Kinnell, 1990). People who laud HyperCard point to its widespread availability, ease of use, and advanced features. Some computers experts, particularly those in creating interactive multimedia, do not count HyperCard as a full fledged authoring system. This is because it requires some programming knowledge in HyperTalk (the HyperCard scripting language) in order to take full advantage of its capabilities (Anderson & Veljkov, 1990).

Hypertext software varies greatly in price, ease of use, and capability. Depending on the main hypertext software selected, additional software may be required in order to use desired peripheral equipment such as a scanner or videodisc player. Potential purchasers and users will want to consider compatibility between hardware and software, compatibility of both hardware and software with instructional purposes, price, and ease of use. One or another factor may be more important in a given location, for example, a previous hardware commitment may need to be the deciding factor in selecting appropriate software.

Because the selection of appropriate hardware and software for hypermedia use can be such a complex task, an entire section of this report discusses the topic in much greater detail (see Chapter III). An excellent overview of available hypermedia development tools (software) is included in Franklin and Kinnell (1990).

2. How Should Hypermedia Equipment be Organized - Computer Laboratory or One Computer Classroom?

An important question in creating computer involved environments concerns how computer equipment should be organized within the educational setting. As more computers have been introduced into schools, many have chosen to locate the best equipment centrally, in one or two classrooms shared by all teachers and monitored by one or a few teachers or aides. This has made sense in a number of

ways. For example, a computer lab makes scheduling large numbers of computers for simultaneous use easier, it is often more feasible to have an instructional aide available to assist with computer applications, and monitoring of necessary repairs can also be more efficient.

Such arrangements have a number of disadvantages, however, in relation to creating computer involved environments. The problem with such computer laboratories is that they imply and promote very traditional technical, teacher-controlled, and even linear metaphors of teaching and learning. In most present computer laboratories, with a computer station for each learner and little room to move chairs or equipment, it is difficult not to expect that the teacher will be seen as the director of learning at the front of the room and that everyone will either be expected to be working on the same networked piece of software or running their own individual piece of software. Probably all students in a class will need to be there together, because it is difficult to supervise students adequately in more than one location at once. In addition, rules of the computer laboratory may not suit those adopted by a given teacher or class.

Other alternatives for organizing computers and peripherals include sharing several computers among a small group of teachers and transporting them between classroom on carts, and/or placing just one or a few computers in each classroom on a permanent basis.

"Computers a la cart" may well support occasional use of hypertext/hypermedia. However, such an arrangement will probably not be optimal for supporting true development of computer involved environments due to the complexity of planning required for use; logistical problems of transporting the equipment; mechanical problems due to constant moving; and software problems due to diverse uses. Fewer computers (even one!) in a classroom on a permanent basis may create internal scheduling challenges but has the advantage of stability and flexibility of use, class ownership of the equipment and approach to learning, and clarity of software needs (Geisert & Futrell, 1990).

Family and Consumer Education teachers will want to consider what a computer involved environment might look and feel like in their own school setting. It might involve using just one computer, hypertext software, and a limited set of peripherals with hypertext/hypermedia capability to begin. With a bit of planning, such a system can be used by both teacher and learners for functions such as teacher and student organization record management, word processing, large group teacher or student presentations, individual projects and cooperative group learning activities. Another school setting may allow use of both a permanent in-class hypermedia system and a computer laboratory.

Appropriate placement of one or more computer systems within the classroom is another consideration in developing the local prototype. Experienced hypermedia teacher-users recommend making this a deliberate choice Campbell & Hanlon, 1990). The location of the equipment may well set the primary tone of the learning environment. Placing the equipment at the front of the room, for example, can make it the dramatic center of the classroom. Individuals and small groups of students may feel self-conscious at exactly the time they most need to feel comfortable trying new things and making mistakes. There will be lots of cords and cables to contend with as well. A location at the side or rear of the room, with plenty of space to move around may be preferable. In-classroom carting of equipment may be another helpful alternative.

3. If There is Limited Equipment, How Should Sharing be Structured Among Students?

There are at least four approaches that can be taken to structuring the time students are allocated for using hypermedia systems. These are the milestone, timed, task-defined, and open time patterns. In the milestone approach, the time allocated for computer use is determined by the nature of the program in question; for example, a user would cycle through a pre-defined learning sequence and then be finished. This approach may work well for students when they

are using pre-developed hypertext stacks (documents) that are tutorial in nature.

The timed approach to scheduling involves allocating given time periods in fixed rotations for student to complete their work. This may initially seem the fairest strategy, but it does not account for varying learning rates or different learning goals or approaches.

In the task-defined approach, students are given as much time as necessary to do the job. It differs from the milestone approach in that the criterion for determining time allocation is external to the computer program. It offers the greatest flexibility for meeting individual and group learning needs and interests.

Open time is a final alternative in which students (or teams) are permitted to use the equipment at their discretion. While the approach may work well for recreational or reward use of the equipment, care needs to be taken that the more aggressive students do not dominate usage.

Experienced teachers recommend use of daily sign-up sheets for computer usage, that can be reviewed by the class and adjusted as needed when someone has a special need. Students will usually choose to be generous if they feel they have a choice and can count on their own fair chance to use the equipment.

A question related to the allocation of student time for use of hypermedia systems concerns the number of students who should use a given system at one time. This will, of course be determined in large measure by the educational goals. Hypertext/hypermedia authoring software can be used successfully both by individuals and by small groups of students. Research suggests that groups of two to three students can actually gain more than one at a time, as a result of the interaction that takes place during the learning process (Geisert & Futrell, 1990). Larger groups of four to five students can also use hypermedia systems at one time, but will probably require more formal cooperative learning instruction first, and selection of specific group learning roles and responsibilities.

4. How much computer expertise will be needed to use hypertext/hypermedia systems? Will we have enough?

Both teachers and students will need to have some basic computer skills in order to use and benefit from hypermedia applications. It is important to know how to turn the computer and peripherals on and shut them down properly; handle disks; open, save, and close files; and set up and put away equipment. Some programs have used the concept of "student user licensing" as a way to ensure that students have basic skills needed for safe use of equipment. This

may be more appropriate for elementary and middle school students than for high school, however.

Although most students today take the idea of computer use for granted, there is likely to be great variation in the computer experience and skills that individual students have. Teachers may want to consider using a school computer laboratory, if available, to teach an entire class some computer basics. If there are computer enthusiasts and owners in class, they might be happy to be put to work teaching others. It might also be possible to develop a team teaching arrangement with another department so that students could work on computer skills and hypermedia projects in more than one class and/or subject at a time (for example, students might work on a family, food, and society project in both a Family and Consumer Education class and in a computer science and/or chemistry class).

<u>The great thing about most hypertext/hypermedia software is that it does not require a great deal of formal computer training or expertise to use!</u> Students and teachers can accomplish much without learning programming (or scripting as it is called in HyperCard), and even simple scripting can do wonders (Campbell & Hanlon, 1990). Because students will usually be working together, not every student will need to be an expert user. The teacher does not even need to be an expert user because it is possible to learn as you go! Experienced hypermedia users note that students actually

tend to be more creative and flexible when they are able to work on their own without worrying about all of the formalities of the hardware and software.

An example of a beginning list of desirable skills for putting HyperCard to use in the classroom was provided by Campbell & Hanlon (1990) (pp. 265-266):

Without scripting (can be learned in one or two short sessions):

Make a card.
Make a background.
Make a field and place it on the card or background.
  Choose a style and font for the field.
Type in a field.
Make a button and place it on the card or background.
  Choose a style for a button.
  Use the button to link the card to another card or stack.
Copy or cut and paste cards, buttons, and fields.
Draw on or paste graphics onto a card or background.

With simple scripting: (write one-line or two-line scripts for cards, locked fields, or buttons that do the following:

Go to another card, with a specified visual effect.
Hide and show fields, pictures, and buttons.
Play sounds.

With slightly more advanced scripting:

Drag objects on the screen to simulate animation.
Play several sounds in sequence.

Besides the software documentation (technical guides for use that come with software programs), many easy to use references are available to assist in learning to use hypermedia software and hardware. For example, numerous helpful guides to learning

HyperCard have been prepared. Among these are references produced by Apple Computer (1989), Beekman (1992); and Bull and Harris (1991). Updates and hints can be found in a wealth of other readily available texts and periodicals. Many of these are listed Chapter 6 of this report.

5. What Are Appropriate Teacher and Learner Roles in Computer Involved Environments?

Traditional views of computer-assisted instruction often implied that the computer software would be used to actually do the teaching in specific areas and that the software could replace, and perhaps even improve upon what teachers had been able to do previously. Some literature has even given the impression that teachers could be replaced by computer technology, at least for some purposes. These scenario represent an extremely technical perspective on the use of instructional technology that essentially relegates teachers to the role of learning technician with the "job" of identifying content-specific instructional software and learning how to work the mechanics of the programs.

Indeed, it would be possible to use hypermedia in mostly technical ways, as has been the case with other applications of technology in education. For example, hypertext software could be used simply by the teacher to create learning programs for individuals to use in drill and practice exercises. But the potential of hypermedia is that it can be used as a structure for learning (as opposed to the content for learning) and thus permit the "teacher to engage in interactive, adaptive, and dynamic interactions with learners" (Goldman & Pellegrino, 1987). This use of technology requires greater attention to the learning processes and culture that are both facilitated and created within the educational environment. Teachers and learners wishing to create computer involved environments that facilitate higher level reasoning with hypermedia will want to give attention to (Ryba & Anderson, 1990):

1. Promoting Effective Working Relationships - questioning and prompting can help students learn to work interdependently and think for themselves. Students will need to know it's okay to: make mistakes, think it through yourself, ask Jerome or Janelle what s/he thinks, help others, rearrange the physical environment to facilitate cooperative projects!

2. Boosting Internal Control and Self-Esteem - The opportunity to set personal learning goals and reflect regularly on them can help promote self-management of learning and have positive effects on social and emotional adjustment. It is important that students have time to think, to explore, and to be creative and to reflect within the task environment. They can profit from hearing: "What are other ways you can think of this?" "What are the important differences between these views?" "What were you trying to do/find out?" "Is that what you wanted to know?" "What do you think should be done next?" "Your view is the important one!"

3. Developing Adaptive Behavior - Self-directed learning activities, such as those possible with hypertext applications, can be helpful in promoting independent thinking and action, which is exactly what families need to be able to do in order to act in communicative and emancipatory ways. As an authoring environment, HyperCard, for example, requires students to take control and make decisions for themselves. This is in contrast to traditional computer assisted applications where the computer is essentially in charge of the learner. Students will profit from knowing that the teacher does not have all of the answers, and from seeing the teacher as a learning partner, not just a learning director.

6. Are There Equity Issues Related to the Use of Hypermedia?

Research has shown clearly that the use of computer technology has not been well balanced in schools (Sutton, 1991). Generally, boys have had more access than girls, assertive students more than passive, and the computer-talented students more than the less talented. Students in communities with higher socioeconomic levels

have also had more access and greater opportunity to learn with technology. Teachers will want to keep equity in mind when arranging equipment and structuring opportunities for access (Giesert & Futrell, 1990):

Girls versus Boys. To avoid reinforcing or creating gender disparities, try to present learning options using hypermedia that will appeal equally to boys and girls. Be aware of the gender of the "computer role models" available for students. It should not always be males that are portrayed as the ultimate source of wisdom relative to technology. Girls and boys need to see examples of women using technology in important work and community roles.

Assertive versus Passive Students. Be aware of assertive students (research indicates they will be boys most often) and take steps as needed to counter attempts to dominate available computer time. Domination may not be the only problem; some students may have less interest in or confidence about using technology. Establishing cooperative learning groups may help in promoting equity of use. However, students will likely profit from first understanding and then practicing cooperative learning skills (see for example Johnson & Johnson, 1987a and b; Johnson, et al., 1984).

Computer-Talented versus Less Talented. Teachers will want to be aware of the possibility that students may vary greatly in their natural proclivity toward computers and media technology as well as in their prior exposure and formal instruction in usage. A major consideration will be establishing structures for use that do not put the less talented in competition with those who have greater skill levels. One strategy is to enlist the aide of the more skilled learners in teaching those with less experience and/or expertise.

7. How Much Do We Need to Worry About Copyright Issues?

Most hypertext/hypermedia software can be easily copied, either because it is not copy-protected or because programs designed to unlock copy protection are readily available. The temptation to copy

software is often great among both teachers and students due to eagerness to use new technology and tight budgets at school and home. Care should be taken to respect copyright laws, however! It is appropriate to worry about this a great deal. The unauthorized copying of software amounts to theft and it is illegal. Teachers, and the tone they set in the classroom, serve as models for students and families, not to mention society as well.

Most computer programs provide lists of the rights and privileges of the purchaser in the software documentation or on the container. Some will allow duplication or loading of a certain number of copies. Other software packages can be purchased with site licenses that allow more flexibility in usage; copying or networking, for example.

It is important that students be made aware of fair use laws to ensure that copyright regulations are followed. Individual situations will vary, but it may be necessary in certain settings to monitor computer usage closely and perhaps even control the number of disks entering and leaving the classroom.

8. What Specific Uses of Hypermedia Should Be Considered and in What Order?

Hypertext and hypermedia can be used by students and teachers for a variety of purposes. The systems can be used by individuals, and by small and large groups. Where to start will be a personal and local decision, but some advance planning may be helpful. Following are some possible uses:

Information Database. Hypertext/hypermedia programs can store large amounts of information in the form of text, video, audio, and sound related to students, the student organization, or virtually any topic relevant to Family and Consumer Education. HyperCard Stacks (files composed of numerous cards) can be as simple as a student address, employer, videotape or test file or as complex as a large database with complex linkages related to work-family relationships.

Drill and Practice or Tutorial. Hypertext programs can be designed for use by individual students to provide information, examples, interactive questions, and pre- and post-tests. The multimedia capabilities can make these individualized packages motivating and can serve to address diverse learning styles. Such usage usually places the learner in a more dependent than independent learning role, but the nonlinear feature of hypertext does (or should) allow learner control of movement within the program.

Large Group Presentations. The nonlinear and multimedia capabilities of hypermedia make such systems ideal for developing large group presentations. Groups of cards (stacks) can be created related to the topic of interest. The cards can include text, animation, and even scanned-in images such as graphs, student work or student pictures. Cards may also be made to link to video or audio material. Some material can be hidden for use as needed (for example, questions or sources) and notes can be typed in during the class discussion when the presentation in used. Large group presentations can be used to teach some of the program characteristics and even research skills. During a presentation, for example, the teacher might casually demonstrate searching for a key word or how to go to another relevant stack for information. Unlike pure audio or video presentations, hypermedia-based presentations can be ended anywhere quite gracefully. Because the audience is not usually aware of the size of the program, it is typically not necessary to say, "We will need to finish this tomorrow."

Individual and Small Group Investigative Projects. Hypermedia can be used as a framework for identifying and organizing information related to individual and/or small group investigative projects. Student experience with family issues and reasoning skills can be used to determine the amount of structure that is provided for such projects by the teacher. Continuing concerns and practical problems of families can be fairly well defined, for example, students could be given a specific illustrative case (perhaps with a video prompt) as a basis for exploration. Or problems can be less well defined, where students might identify their own practical problem and illustrative case for further investigation. In either situation, the

hypertext structure can be used for cataloging relevant information and organizing (and reorganizing) it in ways that lead students to consider all relevant components of the practical reasoning process on the way to an appropriate resolution about family action.

Preparing and Presenting Assignments. Hypermedia systems can also be used to prepare and present assignments. These may be less complex and of shorter duration than investigative projects. A hypertext program can be used, for example, to generate a series of questions related to a graphic contained in the hypertext program, and to print them (and the graphic) out for student response. Or, pieces of information needed for an analysis assignment might be printed for student use, together with directions; for example, data might be presented on food consumption patterns of young children, teenagers, and/or older adults for use in comparing nutritional adequacy levels among these groups in the population. Assignments can be presented using the computer in front of an entire class and then reinforced with paper copy handouts. A sample series of assignments, prepared using a HyperCard format is presented in Chapter 4 of this report.

Some teachers have found that using hypermedia for preparing and presenting assignments is a good way to introduce hypermedia systems in their classes. Students can begin to understand the program conventions by watching the teacher use them (Campbell & Hanlon, 1989). For fostering reasoning about complex issues concerning families, however, one of the most powerful uses is most certainly to be for application in individual and group investigative projects. Such projects hold great promise for helping students recognize and wrestle with family issues in their complexity, to develop social skills needed to work with others, and to develop independence of thought and action.

<u>It is not necessary to make use of the full range of hypermedia hardware or software applications all at once!</u> Hardware beyond the central computer can be added a piece at a time. Similarly, hypermedia databases and specific applications can be added gradually as time permits and expertise grows.

References

Anderson, C.J. and Veljkov, M.D. (1990). Creating interactive multimedia: A practical guide. Glenview, IL: Scott, Foresman.

Campbell, R. and Hanlon, P. (1990). HyperCard: A new deal in the classroom. In S. Ambron and K. Hooper (Eds.), Learning with Interactive Multimedia (pp. 258-286). Redmond, WA: Microsoft Press.

Franklin, C. and Kinnell, S.K. (1990). Hypertext/Hypermedia in schools: A resource book. Santa Barbara, CA: ABC-CLIO.

Geisert, P.G. and Futrell, M.K. (1990). Teachers, computers, and curriculum: Microcomputers in the classroom. Boston: Allyn and Bacon.

Goldman, S.R. and Pellegrino, J.W. (1987). Information processing and educational microcomputer technology: Where do we go from here? Journal of Learning Disabilities, 20(3), 144-154.

Johnson, D.W. and Johnson, F.P. (1987a). Joining together: Group theory and group skills. Englewood Cliffs, NJ: Prentice-Hall.

Johnson, D.W. and Johnson, R.T. (1987b). Learning together & alone: Cooperative, competitive, & individualistic learning. Englewood Cliffs, NJ: Prentice-Hall.

Johnson, D.W., Johnson, R.T., Holubec, E.J., and Roy, P. (1984). Circles of learning: Cooperation in the classroom. Alexandria, VA: Association for Supervision and Curriculum Development.

Lengel, J.G. and Collins, S. (1990). HyperCard in education: Perspective from the field. In S. Ambron and K. Hooper, Eds. Learning with Interactive Multimedia. Microsoft Press.

Petrich, B. (1987). Computers in home economics teacher education: Survey data related to decision-making. Journal of Vocational Home Economics Education, 5(1), 51-58.

Pogrow, S. (1987). The HOTS program: The role of computers in developing thinking skills. TechTrends, 32(2), 10-13.

Ryba, K. and Anderson, B. (1990). Learning with computers: Effective teaching strategies. Eugene, OR: International Society for Technology in Education. (ED 327 157)

Sutton, R.E. (1991). Equity and computers in the schools: A decade of research. Review of Educational Research, 61, 475-503.

Chapter 3
Hypermedia Related Hardware and Software

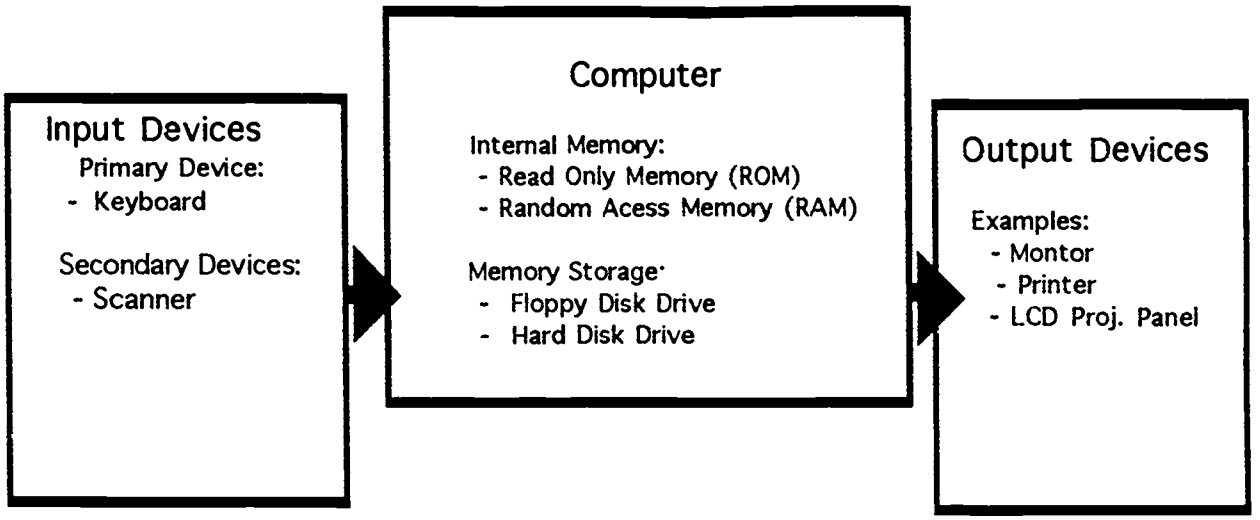
This section is meant to give an indication of "what questions to ask" when investigating hypermedia related hardware and software. Developing a hypermedia system requires some coordination among technologies since "hypermedia extends the concept of hypertext to include other media--graphics, animation, scanned images, voice, sound, music, still video, and full motion video" (Van Horn, 1991, pg. 207).

There are several difficulties in approaching this topic. One major difficulty is that the hardware and software technology is changing so quickly. Today's technological wonder may be replaced by something tomorrow which is newer, updated, upgraded, revised, more efficient, cheaper or more costly. Because of this it is difficult to talk about specific products of hardware or software; although some specifics are mentioned as examples in this section.

Another point of difficulty is in determining "where to start" in making suggestions to create a hypermedia system. Some hypermedia users may use existing hardware; others may start at the beginning. Therefore, the following overview should be considered a general approach to thinking about hypermedia related and software. It is recognized that some parts may be more or less applicable to the reader, depending upon the particular context of resource availability.

Microcomputer System

Understanding the basic components of a microcomputer system will aid the hypermedia developer. The microcomputer system consists of the central processing unit, input and output devices (see the figure below). "A computer system is an electronic device that consists of several components that together provide the capability of executing a stored program for input, output, arithmetic, and logical operations" (Cassel, 1990a, pg. 6).



Software is a crucial component of the computer system. "Software is the program that supplies the instructions for the computer to follow. System software, notably the Disk Operating System (DOS), is a general purpose program that operates with other software and makes the computer function more effectively. Application software are programs that perform specific functions such as an accounting program, a spreadsheet, or a data base package" (Cassel, 1990a, pg. 7).

The microcomputer is a digital device which uses a signal system described in binary units (bi = two). The smallest unit of information in a binary system is a bit (which stands for binary digit) with a value of 1 or 0. Various combinations of bits are used to represent different letters, numbers or other symbols. Eight bits equal one byte to represent, for example, one character in the alphabet.

Most computers are designed to transfer some multiple of eight, such as an 8-bit (which transfers 8 bits at one time), 16-bit (which transfers 16 bits at one time), or a 32-bit (which transfers 32 bits at one time).

Internal Memory. There are two forms of internal memory which operate in a computer: read only memory and random access memory. Read only memory (ROM) chips are programmed when the computer is manufactured. ROM chips contain information that the system needs to function. As it is "read only" memory it cannot be altered or accept information, but it does retain existing information. This is also called non-volatile memory as data is retained even if the power to the computer system is turned off.

Random access memory (RAM) is the computer's work space or blackboard. Memory is measured in terms of how much information can stored or its capacity. Just one page of text will require about 3500 bytes of storage. Memory capacity is measured in kilobytes (KB). One kilobyte will store approximately 1000 bits of information; 1000 kilobytes equals one megabyte (MB).

RAM is also the memory where a program is stored when it is currently active. RAM requires a constant power source. If the power to the computer is turned off everything in RAM is lost unless it is first saved to secondary storage device, such as the disk drive or a floppy disk (Cassel, 1990b). Therefore, RAM is also called volatile memory.

RAM is has a limited capacity which is why it is sometimes "upgraded" to in order for the computer to handle the work load. General guidelines to do multimedia type work is 8 MB for both the Macintosh and PC (Windows System). Some software may have less memory requirements.

RAM memory is fairly easy and inexpensive to expand (Cassel, 1990b). To upgrade memory on the Macintosh, chips are mounted into the circuit board (Brisbin, 1992). These chips are called SIMMs

(Single In-Line Memory Module). SIMMs are organized into banks which are then accessed as one large repository. They may be installed by the user but beware; such user installation may void the computer's warranty. (However, the Macintosh warranty only covers one year and voiding the warranty is a non-issue after that time.)

Memory Storage. The hard drive and floppy disk drive are storage devices. The floppy disk drive has an external port designed for either 5 1/4 inch flexible diskettes or 3 1/2 inch diskettes in a plastic case. Information or data is stored on the disk, not within the computer. Floppy disk drives may be either external or internal.

The hard disk drive allows information to be stored within the computer, although it is not to be confused with RAM. A hard disk drive is composed of recording surfaces which are permanently sealed within a container which is not removable. The advantages of a hard drive are its storage capacity, speed of operation and relatively permanent state (Bullough and Beatty, 1991). Hard drive storage capacity ranges from 20 to 300 MB. For data transfer a hard drive can operate more than ten times faster than a floppy disk drive.

Input Devices

Input devices allows the user to input data or information directly into the computer. Input of any nature is digitized into binary codes. A primary input device is the keyboard. A secondary input device is a scanner.

Scanners. Scanners are like photocopy machines and allow the user to "copy" text or images into the computer. They take "real world" information, scan it and then digitize the information into binary codes. The capabilities of the scanner depend on its actual hardware features and software applications (Van Horn, 1991).

There are several type of scanners available: flatbed, sheet-fed, hand-held (Van Horn, 1991). They differ in how they input

information from paper. With a flatbed scanner, the lid is lifted and the page or book is placed on the glass to be scanned. Sheetfed scanners process only single pages, but have the advantage of doing many pages without assistance. Hand held scanners are exactly that, held in the hand but only scan images a few inches wide. The scanner has its own memory requirements. Many scanners are gray-scale only but color scanners are also available.

There are two types of scanning software which determine the functions of the scanner: imaging and text software. Text scanning software allows the user to scan text from already typed or printed pages. This is called optical character recognition (OCR) software. The OCR software is not always capable of reproducing exact copies as it may not recognize certain characters or type. Additional effort may be required on the part of the user to correct recognition errors.

The advantage is, however, that large documents need not be retyped, but entered through the scanner.

Imaging software allows the scanner to capture images, graphics, or photographs which are may then be copied directly or altered into a new image. The extent to which an image can be altered is determined by RAM and particular output requirements. For example, altering the image to line art, or half-tone will minimize the amount of memory required to work in RAM and final memory storage space.

Scanning software allows these alterations to take place under the control of the user. Scanning software may also include a paint program, in which images or graphics may be re-drawn or detailed on the computer screen.

A second consideration is what output methods will be used. A Macintosh computer monitor is limited to displaying 72 dots per inch (dpi). While working with highly detailed images (such as 300 + dpi) may seem desirable, it may not be effectively displayed on the monitor. On the other hand, if the output is to a laser printer is capable of printing 300 dpi, it may be desirable to scan and save it with more detail.

Scanners and their software vary greatly in price. A hand held scanner is the least expensive and may begin around $200. Flatbed scanners begin around $600(for gray-scale) to over $1200 (for color). Software or cables may be an additional purchase; they are sometimes sold as an interface kit. This will increase the total price up to additional $600.

Output Devices

Output devices allow the user to make use of digitized information. Output devices include the monitor, printer or LCD projection panel.

LCD Projection Panel. One display device is an LCD projection panel, which for large groups is a desirable way of viewing computer images (LCD stands for liquid crystal display). The LCD panel is used with an overhead projector with the computer monitor image displayed on a wall or screen. Special software is not required in order to use an LCD panel. To connect the LCD panel to the computer a special cable is required; a display adapter is required if the LCD panel is to be used with more than one type of computer.

There is a wide range of LCD panels, those which project gray-scale images to semi-colored images to full color projection. The type of panel selected depends on its purpose. Consider what will be viewed using the panel as well as the range of the computer monitor, or software program being used.

LCD projection panels have either passive or active matrix technology. Gray-scale LCD panels have passive matrix technology. This means that any quick movements viewed on the computer monitor will not be seen. With active matrix technology, cursor movement is visible as well as animation. Images are clearer and sharper with active matrix technology but currently only color LCD panels are designed with this feature. Gray scale LCD panels may cost in the $1000 range in contrast to good quality color panels

which may cost $4000. Video adapters may be purchased with some panels which allow other video images, such as video tapes, to be viewed through the panel.

If using an LCD projection panel it is essential to also have an overhead projector that is LCD compatible. Older models of overhead projectors are not really as bright and are designed with a centrally located light source. (With the LCD panel, the image is displayed across the full panel, not centered, so it requires more even brightness.)

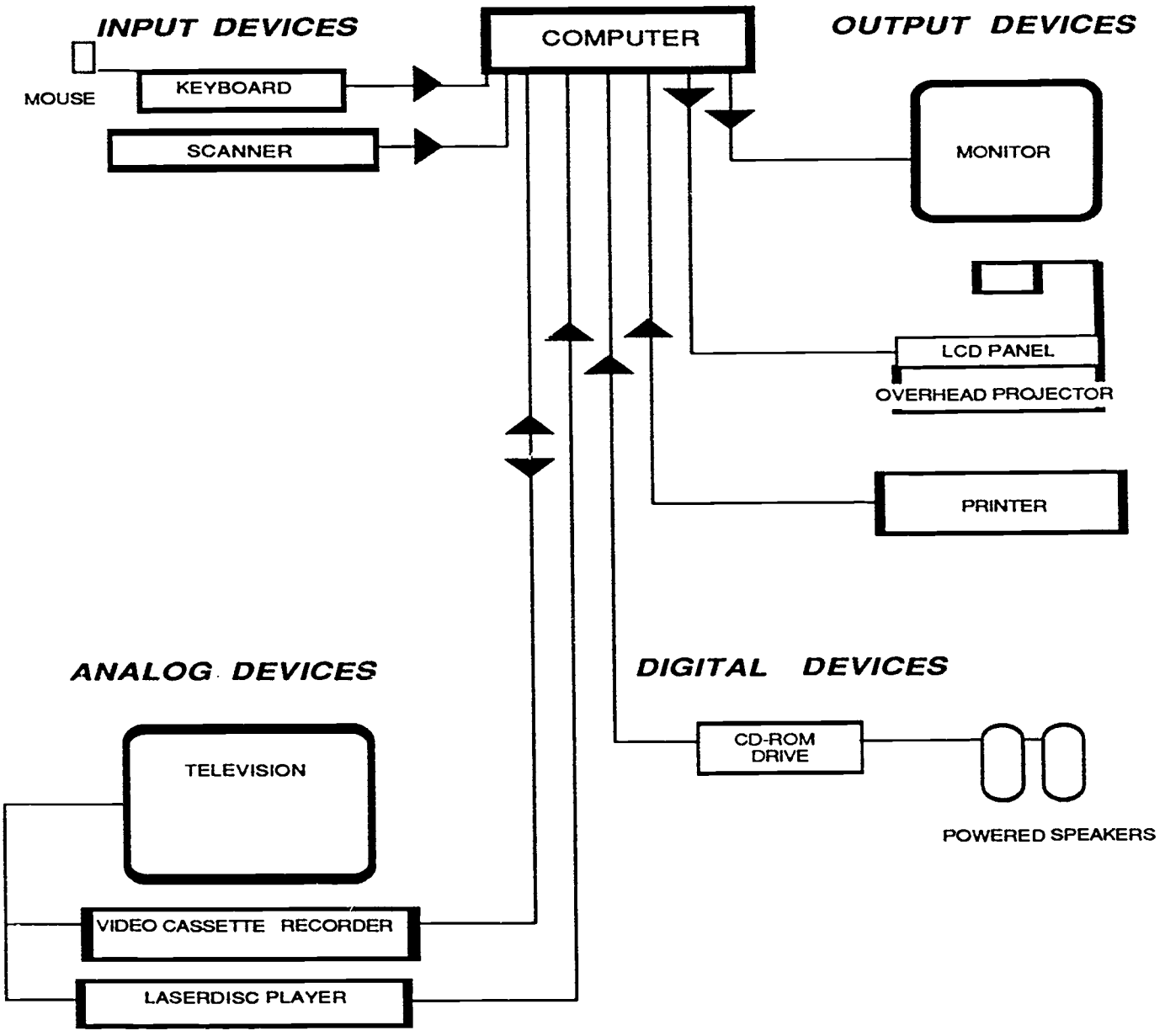
Also available are LCD projectors which are an "all-in-one" units which do not require a separate overhead projector. Some are also capable of producing both computer and video images from other sources (such as videodiscs or videotapes). Computer capable LCD projectors may begin at $6000. Such LCD projectors have an advantage in that they eliminate the need for additional equipment (the overhead projector as well as a television monitor) and make a compact unit for any "traveling" that must be done.

Hypermedia Systems

There are number of possible systems which can be used as platforms for hypermedia: Mac systems, PC compatibles, Unix work stations, Amiga, and Apple II. At this time the most commonly used are PC compatibles (which use a graphical interface like Windows) and Macintosh.

There are two approaches to creating a hypermedia system: digitize everything and store it on the hard disk drive or use the computer as a control center (that stores text and graphics) for peripherals that play other media such as sound or video (Lockwood, 1990). Usually these two approaches are integrated. The scanner was mentioned earlier as an input device which digitizes input. This section will focus primarily on using the computer as a control center with multimedia devices.

Example of a Hypermedia System with the Computer as Control Center



Using the computer as a control center may involve using a number of hardware peripheral devices. It is necessary to keep in mind the functions of hardware and software. Just obtaining the hardware device, does not automatically mean that the software required to "computer control" it is included. Nor does it mean that the necessary cables are automatically included with the purchase of the hardware device.

Multimedia Devices

Multimedia devices are other pieces of hardware which supplement the computer . They include digital devices, such as the CD-ROM player, and analog devices, such as the VCR or laserdisc player. "Working with hypermedia implies working simultaneously in both the digital and analog worlds. Television, music and photographic images are all analog in nature. On the other hand, computers, their files, and their displays are digital" (Van Horn, 1991, pg. 211). Digital peripheral devices are those which read or play digitized signals, those which have been defined in binary codes. Analog peripheral devices play "real world" information.

SCSI Connections. In order to use multimedia devices with the computer, some type of connection is required. The scanner and CD-ROM drive require a small computer system interface or SCSI (frequently pronounced as scuzzy) to make these connections (Heid, 1992). The SCSI is a bus or "a set of common wires upon which data and instructions flow" (pg. 223.) On the Macintosh, there is one SCSI port to connect the first peripheral device, other devices are added through "daisy-chaining" and connected to one another. Each device in a SCSI chain has its own identification number in which the computer sends information to that address. Setting the address is part of the installation process, installation directions are provided with the devices software and documentation.

One of the issues in making a SCSI chain work is making sure it is terminated correctly. Terminators may be internal or external on the computer. However, internal terminators are not desirable on

multimedia devices. In selecting the appropriate cables it is important to note differences in their structure (ie., pin connections--25-pin vs 50-pin) and purpose (ie., a system cable which makes the first connection to the computer or a peripheral cable which connects to other peripheral devices in the chain).

Digital Multimedia Devices

CD-ROM Drive. A CD-ROM (Compact Disk-Read Only Memory) player is also called a CD-ROM drive; it works much like a computer's hard disk drive (Van Horn ,1991). However, it differs from a computer's hard disk drive in that it is a read only device, not a recording device. Features to look for in a CD-ROM player include (Anderson and Veljkov, 1990):

- RAM Buffer - Improves the speed of data transfer [also access and transfer to support multimedia applications].
- High Sierra compatibility - Ensures compatibility between players and CD-ROM format.
- Network Support - Allows access to information over a network. [Such as used in library networks.]
- CD Audio Chip set - Allows playing of audio CDs in the CD-ROM player.
- RCA jacks - Provides audio connection for speakers.
- Headphone jack - Provides option for individual listening.

CD-ROM software is required to operate the drive which may be included with the purchase. CD-ROM drives cost approximately $400. It is important to note that the audio for some CD-ROMs and all audio CDs are only heard through the CD drive itself. A headphone set is required for individual listening or speakers for group listening. Powered speakers provide good audio capabilities for small or large groups.

CD-ROMs. The CD-ROM drive reads information using a finely focused low powered laser beam (Van Horn, 1991). CD-ROM players can read both visual CD-ROMs and audio CDs. One compact disc can hold 645 megabytes or about 226,000 pages of information; an audio compact disc can contain up to 70 minutes of sound. CDs are a read only format they may not be written to or recorded on. They are relatively small, about four inches in size and silver in color.

CDs with visuals are of a digitized format, and viewed through the computer monitor, as the computer is required to interpret the codes on the disc. "Motion picture" CDs are actually a series of pictures which may appear to as an animation. CD-ROM data bases may contain pictures or text only. Common formats for CD-ROM include "High Sierra" (standard format proposed by computer and CD-ROM companies), and "CD-XA" (Van Horn, 1991; Apple, 1991).

To the users CD-ROMs work like other discs on the Macintosh. On a Macintosh when a floppy disk is inserted into the disk drive an icon appears on the screen and the user "clicks" on the icon to access the files. A CD-ROM player works like the disk drive; when a CD is inserted into the player an icon appears on the screen. The user then clicks on the icon which activates the program on the compact disc.

The audio CDs that are played are the same ones that can be purchased in any music store. The information on audio CDs are recorded on tracks and are accessed in a different way than CD-ROMs. If one were to click on the track icon it will not automatically play or "open" the track. Instead in order to play an audio CD requires a remote control. The CD remote functions like a TV remote control, only it is viewed on the computer monitor as it is actually software. The CD remote comes with the CD player software or in an audio CD toolkit.

For use in authoring, an audio CD toolkit (the toolkit software) will allow the users to define clips from the audio CD. The toolkit "automatically" writes a script for button, the button can than be copied into a HyperCard stack.

Analog Multimedia Devices

Unlike digital devices, which store information in binary units, analog devices stor information by variations in frequency of, for example, sound.

Laserdisc Player. Laserdisc, or videodisc players read information from videodiscs through low powered laser beams. Laserdisc players differ in level of user interaction ranging from one which may be used with a television to one which allows user interaction through the computer. The level of laserdisc player also defines what level videodisc may be played.

> Level I: A level I laserdisc player is designed for stand- alone use. It cannot be connected to a microcomputer. It can only play level-one videodiscs, such as movies.
>
> Level II: A level II laserdisc player has an internal microprocessor. It can play level-two videodiscs which contain computer programs.
>
> Level III: A level III laserdisc player has a computer interface port. It can be connected to a computer and used for computer-assisted video instruction. It can play videodiscs from level-one, -two or -three (Van Horn, 1991.)

For a hypermedia system, the best choice is a level III laserdisc player. However, laserdisc players which are controlled through the computer require additional software, such as a videodisc toolkit. The toolkit enables the user to select sections of the videodisc which may then be incorporated into other programs, such as a hypercard stack. The image is viewed through a television set--the videodisc is not copied onto the computer hard drive.

The main features to look for in a laserdisc player include (Anderson and Veljkov, 1990):

- o authoring system compatibility - Check for compatibility between the authoring software and the laserdisc player.

- o seek time - The amount of time it takes to find a single frame (the average time = 3 seconds).

- o interface between the laser disc player and computer - The RS232 serial port is the standard interface for computer control.

- o standard command set- The language used in giving directions from the computer to the laserdisc player.

- o character generator and overlay - Simple graphics that the laser disc player is capable of doing.

- o multispeed play - Option which further controls speed play and may be helpful for advanced authoring, but not necessary.

The cost of laserdisc players will vary according to their basic features and the number of "extras," such as faster access time or increased audio capabilities. Prices for a "basic" laserdisc player with computer compatibility begin around $1000. It is essential to obtain the correct cable to be used with the player and the computer (it is not a SCSI cable). It is usually obtained through the company which makes the laserdisc player as it is a specialized cable for that player.

Laser Videodiscs. Laser videodiscs are "records that play television" (Van Horn, 1991, pg. 21). They are about the size of an lp record, and silver in color. Videodiscs can only be "read" by the laser disc player, they do not record information.

As noted in the section above, the videodiscs themselves are defined as level-one, -two, or -three. These levels indicate what player level is required as well as give an indication of user interactivity.

At level-one video disc interaction is limited to watching a movie or television program. A level-two video disc uses the players microprocessor which controls "the order or sequences of visual scenes that appear by using commands recorded on the surfaces of the disc" (Litchfield and Dempsey, 1992, pg. 40). In contrast a level-three video disc is usually highly interactive; it "is controlled by a program stored on an external microcomputer" (Litchfield and Dempsey, 1992, pg. 40).

In addition to interactivity levels, videodiscs are formatted in either of two ways, standard or extended play. The videodisc consists of tracks which contains video images, and may also include two audio tracks. These audio tracks may be a combination of voices and music or even two different languages or stereo.

A standard play videodisc will contain 30 minutes of images per side or up to 54,000 individual images. Standard play videodiscs are also known as constant angular velocity (CAV). CAV refers to the speed at which the videodisc is played. On CAV discs, each track on the videodisc is equal to one frame or picture as tracks are numbered or coded. Still frames are steady with CAV discs; it is the only format for including still video. CAV format is most effective for computer interactive videodiscs.

Extended play discs have one hour of programming per side. This videodisc format is also refer to as constant linear velocity (CLV). They are formatted differently from CAV discs as the tracks are smaller in the center and larger on the outside of the disc. On CLV videodiscs more than one picture or image is placed on a track. Clips or segments of the CLV disc may be defined by referring to the number of minutes and seconds into the videodisc in which it is played. However, because of the CLV format, if it is stopped on one frame, the picture will be blurred; in effect, the user cannot stop on one image to study it. However, some laserdisc players have a "freeze frame" or "stop frame" feature when used with CLV discs which will then stop on a "clean" picture image.

Costs of videodiscs vary. Usually CAV videodiscs are more expensive than CLV videodiscs but this is due more to market factors than technical differences. Most CAV videodiscs are produced for more specialized market.s Catalogs will specify interactivity level and format type, in some instances there may be a choice between CLV or CAV. Popular movies, and a very limited number of television programs (such as National Geographic or NOVA) may cost as little as $40-$80 and are usually CLV format. CAV videodiscs which are directed for the educational market may cost from $30-50$ or several hundred to thousands of dollars.

Videodiscs are of great advantage in that they virtually do not wear out (but need careful handling and storage). Videodiscs have a great advantage over videotapes as specific segments or frames may be randomly accessed within a few seconds.

Video Cassette Recorders. Video cassette recorders (VCRs) are devices already commonly used in most schools and many homes. To use a VCR with the computer requires the VCR to have a control interface port. Professional or industrial VCR, such as a Sony model with a Control-L interface or Panisonic with a Control-P interface, set up a two-way communication between the computer and VCR. Having two-communication is ideal for use in developing hypermedia stacks. With use of a videotape toolkit (or other VCR authoring system), the user may define video clips which may included as part of a hypercard stack.

A consumer model VCR, such as a Sony model with a Control S interface, allows only one-way communication; the computer can communicate to the VCR, but the VCR cannot "talk back" to the computer. To use this set-up may also use of a videotape toolkit, but it does not allow the use of all features "automatically." Rather, it requires the use of a programming language. This set-up is much more difficult to use with beginning hypermedia users. Although a consumer model VCR does not allow the flexibility desired with hypermedia, it might still be used but requires some computer expertise. A consumer model VCR, however, would work well as a secondary VCR or recording device.

While most consumer models of VCRs will cost less they have very limited capabilities in use with a computer. Industrial or professional VCRs allow two-way communication between the computer and VCR but also cost a great deal more (beginning around $2000).

Other VCR options might be available within the school setting. It should be noted that some camera-recorders have a Control-L or -P interface (and therefore might be used in place of the VCR) in order to gain the full use of the video toolkit software. Also, some older model VCRs may have multiple interfaces. For example, prior to this year certain consumer Sony models had both Control-S and Control-L interfaces.

Authoring Systems

Using the computer as a control center for hypermedia requires the use of authoring software. Authoring software allows the user to actually write their own programs. The software presents a "blank slate" and many tools and procedures which may be selected to fill in the blanks. There are a number of factors that are important to consider in choosing authoring software. Among these are (Anderson & Veljkov, 1990):

*How easy is it to use?

*Is a procedural (i.e. programming) language required for use or is this an enhancement?

*Does it have appropriate multimedia device support?

*Does it have cross platform compatibility?

*Does it have support for color?

*Does it permit integration of graphics, animation, sound, video, and text editing? What hardware, other software, and expertise is needed for this integration?

*Does it have hypertext functions (i.e. permit the nonlinear linking of information)?

A good authoring software will make the operation and integration of the computer and any peripheral device(s) easy to accomplish. The ease of integration depends inversely proportional to the amount of procedural or programming language which is required. In some instances this language is an optional feature which can be used to enhance basic operations. Look for products with scripting language to in order to make it do things the programmers didn't intend.

In selecting authoring software, care should be taken to distinguish between software systems that are designed primarily for the authoring of multimedia presentations and those that have hypertext/hypermedia capability. For purposes of building rich conceptual knowledge structures and fostering higher level reasoning, the nonlinear hypertext linkage functions are probably much more important than the multi-media applications.

There are numerous types of hypermedia authoring software packages available. After purchasing a specific piece of software, it is important to watch for upgrades or new versions. These appear very rapidly and sometimes upgrades are provided free or for minimal cost. Several well-known hypertext software packages are described below (Franklin & Kinnell, 1990; Anderson & Veljkov, 1990; Eiser, 1992).

Sample Hypermedia Software Packages

Macintosh Authoring Software

HyperCard. HyperCard is often regarded as a benchmark against which other hypertext/hypermedia software can be compared because of its ease of use and advanced features. HyperCard has been supplied free with all Macintosh computers since 1987. Because it has been so widely used, thousands of applications (stacks) related to education are now available, and many of them are in the form of public domain or shareware packages. HyperCard provides a very sophisticated authoring environment that permits text editing facilities and a complete set of painting and graphics tools. The currently available version of HyperCard (2.0) does not support color, however, and has been criticized because the user must have some programming skills (in the HyperTalk scripting language) to perform some authoring functions, such as integrating videodisc material. A new version of HyperCard is expected out soon that will have color capability. HyperCard comes free with a Macintosh purchase. A developer's edition is $199 ($99 academic) available form Claris Corporation.

SuperCard. Developed by Silicon Beach Software, SuperCard is designed to take up where HyperCard leaves off. It can make use of stacks created in HyperCard. The advantage is color capability but there is some trade off in speed. The program cost is $299 list ($99 academic).

Architext. ArchiText is an intermediate-level development tool that can handle large amounts of text and basic graphics, and has a built-in ability to record users session. It does not have a built-in programming language. It works better with large amounts of text, compared to HyperCard which has more of a multimedia approach. On the other hand, the ArchiText development environment leads the designer to create maps of information, which HyperCard does not, which may be helpful for visually oriented users. The cost is close to $400.

HyperStudio. Hyperstudio was developed by Roger Wagner Publishing. It has many of the same characteristics and terminology as Hypercard but does not have a built-in programming language that permits more complicated applications. However, some functions, such as video access, are actually easier to perform with HyperStudio than with Hypercard. An advantage is that it will run, albeit slowly, on an Apple IIGS with two floppy disk drives and 768K of RAM. The cost is about $130.

Tutor-Tech. Tutor-Tech will run on an Apple IIe with only 128K of RAM and comes with two versions; a teacher disk and a student disk. The teacher disk can be used to author a stack that may then be read but not modified by the student disk. Some of the limitations of this application are due to differences in the hardware. The Apple II does not have the high resolution screen that the Macintosh does. Links in the program are limited to links between pages and there is limited control over graphic image creation. There is also no programming language. However, it can be used quite easily by persons with little or no prior experience with the program. Tutor-Tech is available from Techware Corporation for about $200.

HyperCard IIGS. A relatively new program is available from Apple Computer for the IIGS that is designed to simulate HyperCard. It has many of the same features as HyperCard; for example, creation of stacks, cards, and interactive buttons with a mouse click, point program and pull-down and tear-off menus. There is also color capability and HyperTalk programming language. Disadvantages are that the hardware requirements are extensive (a hard drive and at least 4 megabytes of free space and 2 megabytes of RAM), there are relatively few third party stacks available, there is no built-in way to control a videodisc player (and no directions are included for writing a script), and no run-time version is supplied so that other users must have their own copy of the program to use your stacks. The cost is about $100.

IBM (MS-DOS) Software

ToolBook. ToolBook is a Windows construction text similar to HyperCard on the Macinotosh. Slow performance is the most common complaint about it--which is as much a problem of Window's as ToolBook. Cost is $395 list ($149 academic).

Hypertise. Hypertise, developed by Cognetics Corporation, emphasizes the design of text rather than graphics. It has a book metaphor and graphics are used for text illustrations. It has no scripting (programming capability). However, the program is easy to learn and requires only a basic knowledge of MS-DOS. The cost is about $350 and it requires 256K of RAM.

KnowledgePro. KnowledgePro is a fairly expensive ($500.) authoring system that emphasizes text. Because it takes a character approach rather than a bitmapped approach to screen display, it cannot integrate text and graphics seamlessly. It contains a sophisticated built-in programming language but can be difficult and time-consuming to use. It requires 1.2 megabytes of disk space and 512 of RAM.

Linkway. LinkWay is a hypertext/hypermedia development program designed primarily for the K-12 market with MS-DOS systems. It is reasonable in cost ($110 list and $62 academic) has excellent documentation, and is easy to learn. It resembles HyperCard in a number of ways. A more limited LinkWay script language is somewhat clunky to use. A LinkWay Toolkit permits hypermedia applications such as CD-ROM, videodisc, music, and speech. It is available from IBM and runs on only 1 floppy drive and 384 of RAM.

Guide. Guide is a Windows application that has an overall text orientation but can incorporate graphics. Both Guide and HyperCard use buttons and links but buttons in Guide are typed and stay with the text instead of screen location. It's strength is probably as a course development tool for text-driven subjects like history and English. One positive feature is that it can be used like a word

processor when it is not being used for hypertext applications. Guide is available from OWL International at about $495 ($198 academic). It runs on an IBM AT with two disk drives and 640K of RAM.

Cross-Platform Software

Plus. Plus is a cross-platform superset of HyperCard program that runs on the Macintosh, Windows and OS/2. An application developed on one platform will run on the others with minor alterations. Plus also has full color support. It is similar to HyperCard but the scripting environment is a bit more awkward. The list price is $495 ($150 academic).

References

Anderson, Carol J. and Veljkov, Mark D. (1990). Creating interactive multimedia. A practical guide. Glenview, IL: Scott, Foresman and Co.

Apple Computer, Inc. (1991). Apple CD SC plus owner's guide.

Brisbin, Shelly (1992). How to keep you Mac current. Macworld 9 (5) 142-149.

Bullough Sr., Robert V. and Beatty, LaMond F.(1991). Classroom applications of microcomputers. Second edition. NY: Macmilan Publishing Co.

Cassel, Don (1990a). Instructor's manual. Understanding Computers. Englewood Cliffs, NJ: Prentice Hall.

Cassel, Don (1990b). Understanding Computers. Englewood Cliffs, NH: Prentice Hall.

Eiser, L. (1992). Hypercard IIGS software review. Technology & Learning, 12(4), 16-17.

Franklin, C. and Kinnell, S.K. (1990). Hypertext/hypermedia in schools. Santa Barbara, CA: ABC-CLIO.

Frasse, Michael (1990). Macintosh hypermedia. Use and Implementations. Volume II. Glenview, IL: Scott, Foresman and Co.

Heid, Jim. (1992). How To/Getting Started. SCSI. Macworld 9 (5) 223-225.

Litchfield, Brenda and Dempsey, John (1992). The IVD-equipped classroom: Integrating videodisc technology into the curricula. Journal of Educational Multimedia and Hypermedia 1 39-49.

Lockard, James; Abrams, Peter D.; and Many Wesley A. (1990). Microcomputers for educators. Second edition. Glenview, IL: Scott, Foresman and Co.

Lockwood, Russ (1990). Multimedia in business: The new presentations. Personal Computing 14 (6) 1990.

Lockwood, Russ. (1990). Size up CD-ROM. Personal Computing 14 (7) 1990.

Merril, Paul F.; Hammons, Kathy; Tolman, Marvin N.; Christensen, Larry; Vincent Bret R.; and Reynolds, Peter L. (1992). Computers in education. Second edition. Boston: Allyn and Bacon.

PC Magazine 10 (2) 1991. Annual issue on printers.

Smith, Cathy and Tynan, Daniel (1991). Personal printers. PC World 9 (8) 1991.

Van Horn, Royal (1991). Advanced technology in education. Pacific Grove, CA: Brooks/Cole Publishing Co.

Veljkov, Mark D. (1990). Managing multimedia. Byte 15 (8) 227-232.

Weibel, Bob and Tynan, Daniel (1991). Postscript Lasers. PC World 9 (12) 174-190.

Further Information

Scanners:

Jones, Mitt (1992). Nine desktop scanners that do it all. PC Magazine 11 (7) 247-297.

Image Makers. (1992). PC Sources 3 (4) 455-471.

Computer Memory:

Gookin, Dan (1992). Managing you PC's memory. Compute 14 (2) 6-16.

Sprague, David (1992). How will multimedia change system storage? Byte 17 (3) 164-165.

Rayan, Bob (1992). Scaling the memory pyramid. Byte 17 (3) 160-170.

Printers:

Smith, Cathy and Tynan, Daniel (1991). Personal printers. PC World 9 (8) 1991.

PC Magazine 10 (2) 1991. Annual issue on printers. (Note: Including laser, shared laser, ink jet, dot matrix printers, color PostScript, etc.)

Weibel, Bob and Tynan, Daniel (1991). Postscript Lasers. PC World 9 (12) 174-190.

CD-ROM:

Lockwood, Russ (1990). Size up CD-ROM. Personal Computing 14 (7) 70-80

Chapter 4
Stack Guidelines and Sample HyperCard Stack Designs for Family and Consumer Education

This chapter is intended to help authors begin to develop their own stacks as well as provide sample stacks with a family focus approach.

The first section of this chapter includes general guidelines in stack development and evaluation:

Beginning Skills for Using HyperCard in the Classroom
Designing Cards and Stacks for Large Group Presentations
Designing Cards and Stacks for Individual and Small Group Use
Stack Evaluation Checklist

The second section of this chapter includes sample stack designs. These sample stacks should be considered works in progress. While at times completed presentation are desirable, the nature of HyperCard allows continued development. Once a stack foundation is established, it is possible to utilize stacks in the classroom, while simultaneously continuing their development.

It should be noted that within these samples there are several animation sequences which may appear to be duplicate pages. While animations might be omitted for printing they are included here to present a view of all the cards in each stack.

Sample stacks which are included:

A. Learning Alternatives with Hypermedia: A HyperCard Stack Overview.

B. Sample Student Tutorial Stacks:

1. Continuing Concerns of the Family
2. Practical Reasoning

3. Family Systems of Action

C. Sample Student Assignment Stacks

1. Family Issues for Analysis
2. What Should Be Done About Balancing Work and Family?
3. Learning Options: Overview
4. Technician - Learning Option
5. Reporter - Learning Option
6. Researcher - Learning Option

D. Sample Student Investigative Project

1. Student Example

Section I: General Stack Guidelines and Evaluation

Without scripting (can be learned in one or two short sessions):

Make a card.
Make a background.
Make a field and place it on the card or background.
  Choose a style and font for the field.
Type in a field.
Make a button and place it on the card or background.
  Choose a style for a button.
  Use the button to link the card to another card or stack.
Copy or cut and paste cards, buttons, and fields.
Draw on or paste graphics onto a card or background.

With simple scripting: (write one-line or two-line scripts for cards, locked fields, or buttons that do the following:

Go to another card, with a specified visual effect.
Hide and show fields, pictures, and buttons.
Play sounds.

With slightly more advanced scripting:

Drag objects on the screen to simulate animation.
Play several sounds in sequence.

Campbell, R. and Hanlon, P. (1990). HyperCard: A new deal in the classroom. In S. Ambron and K. Hooper (Eds.), Learning with Interactive Multimedia (pp. 258-286). Redmond, WA: Microsoft Press.

Designing Cards and Stacks for Large Group Presentations

"In large group presentations, the predominant consideration is the moment, which includes the single card, what the screen looks like, what sound is playing and what sound and images are coming from the videodisc" (Campbell and Hanlon, 1990, pg. 271).

General Guidelines:

a. Cards should have a minimum of text.

b. Develop points logically over a sequence of cards.

c Use larger, clearer fonts for text.

d. Avoid scrolling fields.

e. Uses images and graphics frequently.

f. Use image and text together to help orient the audience.

g. Use variety in choice and placement of images.

h. Deliberately vary the amount of information on each card.

i. Use drag text and animation sequences for added interest.

j. Use HyperCard's built in visual effects for moving from one card to the next (i.e., scroll left, scroll right, dissolve, etc.)

h. Choose a visual effect that help to illustrate relationships or themes.

k. To help the audience see a difference between cards, regulate the speed (i.e., use slow or very slow with visual effects.)

l. Cards in a related sequence which share a background might also have a uniform visual effect written in the background script.

m. Include sound, Sound may be a substitute for text or be considered as a another form of text. Sound might be voice or music.

n. To conserve memory when using sound, store sound stacks on floppy disks. Temporarily add these stacks to your hard drive when giving the presentation that require them.

o. Don't have sound in exist in isolation. Show something on the screen which is related to the sound.

p. Use sound as a link when moving from one idea to another.

q. Use pauses to teach. Pauses allow the audience to react to the material. Pauses encourage thinking time and help to vary the presentation. "Pauses should be as compelling and as carefully crafted for the presentation as are sounds and images" (Campbell and Hanlon, 1990, pg. 270).

r. Be sure to include something for the audience to discover!.

Source: Campbell, R. and Hanlon, P. (1990). HyperCard: A new deal in the classroom. In S. Ambron and K. Hooper (Eds.), Learning with Interactive Multimedia (pp. 258-286). Redmond, WA: Microsoft Press.

Designing Cards and Stacks for Individual and Small Group Use

In individual and small group use, the control is placed in the hands of the users. Cards and stacks are designed to provide choice as a part of interactivity.

As an designer the major concern is to think in terms of stacks or paths rather than only in terms of a single card or screen (as with large group presentations.)

a. Give visual clues (i.e., title, label or icon) to show where the user is and how navigate to other cards.

b. Provide a map of the cards in the program or an index card that lists all the cards in the stack.

c. Design the similar or use the same backgrounds for related groups of cards so the cards look visually related.

d. For closely related cards use background fields so that text will be place in the same location.

e. Rather than use background fields, related cards might also appear similar by using the same fonts for text.

f. Examine each screen individually:
   Does the card convey the message intended?
   Does it include too much or too little?
   Is it interesting and appealing?
   Does it connect with what proceeds it and what might follow?
   How does it contribute to the overall them of the stack?

g. For cards which allow user choice:
   Does the user understand choice exists?
   Does the user know what the choices are?

h. If there are only a few places where choices are offered, add more choices to the stack.

k. Analyze the consequences of possible choices the user might take:
   Are these the choices you intended?
   If not, are they appropriate?

l. Observe users with the stack.
   Are they confused?
   Do they have difficulty in using the stack?

m. Do several trial runs with intended users.

Campbell, R. and Hanlon, P. (1990). HyperCard: A new deal in the classroom. In S. Ambron and K. Hooper (Eds.), Learning with Interactive Multimedia (pp. 258-286). Redmond, WA: Microsoft Press.

63

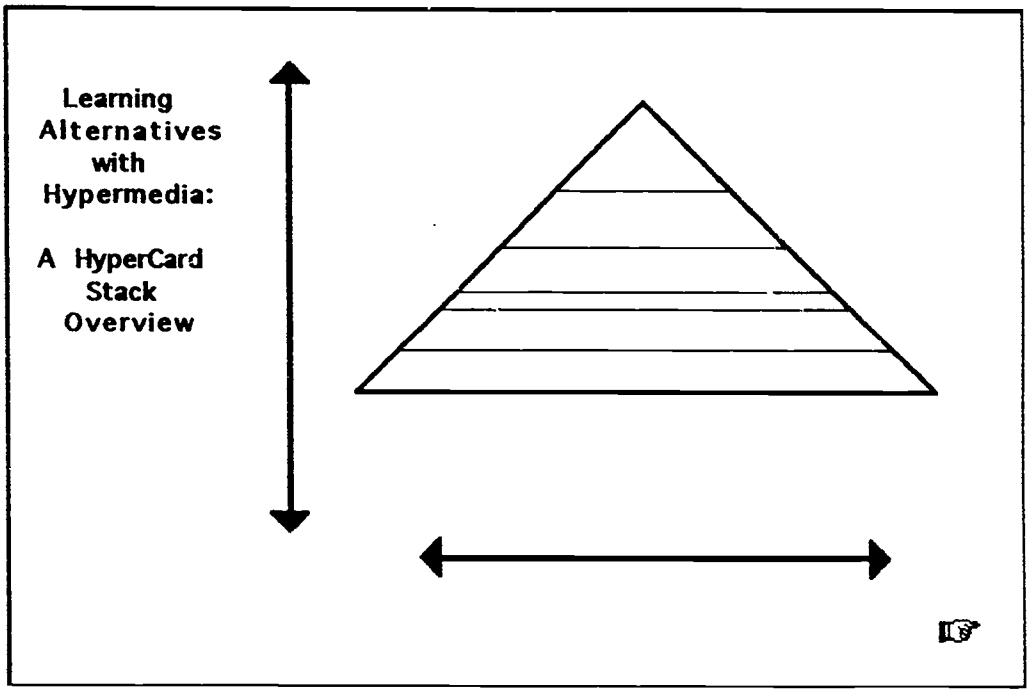
Stack Evaluation Checklist

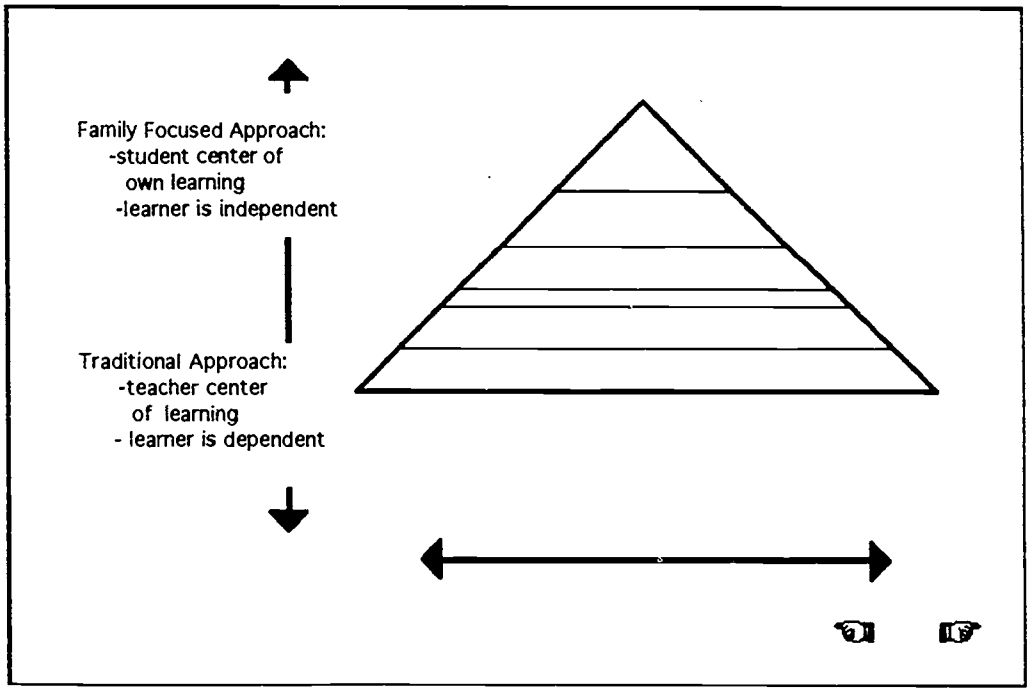
Stack	____	has been compacted
	____	includes an overview/introduction
	____	includes an objective
	____	includes directions as needed
	____	has a menu allowing nonlinear access
	____	clear focus and logical program progression
	____	performance measure of learning
	____	content, spelling, grammar correct
Cards	____	includes a title card
	____	each card has navigation options
	____	adequate white space
	____	one idea per card
	____	appropriate graphics are used
	____	text is in fields
	____	text size, style and font are appropriate
Fields	____	appropriate font options
	____	text locked when not to be changed
	____	wide margins for tex
	____	scrolling field rather than card full of text
	____	one idea per field
Buttons	____	use same locations for buttons
	____	uniform styles
	____	work as intended
	____	purpose clearly indicated
	____	no extraneous buttons
Backgrounds	____	appropriately used

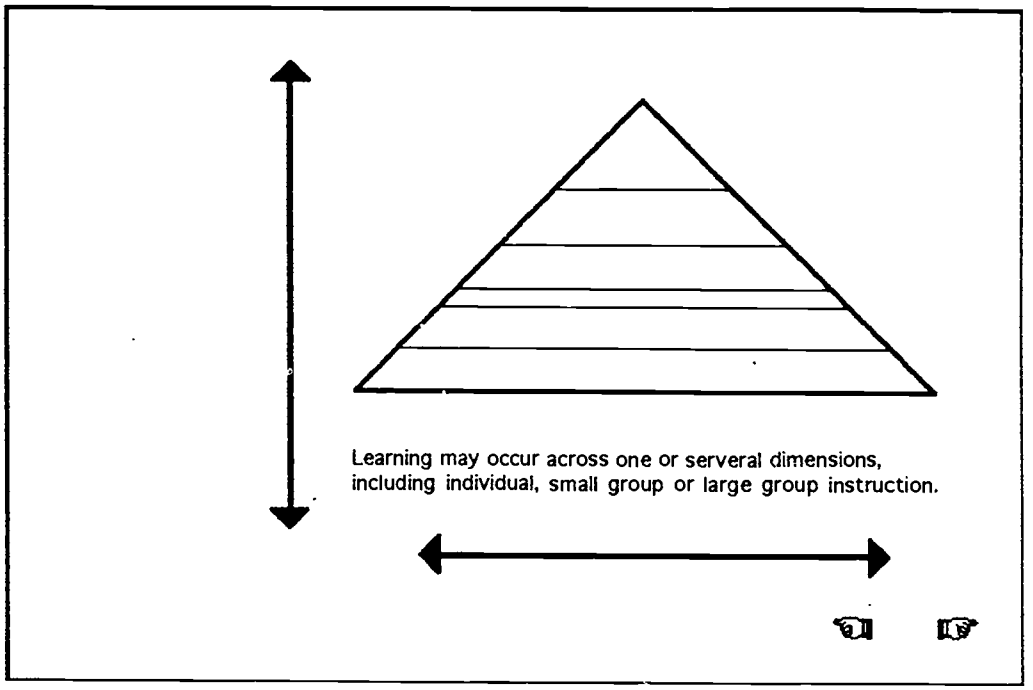
Source: Rude-Parkins, C. (1992). Computer-based curriculum development tools for teachers. Journal of Education Multimedia and Hypermedia 1 179-186.

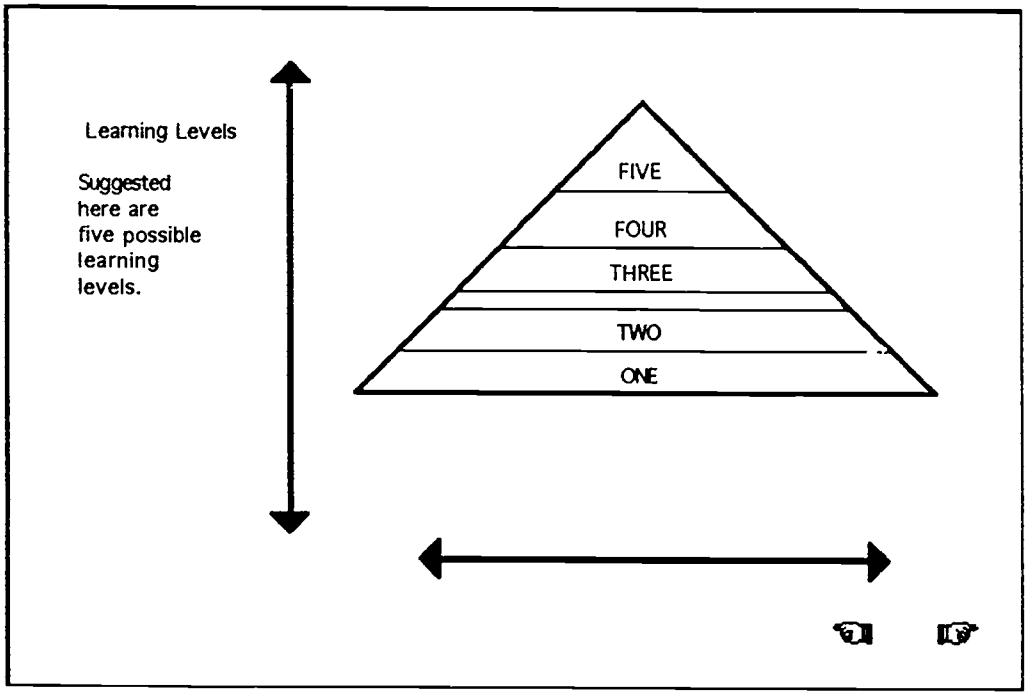
Section II: Sample Stacks

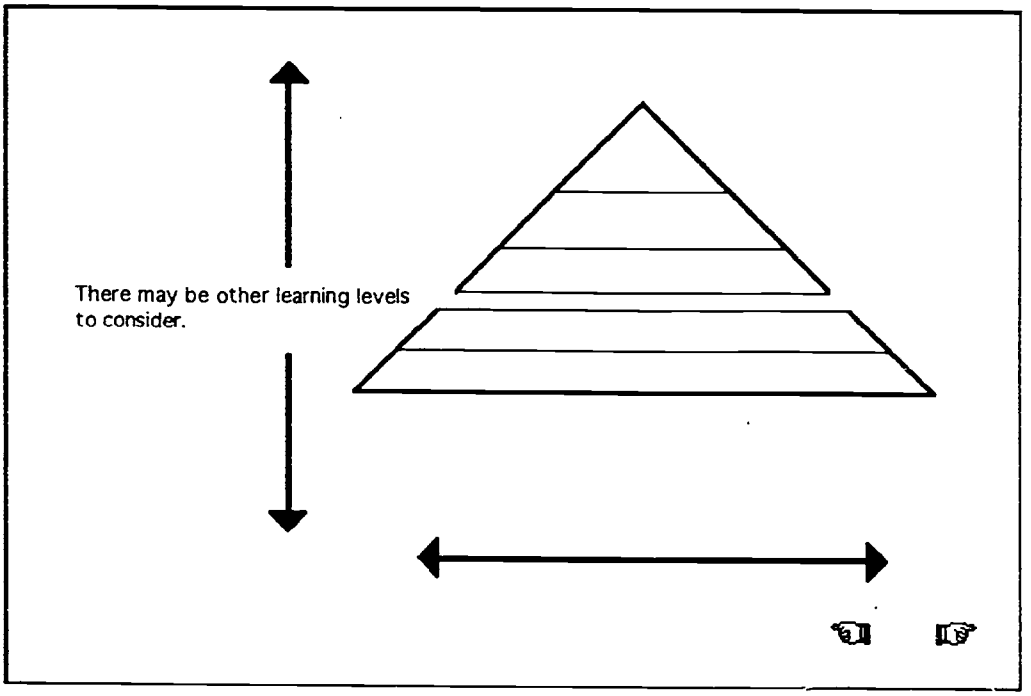
Learning Alternatives with Hypemedia: A HyperCard Stack Overview

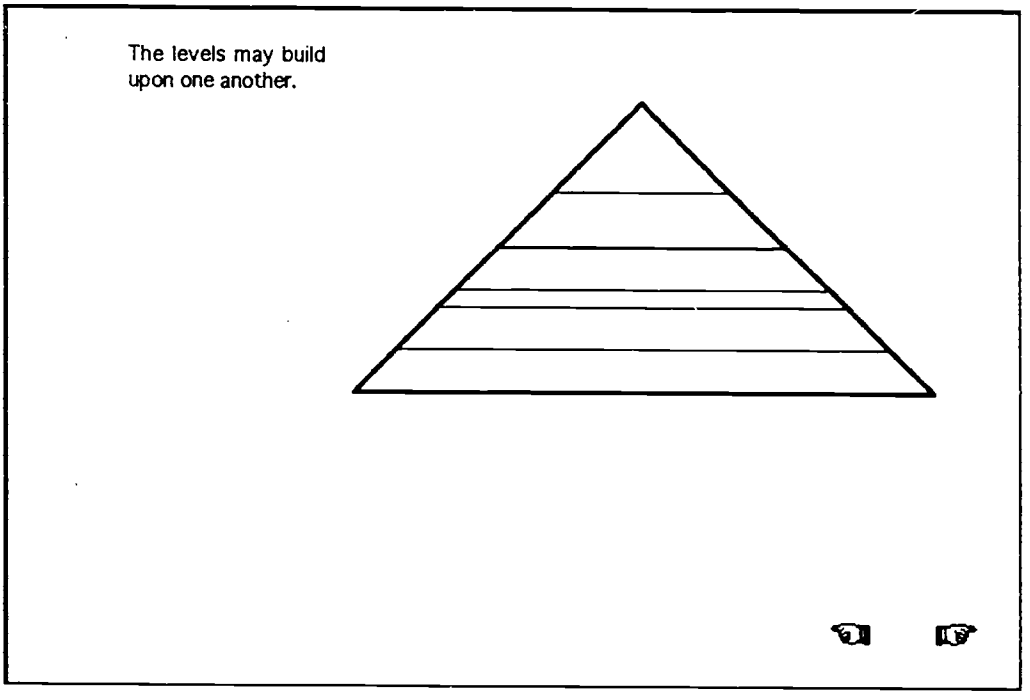

Learning
Alternatives
with
Hypermedia:
A HyperCard
Stack
Overview


Family Focused Approach:
-student center of
own learning
-learner is independent
Traditional Approach:
-teacher center
of learning
- learner is dependent

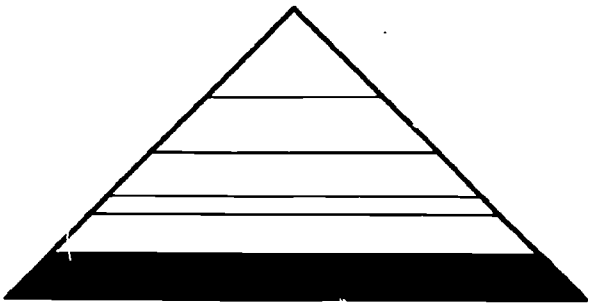

Learning may occur across one or serveral dimensions,
including individual, small group or large group instruction.


Learning Levels
Suggested here are five possible learning levels.
FIVE
FOUR
THREE
TWO
ONE

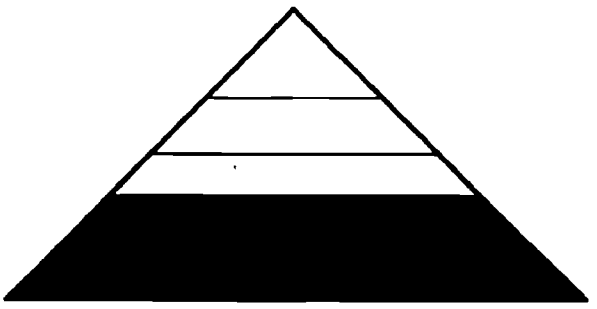

There may be other learning levels
to consider.


The levels may build
upon one another.

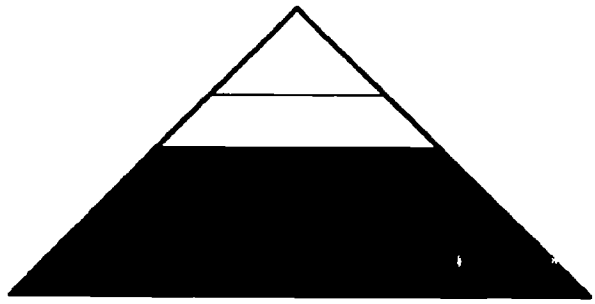
The levels may build upon one another.



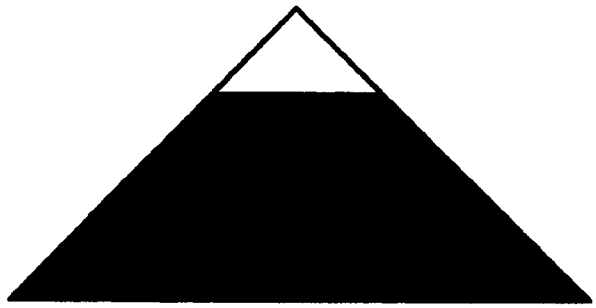
The levels may build upon one another.



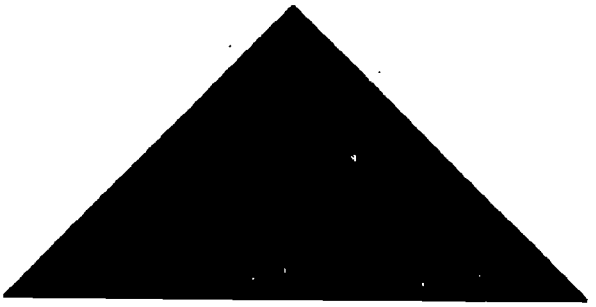
The levels may build upon one another.



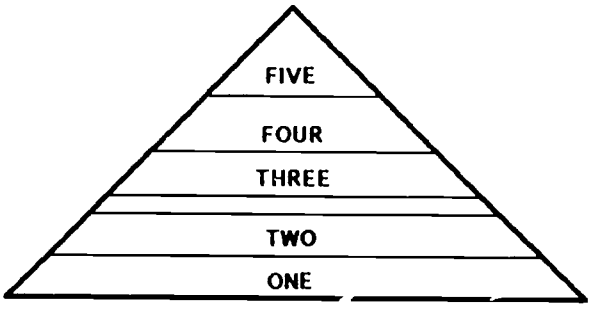
The levels may build upon one another.



The levels may build upon one another.



Learning Levels



Click on a level.

Teacher:

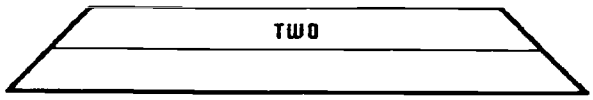
- Provides continuing concern for student to address
- Provides specific problems to address
- Gives students an illustrative case; could be a video prompt
- Provides practical reasoning questions and descriptions of them
- Provides strucuture to using family systems of action in answers

Student:

- Provides answers in "drill and practice" manner
- Answers are given to pre-structured questions related to practical reasoning
- Answers are given to pre-structured questions about family systems of action

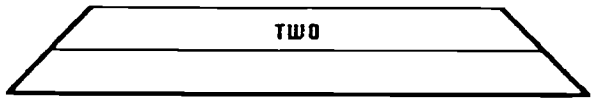
Teacher :

- Provides continuing concern to be addressed
- Gives students the same problem to address as in level one
- Parts of the practical resoning process are mentioned



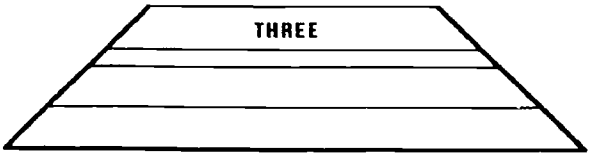
Student:

- Writes their own illustrative case
- Develops own cards/stacks for answers
- Both practical reasoning and family systems of action used in answer



Teacher:

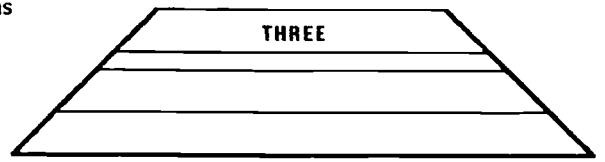
- Teacher role is limited



GO BACK

Student:

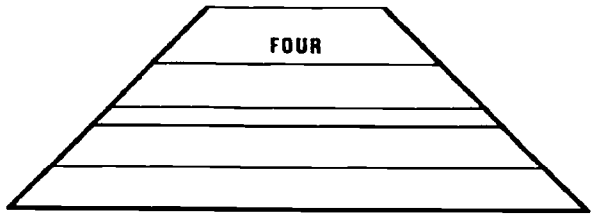
- Uses the same continuing concern
- Writes different problem
- Goes through practical reasoning process without prompts
- Uses family systems of action without prompts



GO BACK

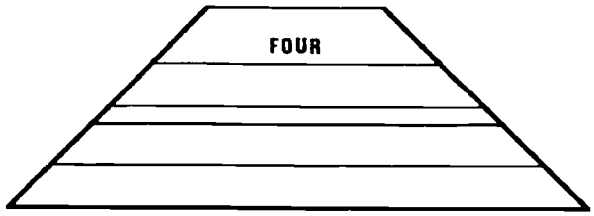
Teacher

- Teacher role is lessened in comparison to earlier levels as student gains further learning independence



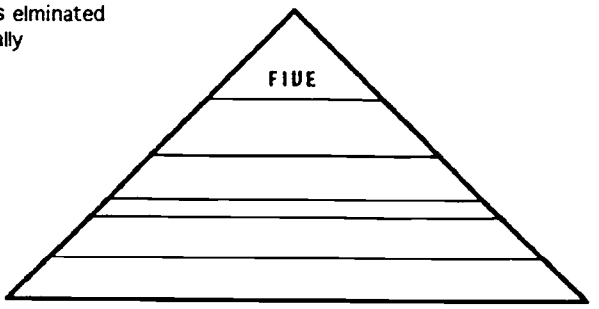
Student:

- Identifies range of other specific problems related to same continuing concern



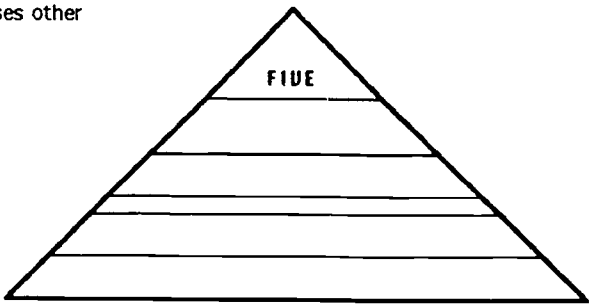
Teacher:

- Ideally the teacher is elminated as student is virtually independent

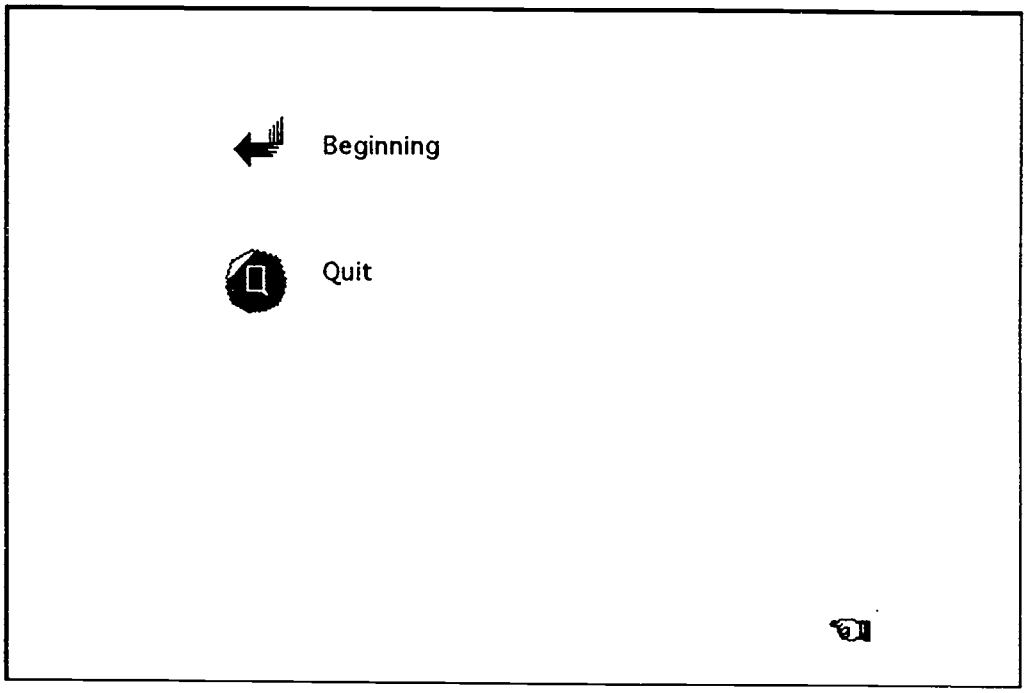


Student:

- Identifies and addresses other continuing concerns.



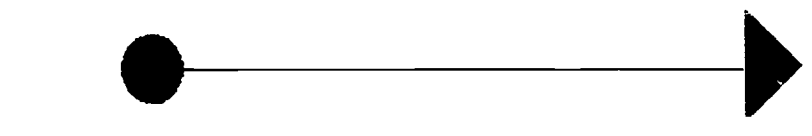
GO BACK


Beginning
Quit

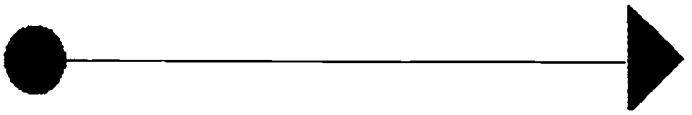
Sample Student Tutorial Stacks

Continuing Concerns of the Family

Continuing concerns begin with an awareness or recognition between "what is" and "what ought to be."



Continuing concerns raise questions of value which need to be answered.

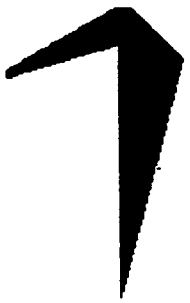


Continuing concerns raise questions of value which need to be answered.

Continuing concerns raise questions of value which need to be answered.

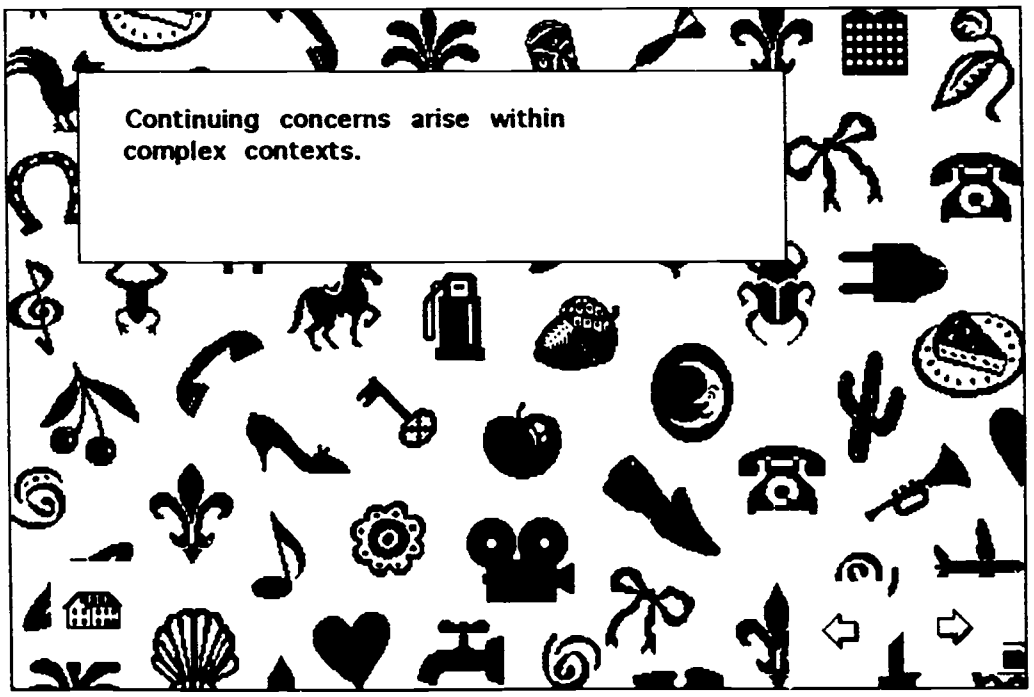
Continuing concerns raise questions of value which need to be answered.

Continuing concerns raise questions of value which need to be answered.



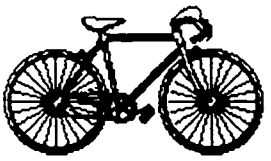
Continuing concerns raise questions of value which need to be answered.

Continuing concerns raise questions of value which need to be answered.

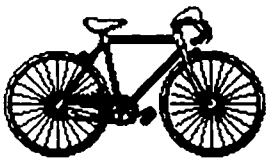


BEST COPY AVAILABLE

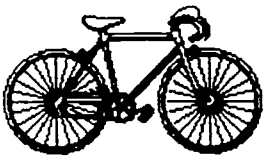
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.



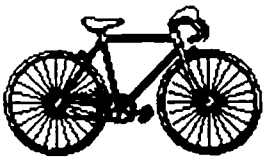
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.



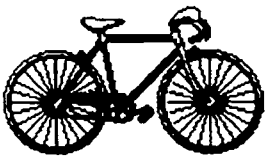
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.



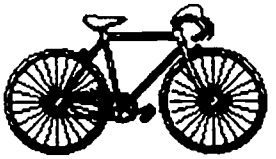
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.



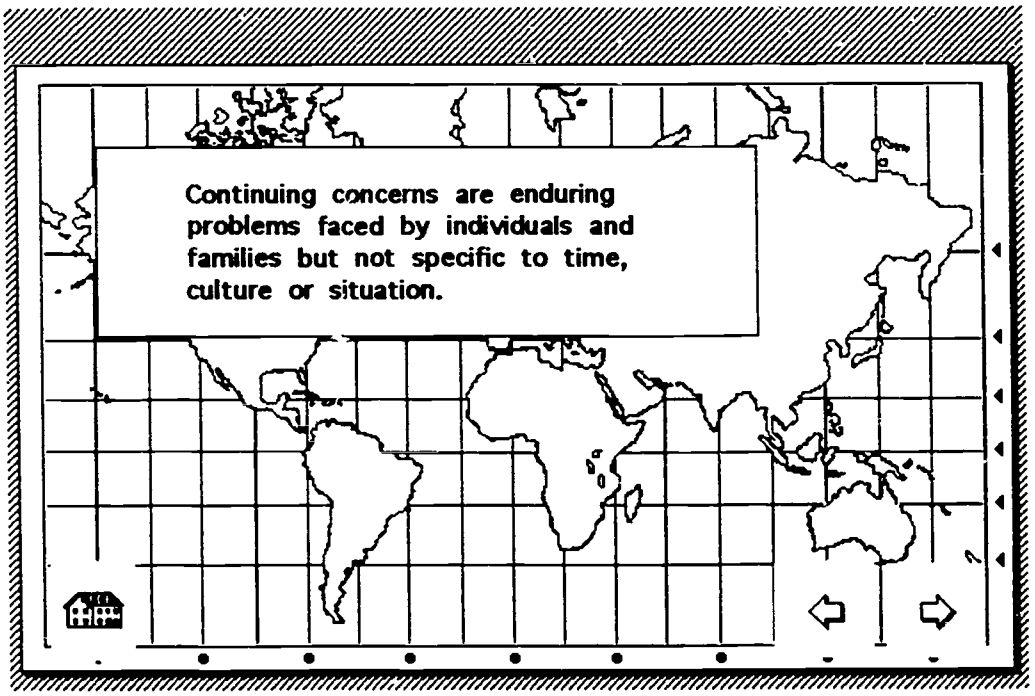
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.



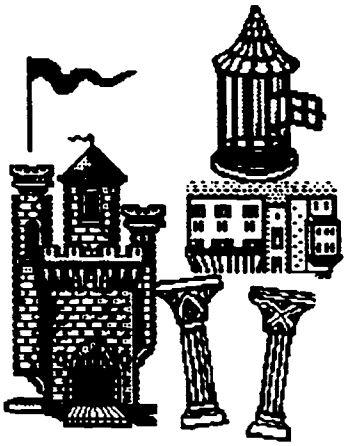
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.



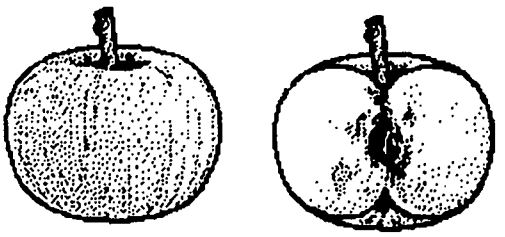
Continuing concerns recur over time as there is a continuing search for personal, family and societal improvement.

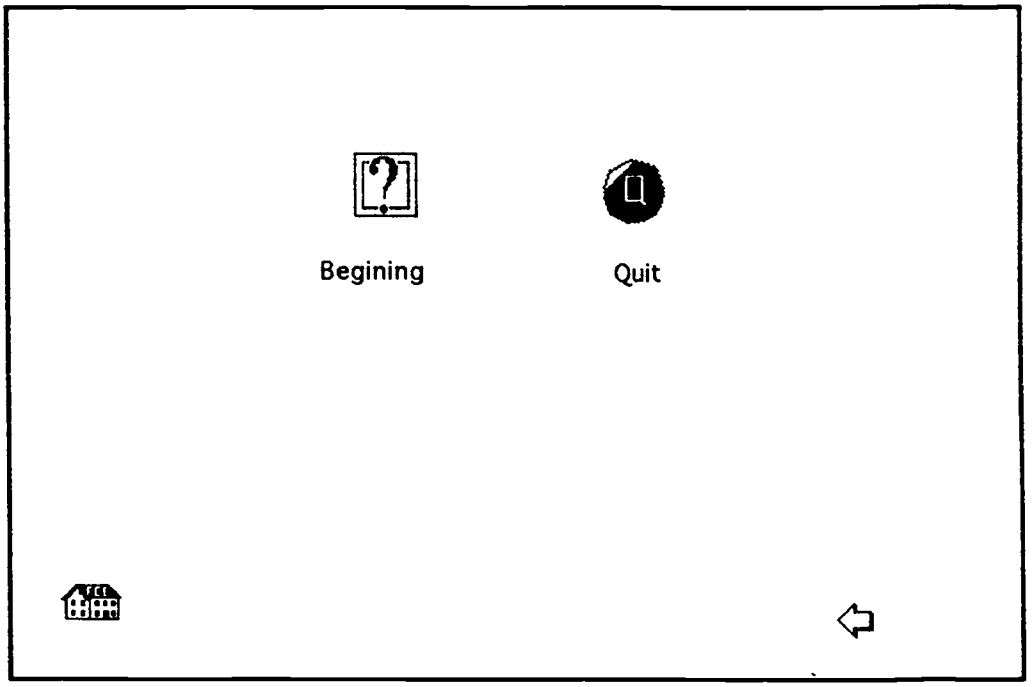


Continuing concerns are often ill structured and difficult to solve.



Continuing concerns are solved through action resulting from reflective thought.




Begining
Quit

Practical Reasoning

There are four parts involved in practical reasoning.

Valued Ends **Consequences**

Means **Context**

93

They may be completed in any order or pattern . . .

Valued Ends **Consequences**

Means **Context**

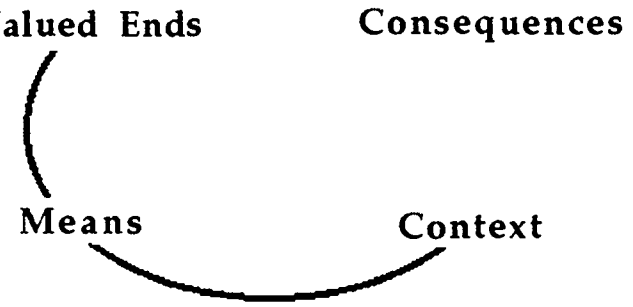
They may be completed in any order or pattern . . .

Valued Ends **Consequences**

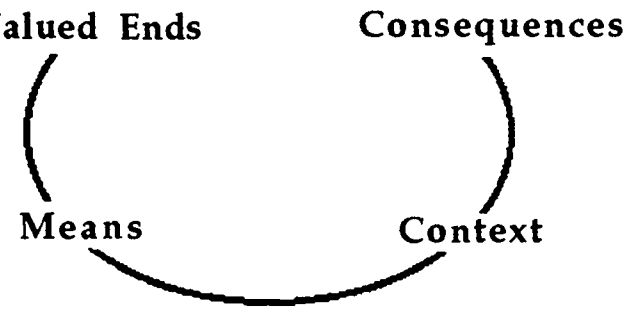
Means **Context**

94

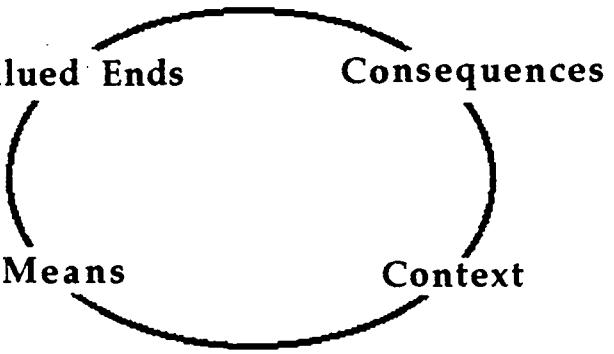
They may be completed in any order or pattern . . .



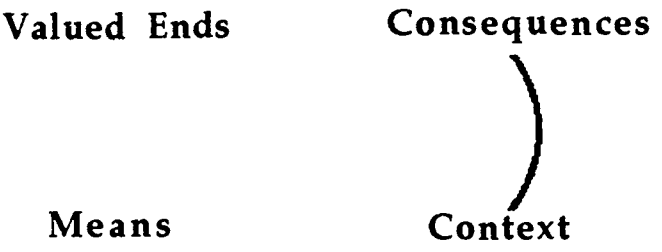
They may be completed in any order or pattern . . .



They may be completed in any order or pattern . . .

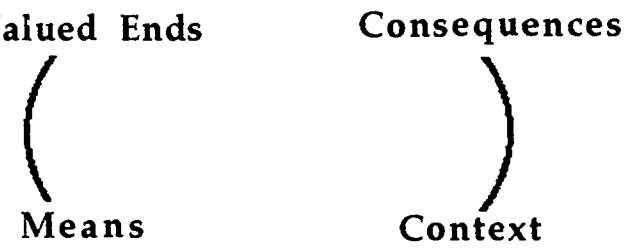


They may be completed in any order or pattern . . .

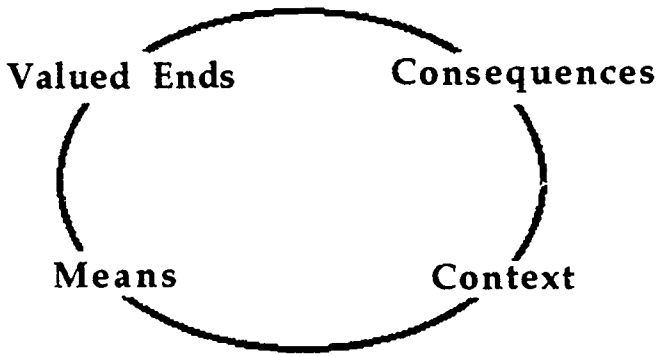


96

They may be completed in any order or pattern . . .

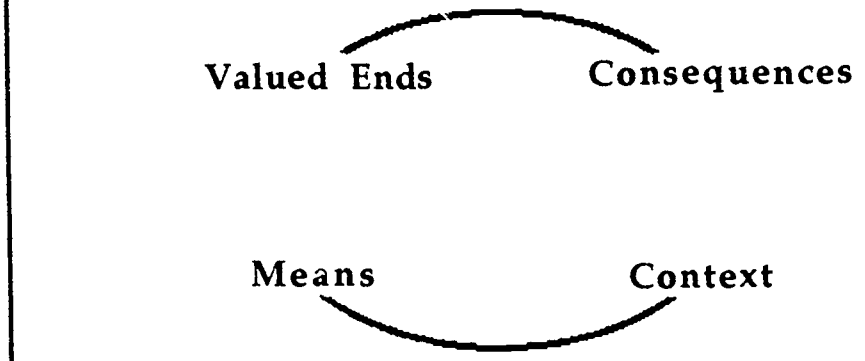


They may be completed in any order or pattern . . .

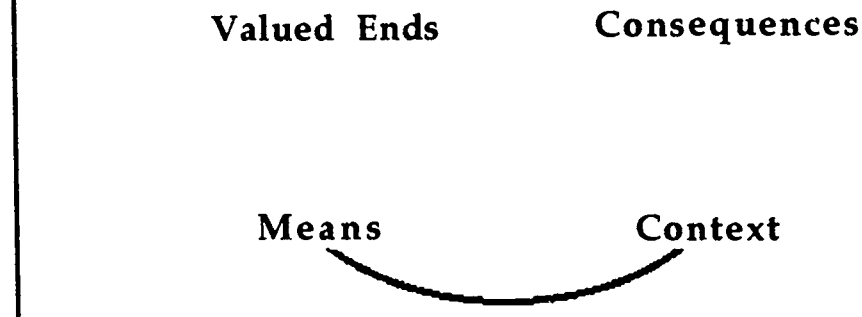


97

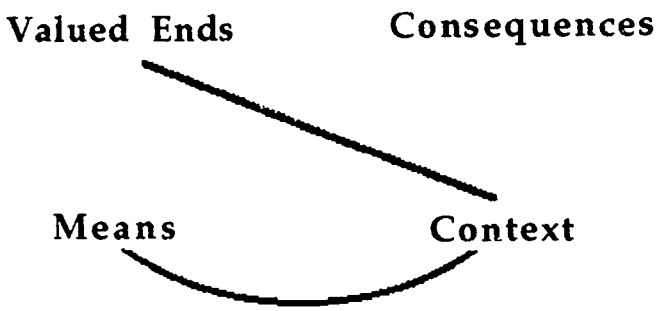
They may be completed in any order or pattern . . .



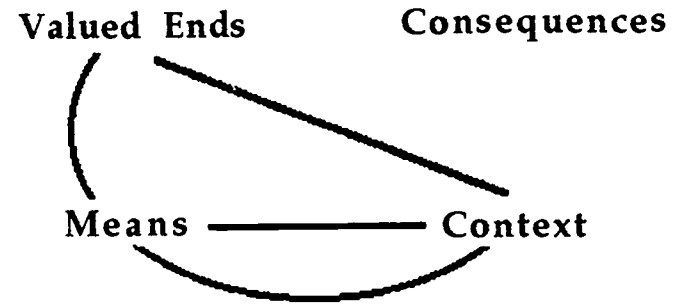
They may be completed in any order or pattern . . .



They may be completed in any order or pattern . . .

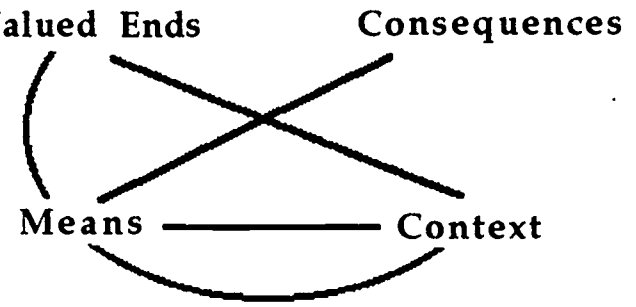


They may be completed in any order or pattern . . .

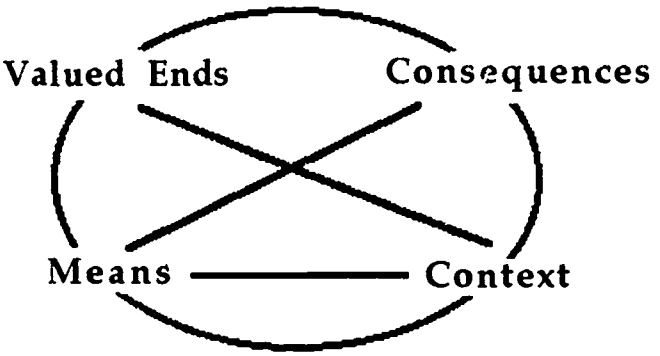


99

They may be completed in any order or pattern and may become quite complex.

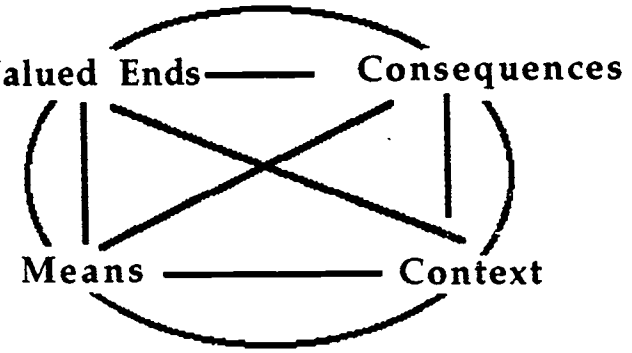


They may be completed in any order or pattern and may become quite complex.



100

They may be completed in any order or pattern and may become quite complex.



They are used to form a judgement.

Valued Ends **Consequences**

JUDGEMENT

Means **Context**

Click on a word for further information.

Valued Ends **Consequences**

JUDGEMENT

Means **Context**

Valued Ends

Identify Value Ends. What should our goal(s) be? Why?

Define practical problem requiring action

Identify value issues

Determine whose wants are affected

Examine own value position critically (clarify personal values

Context

Interpret information about the context of the practical problem. What interpretations of personal, social, historical, economic, and cultural context seem relevant? Why?

Identify factors relevant to the particualr problem and its solutions

Identify historical, social, economic, political factors

Identify feelings and wants of people inovled, their motives,

Means

Examine possible means and strategies for reaching goals. What actions are open to achieve goal(s)?

Retrieve, examine and use factual information

Assess relevance and accuracy of information obtained

Translate knowledge about ways to accomplish goals into action strategies

Examine the moral defensibility and utility of alternatives

Consequences

Consider Consequences of specific acts. What are the probable primary and secondary consequences of action strategies?

Use reliable knowledge about probabe consequences of each alternative

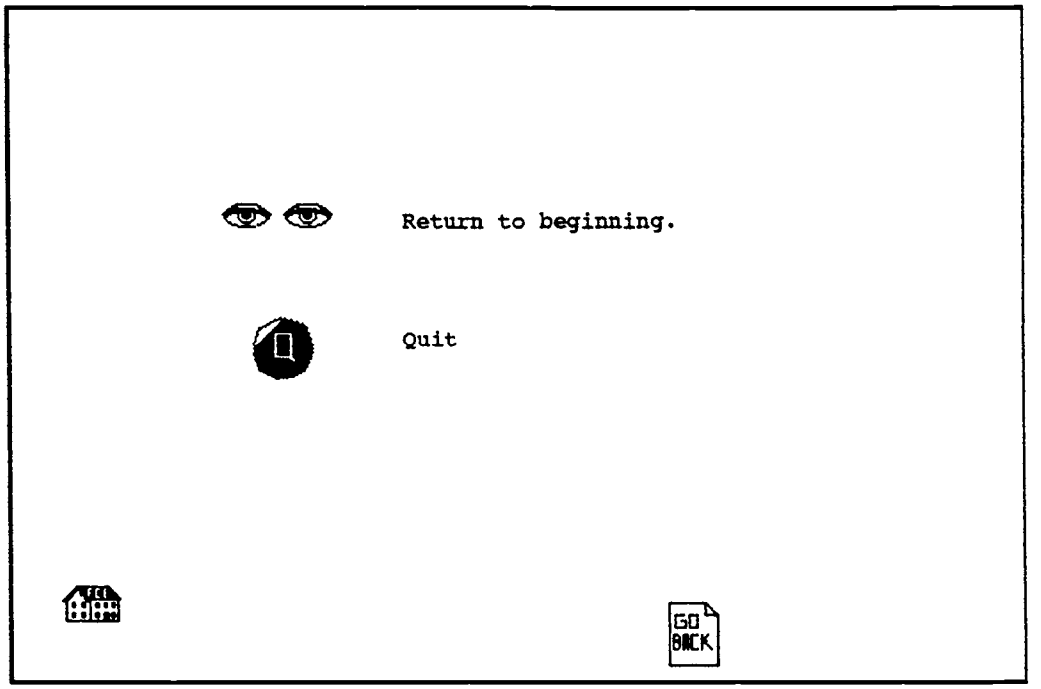
Check the relevance and accuracy of information

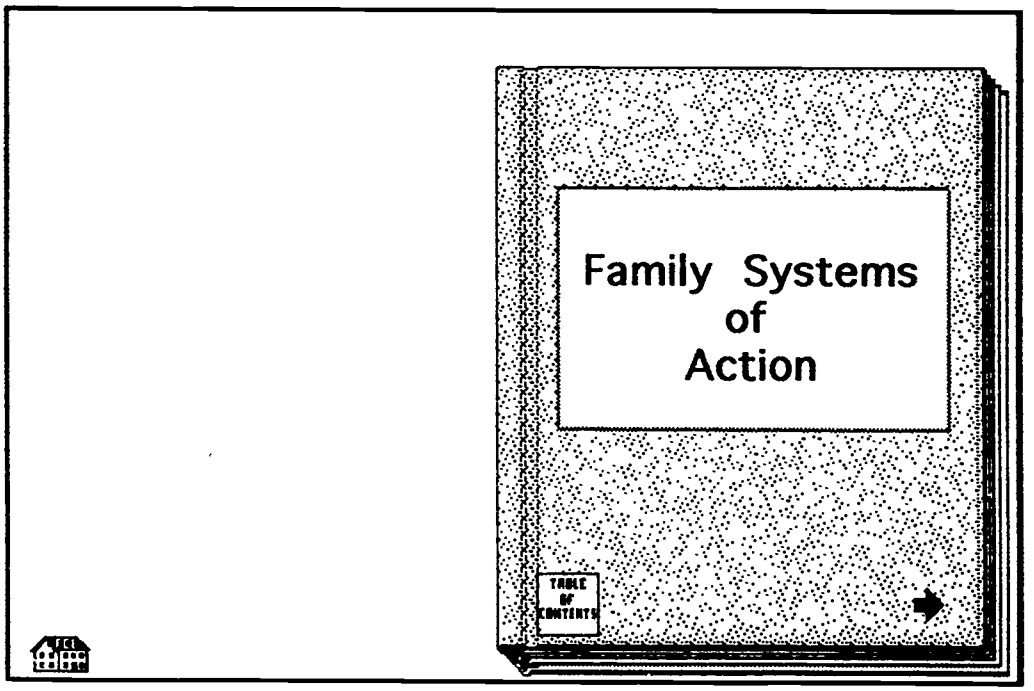
Evaluate sources of information according to appropriate criteria

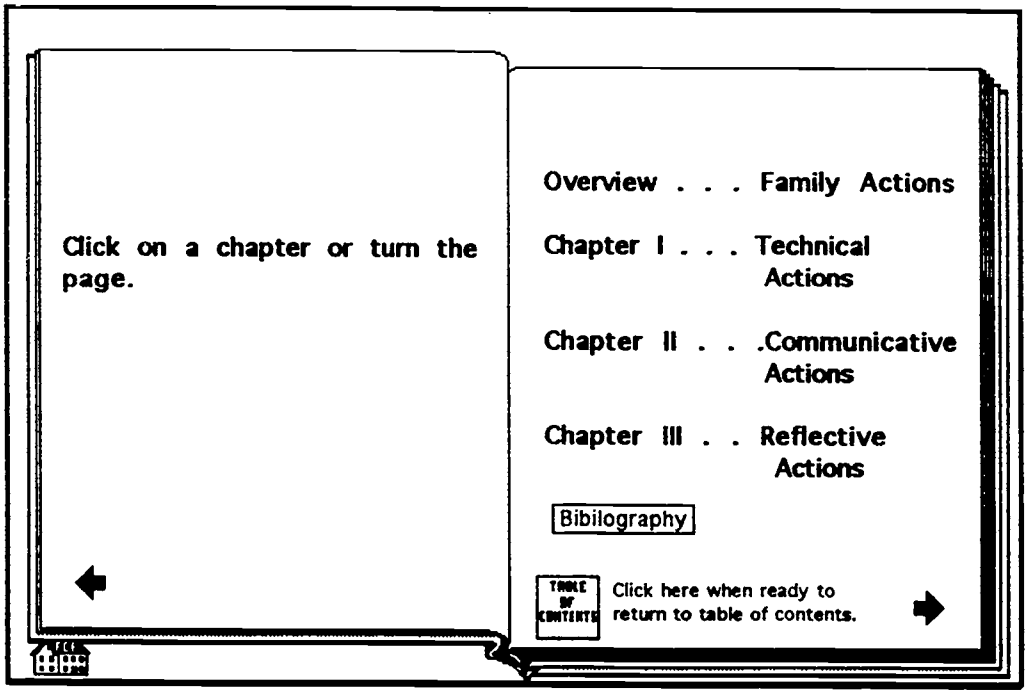
Judgement

Form a judgement.

Form a judgement about what to do regarding a continuing concern.


Return to beginning.
Quit
GO BACK


Family Systems
of
Action
TABLE OF CONTENTS


Click on a chapter or turn the page.
Overview . . . Family Actions
Chapter I . . . Technical Actions
Chapter II . . .Communicative Actions
Chapter III . . Reflective Actions
Bibilography
TABLE OF CONTENTS
Click here when ready to return to table of contents.

Family Actions

In the family focused approach, the family is seen as taking three kinds of reasoned action in order to develop the capacities of persons to shape and direct themselves.

These actions promote human and societal development and enhance quality of life.

TABLE OF CONTENTS

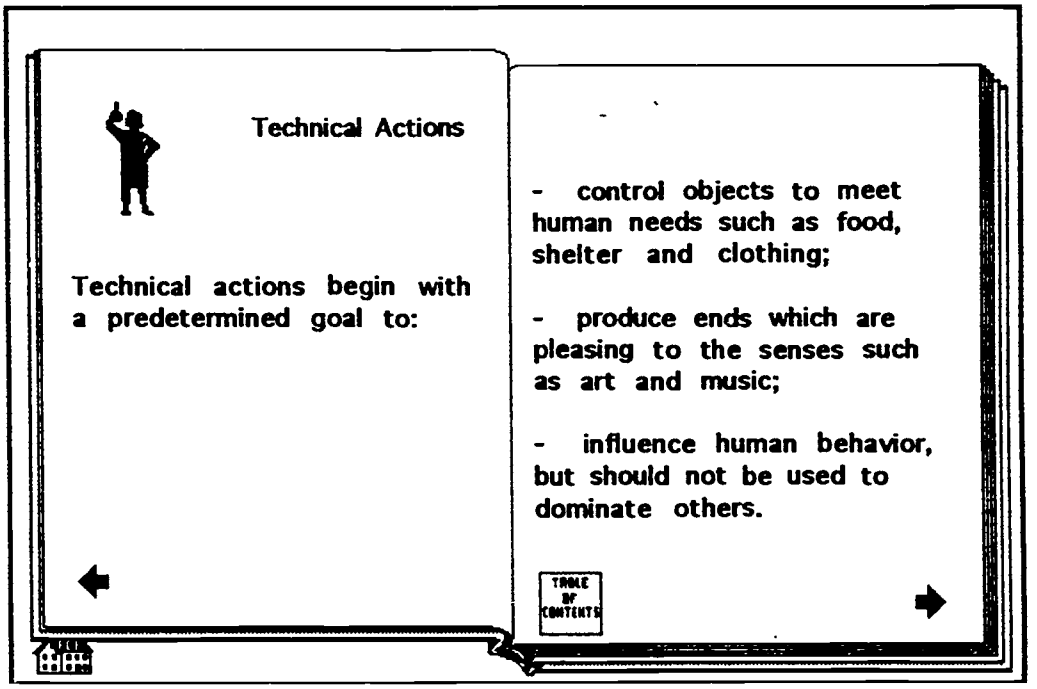
The three types of actions include:

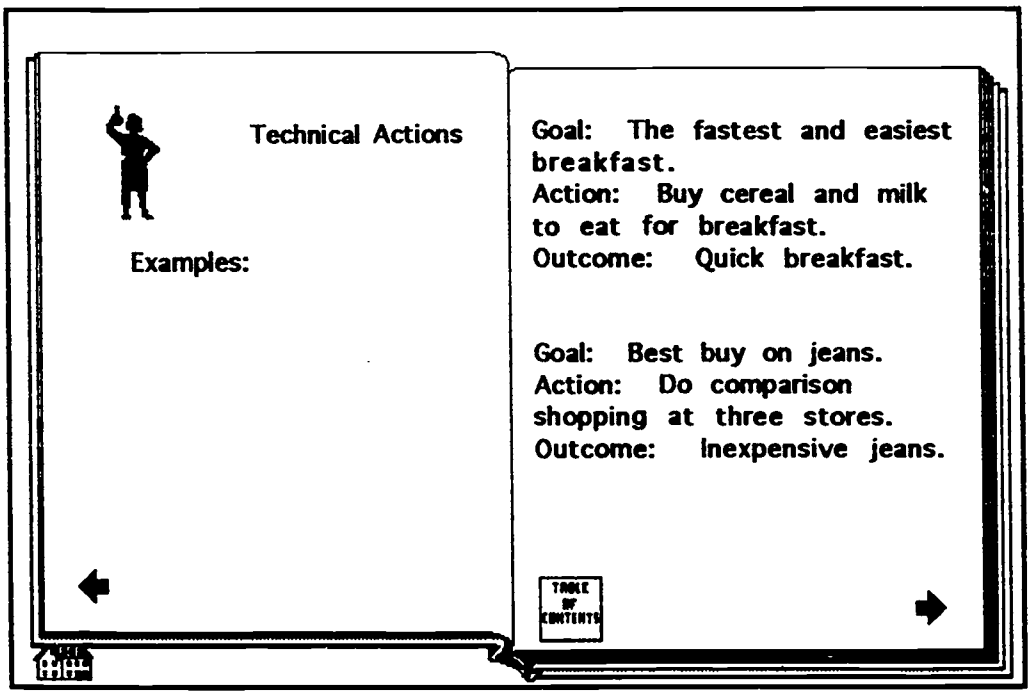
technical actions,

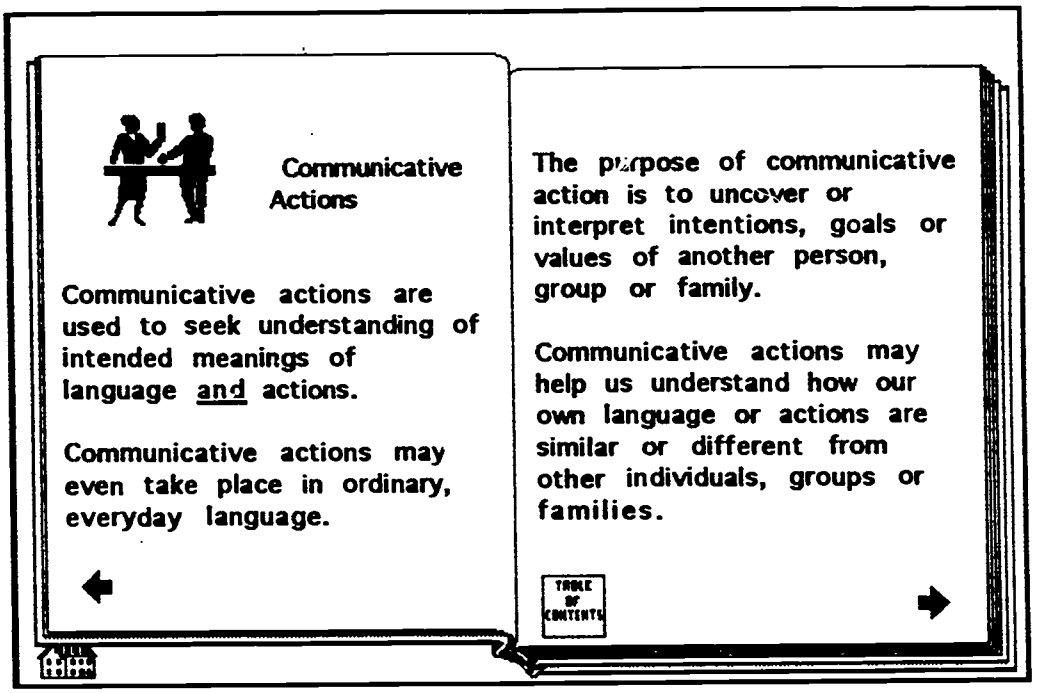
communicative actions, and

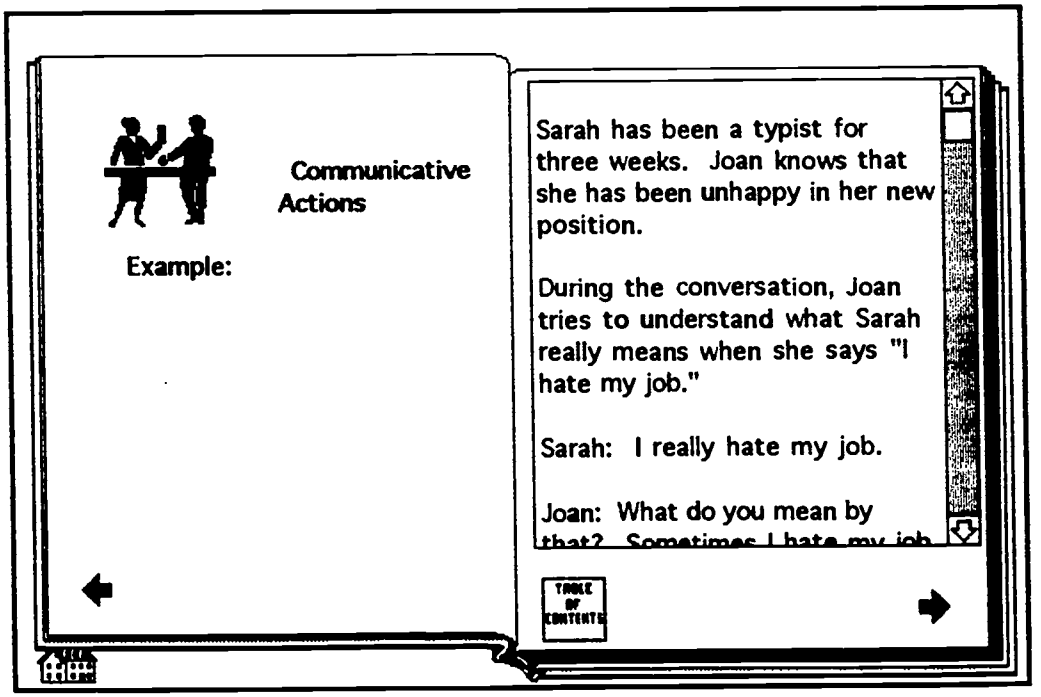
reflective actions.

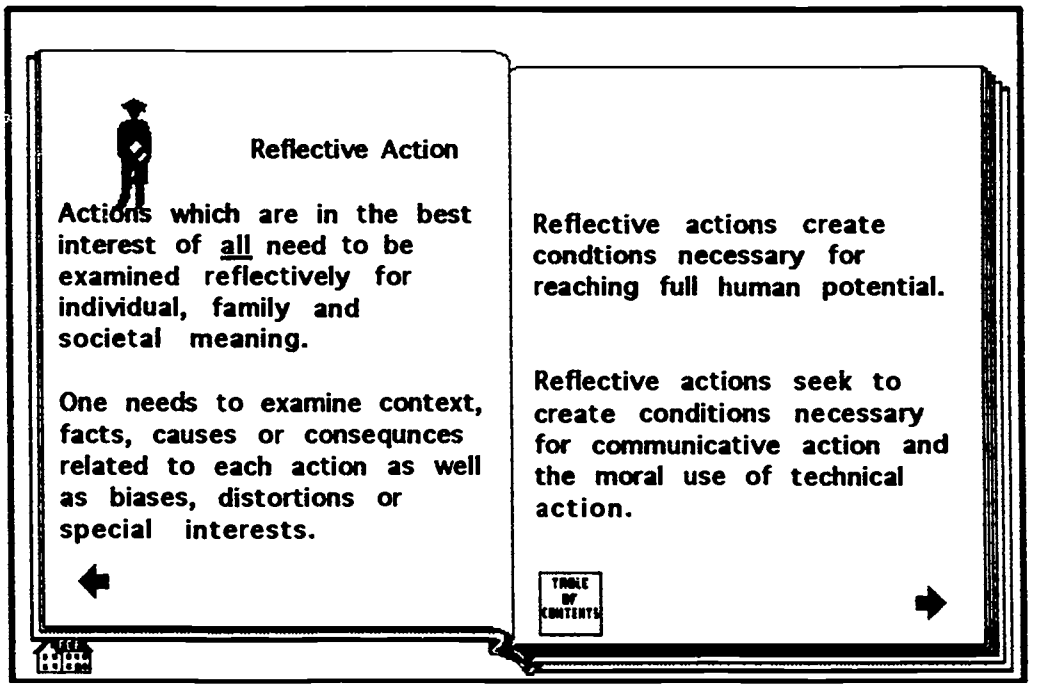
TABLE OF CONTENTS

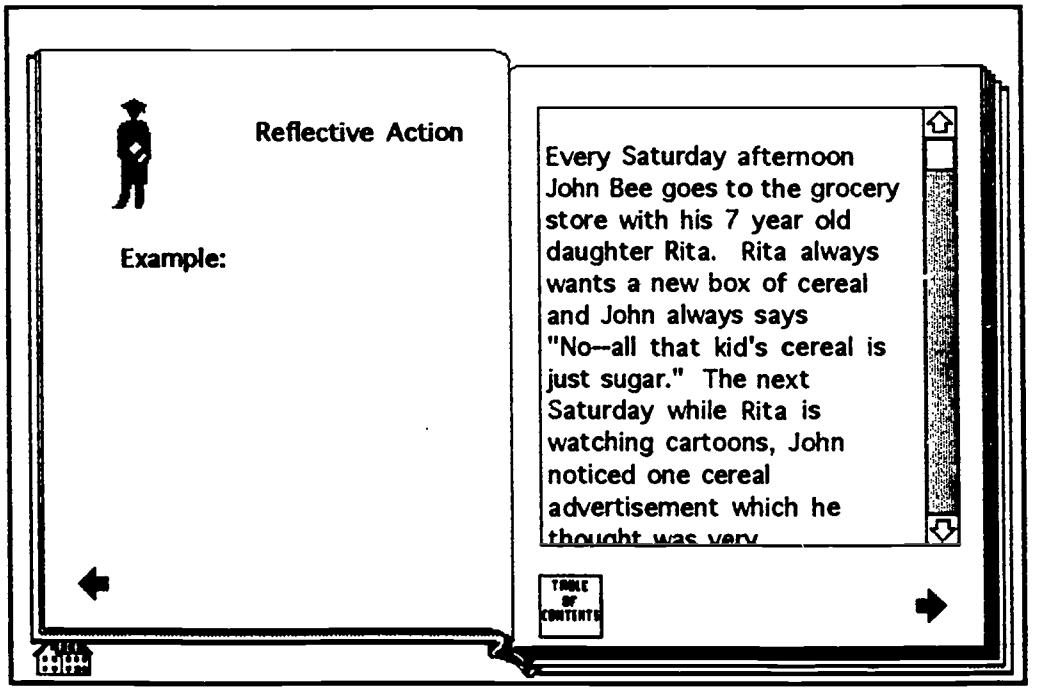

Technical Actions
Technical actions begin with a predetermined goal to:
- control objects to meet human needs such as food, shelter and clothing;
- produce ends which are pleasing to the senses such as art and music;
- influence human behavior, but should not be used to dominate others.
TABLE OF CONTENTS


Technical Actions
Examples:
Goal: The fastest and easiest breakfast.
Action: Buy cereal and milk to eat for breakfast.
Outcome: Quick breakfast.
Goal: Best buy on jeans.
Action: Do comparison shopping at three stores.
Outcome: Inexpensive jeans.
TABLE OF CONTENTS

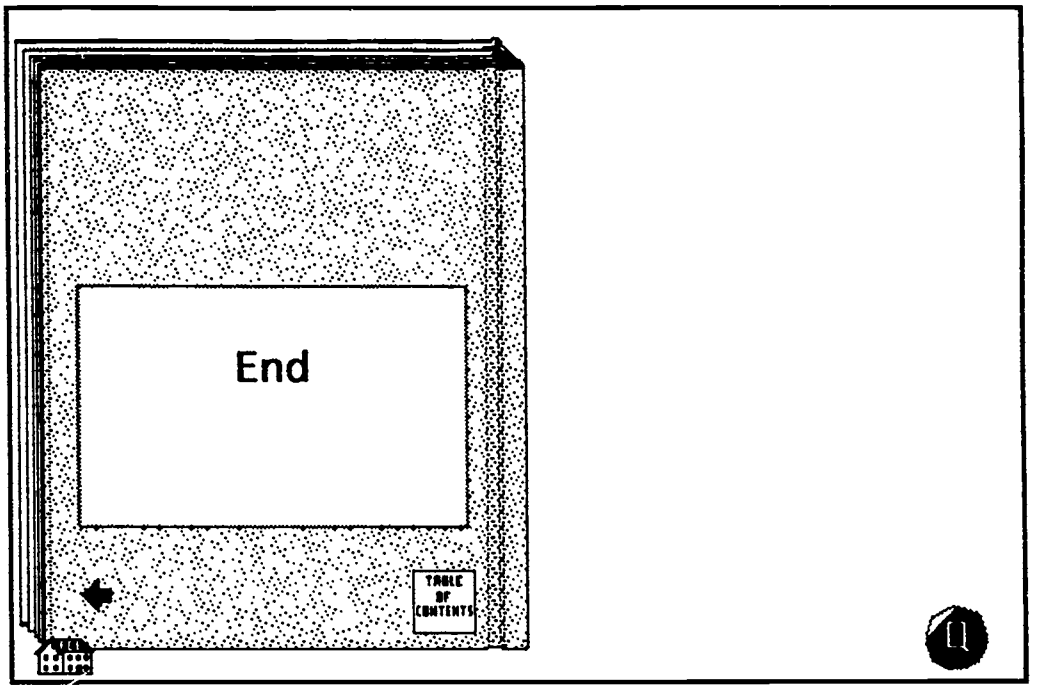

Communicative Actions
Communicative actions are used to seek understanding of intended meanings of language and actions.
Communicative actions may even take place in ordinary, everyday language.
The purpose of communicative action is to uncover or interpret intentions, goals or values of another person, group or family.
Communicative actions may help us understand how our own language or actions are similar or different from other individuals, groups or families.
TABLE OF CONTENTS


Communicative Actions
Example:
Sarah has been a typist for three weeks. Joan knows that she has been unhappy in her new position.
During the conversation, Joan tries to understand what Sarah really means when she says "I hate my job."
Sarah: I really hate my job.
Joan: What do you mean by
TABLE OF CONTENTS


Reflective Action
Actions which are in the best interest of all need to be examined reflectively for individual, family and societal meaning.
One needs to examine context, facts, causes or consequnces related to each action as well as biases, distortions or special interests.
Reflective actions create condtions necessary for reaching full human potential.
Reflective actions seek to create conditions necessary for communicative action and the moral use of technical action.
TABLE OF CONTENTS


Reflective Action
Example:
Every Saturday afternoon John Bee goes to the grocery store with his 7 year old daughter Rita. Rita always wants a new box of cereal and John always says "No--all that kid's cereal is just sugar." The next Saturday while Rita is watching cartoons, John noticed one cereal advertisement which he thought was very
TABLE OF CONTENTS

111


End
TABLE OF CONTENTS

Sample Student Assignment Stacks

Family Issues for Analysis

Family Issues for Analysis

This series is to examine family issues through critical analysis and reflective thinking.

Family Issues for Analsyis Home Card

What should be done about balancing work and family?

Continuing Concerns of the Family

Practical Reasoning

Family Systems of Action

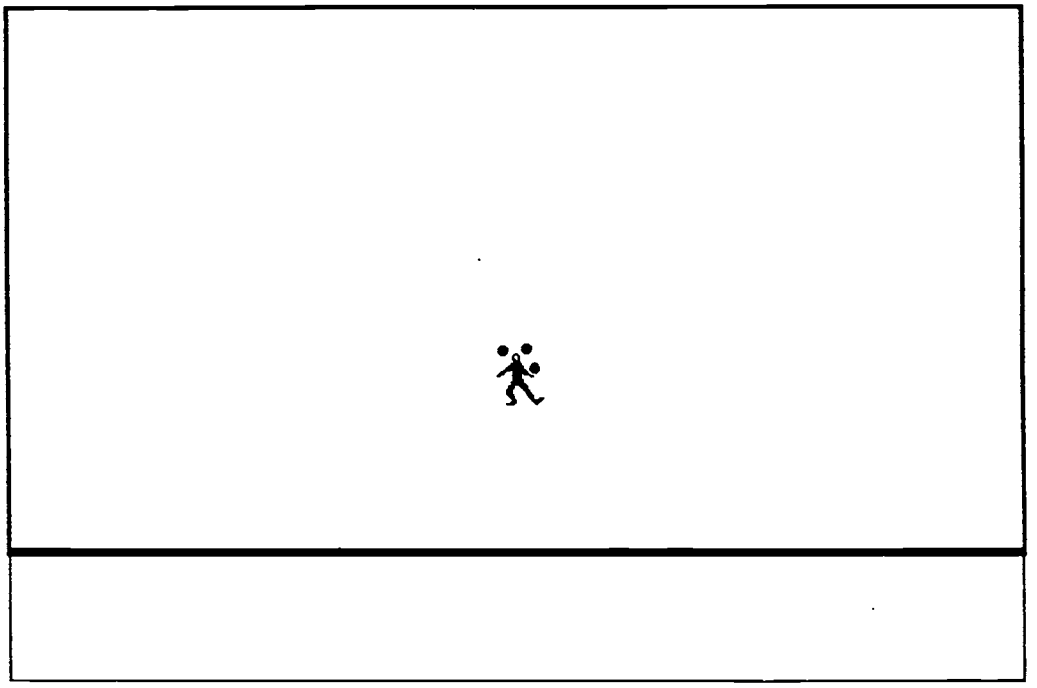
Learning Options

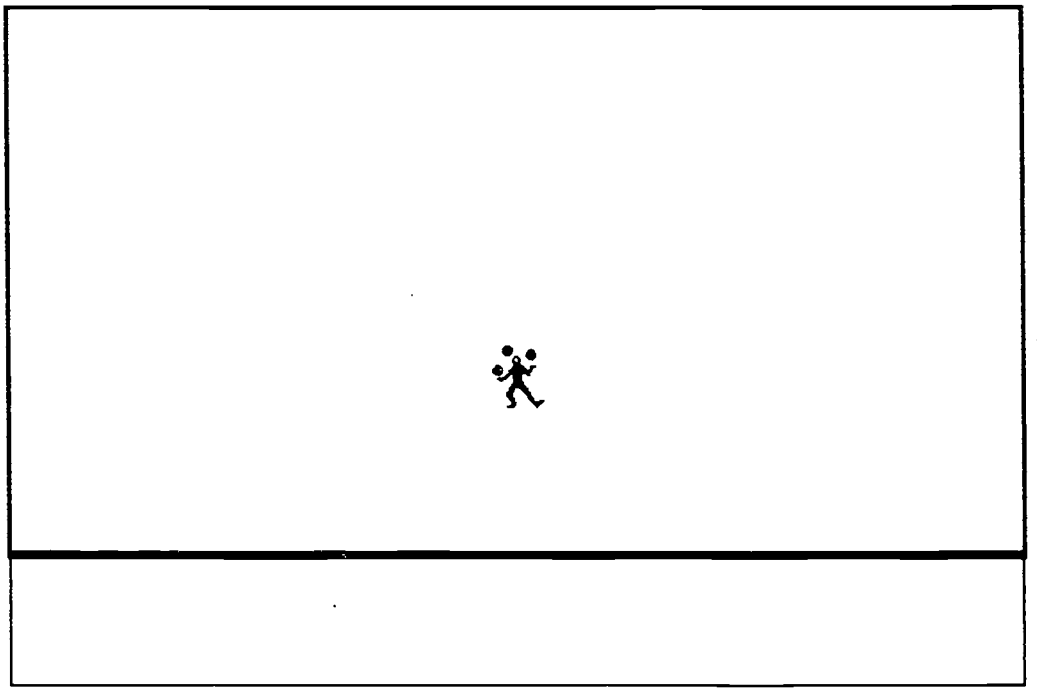
Return home.

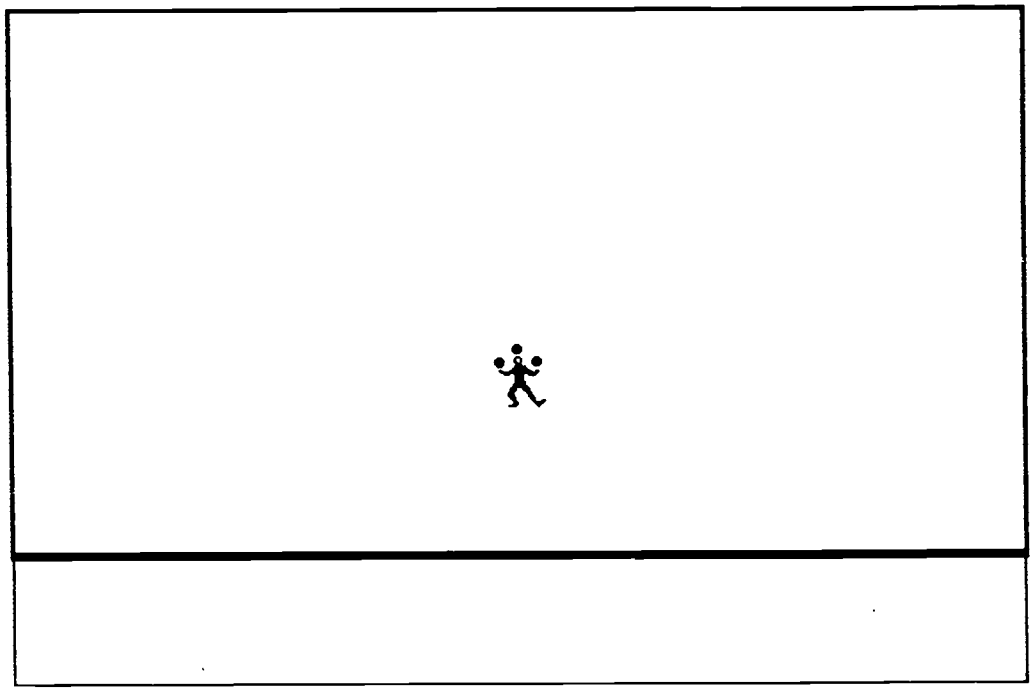
What Should Be Done About Balancing Work and Family?

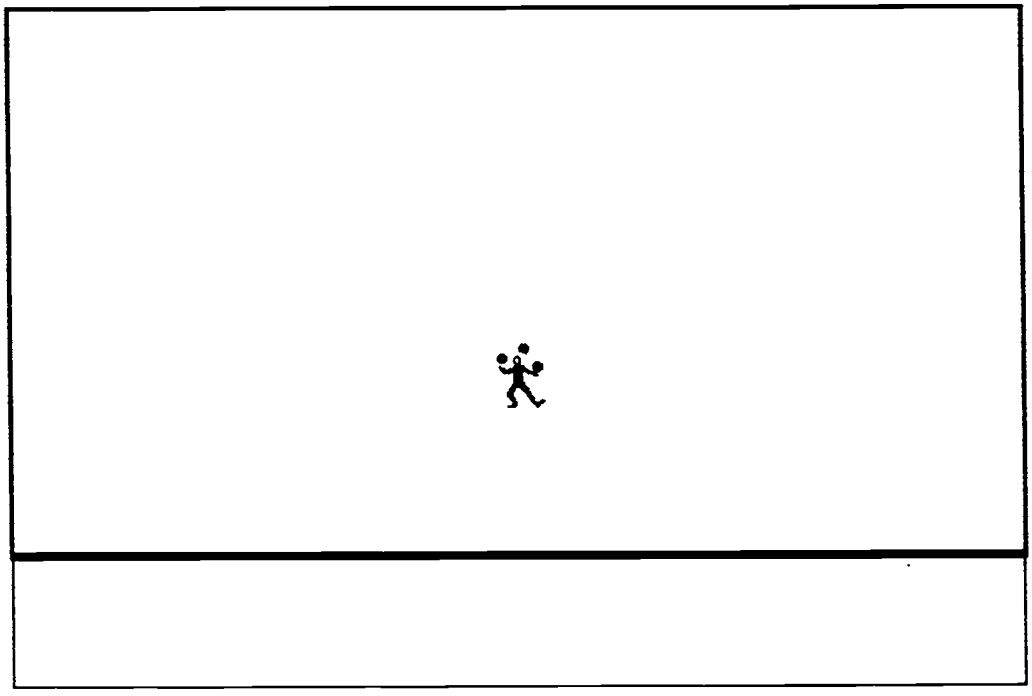
What Should Be Done About Balancing Work and Family?

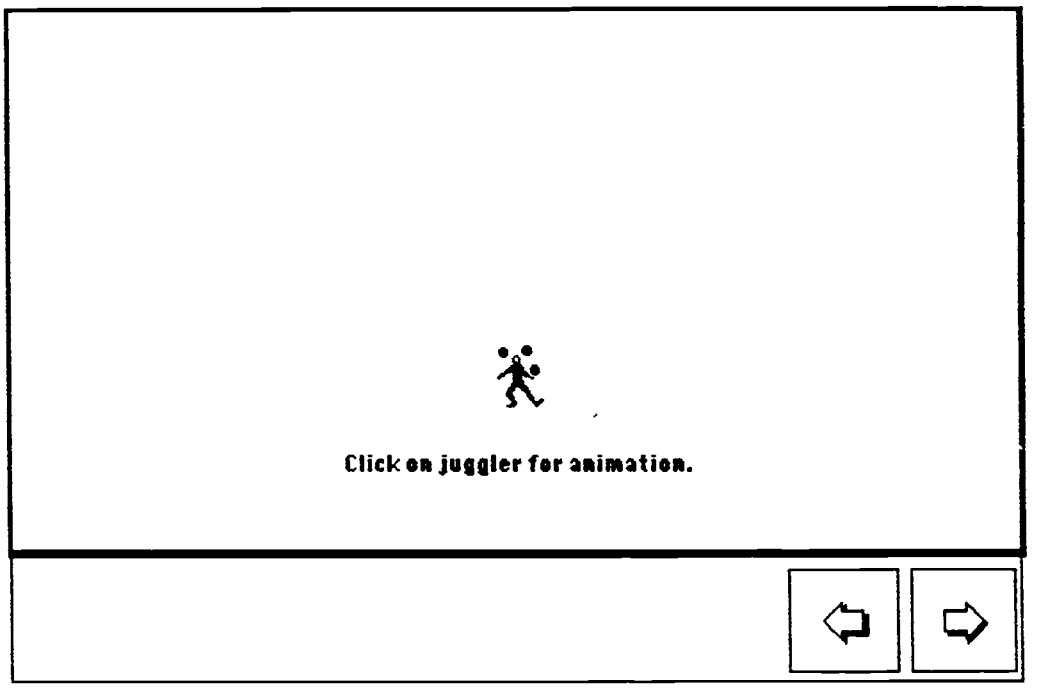
Click on juggler for animation.







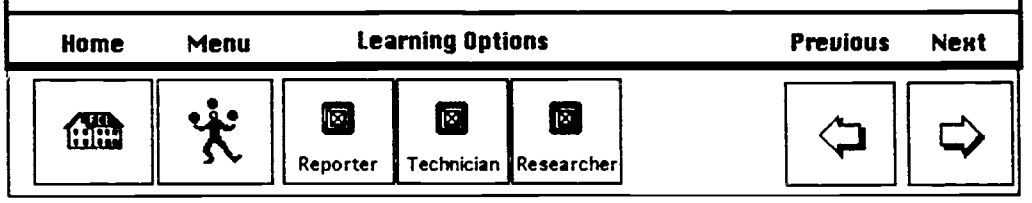




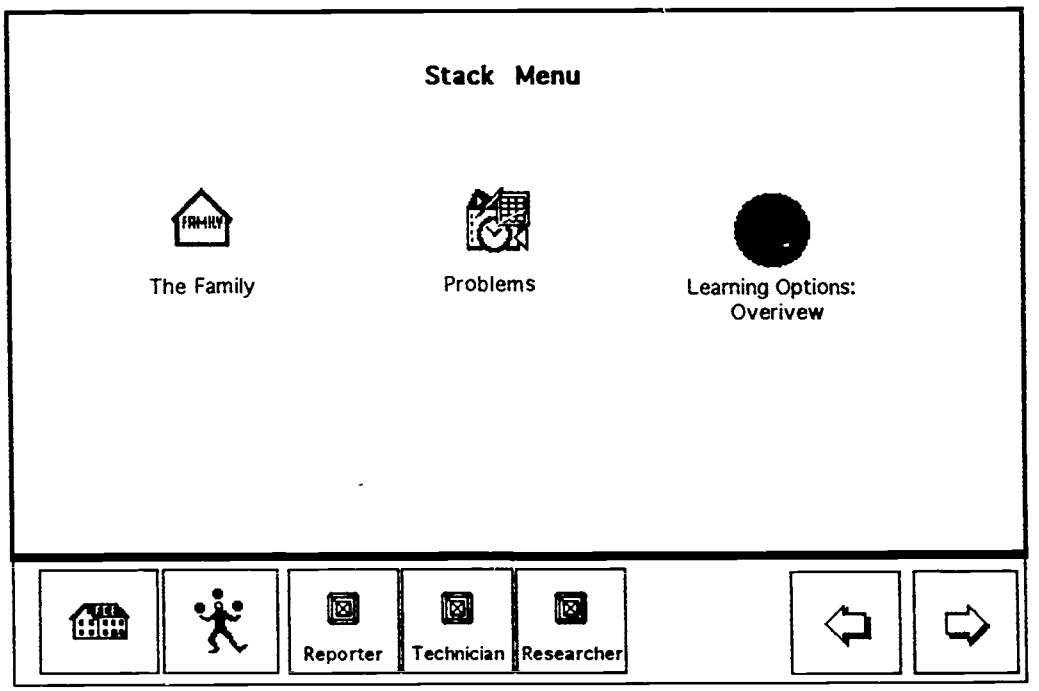
General Directions:

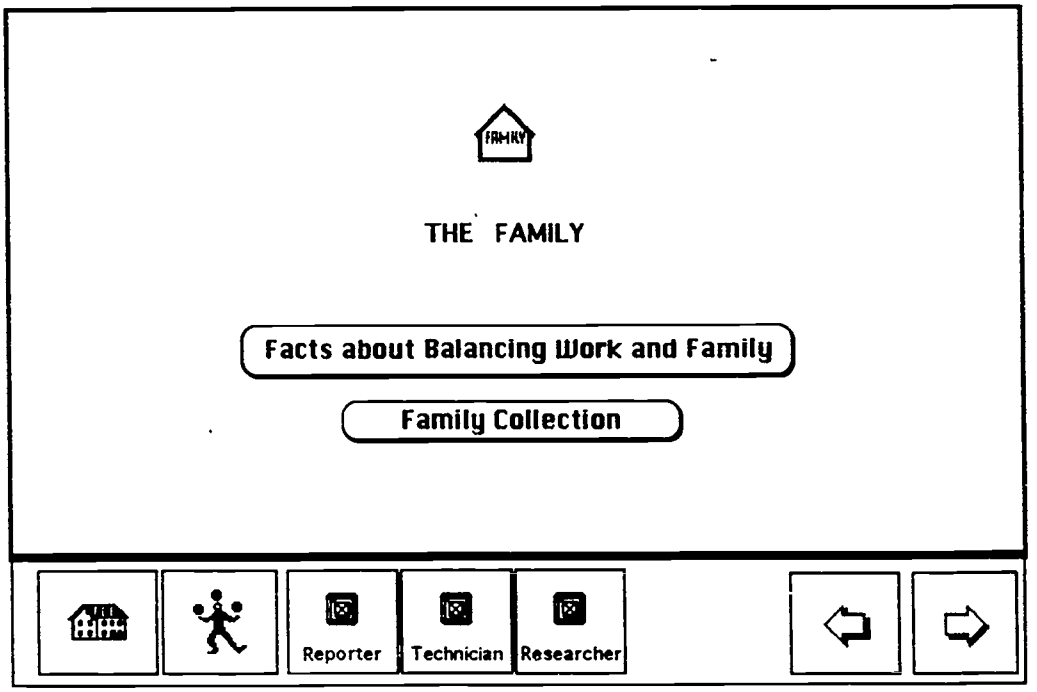
After examining facts, problems and case studies, select a learning option with which to examine a problem.

For help with continuing concerns, practical reasoning or family systems of action, return to the home card.

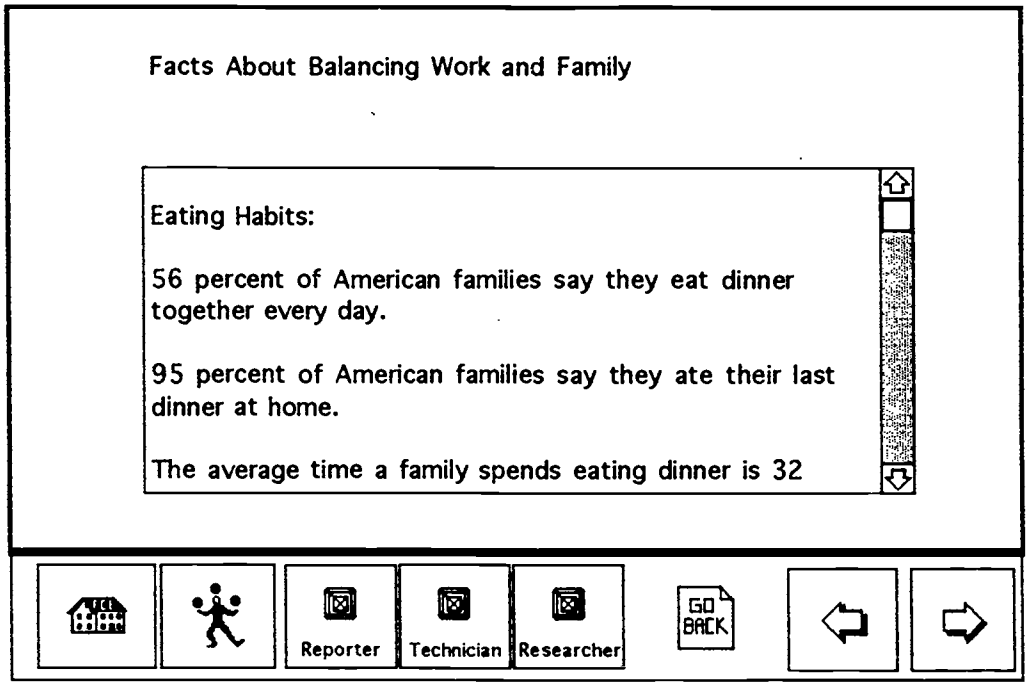


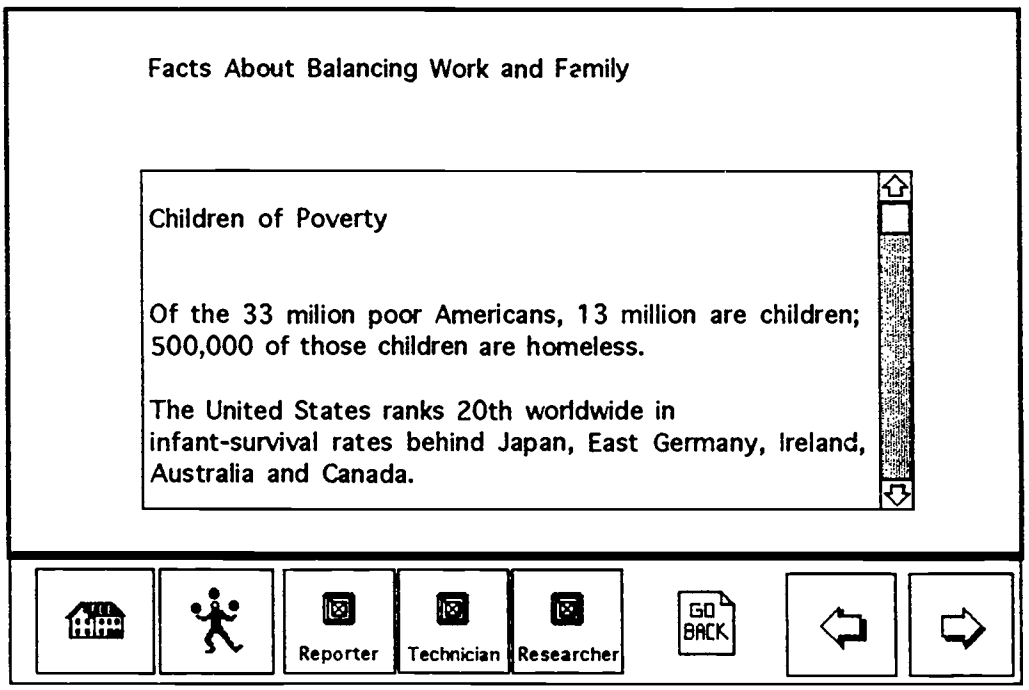
120

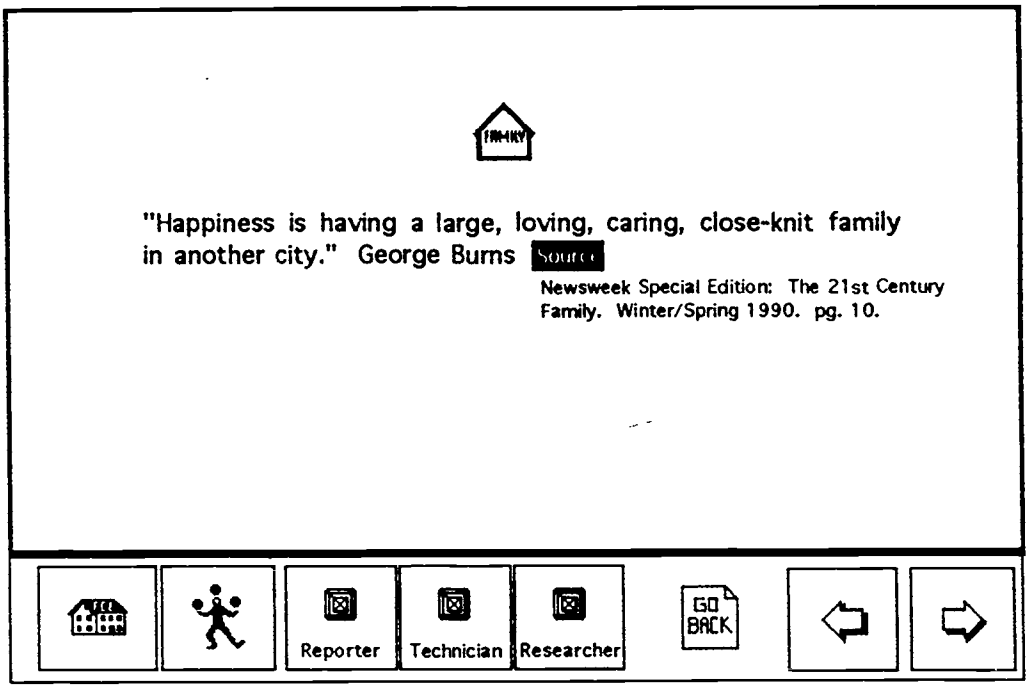

Stack Menu
The Family
Problems
Learning Options:
Overivew
Reporter
Technician
Researcher

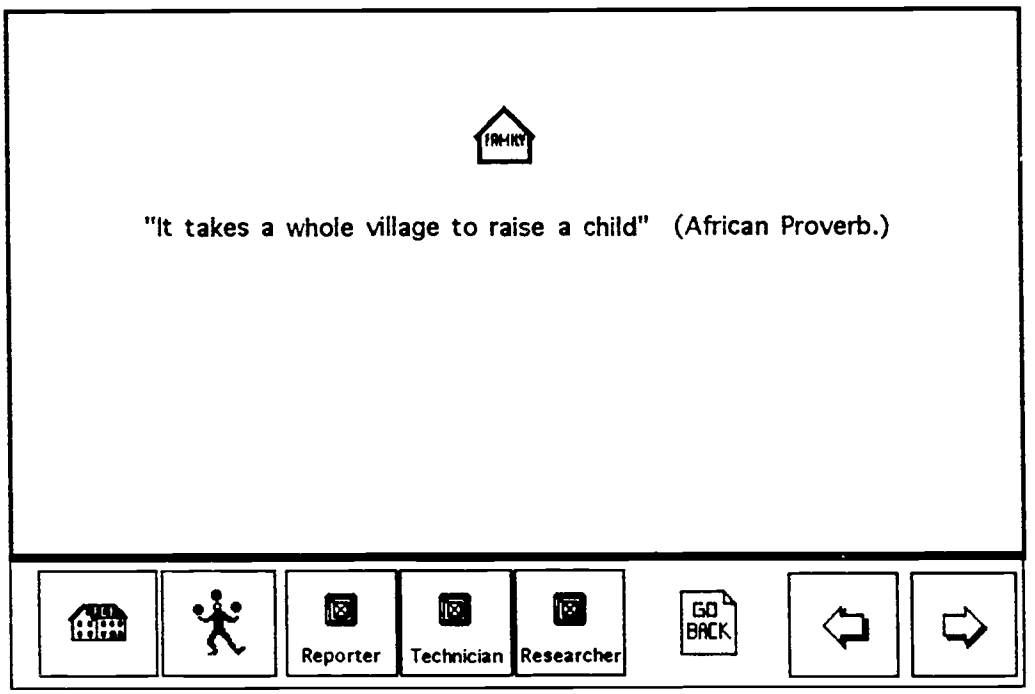

THE FAMILY
Facts about Balancing Work and Family
Family Collection
Reporter
Technician
Researcher

121

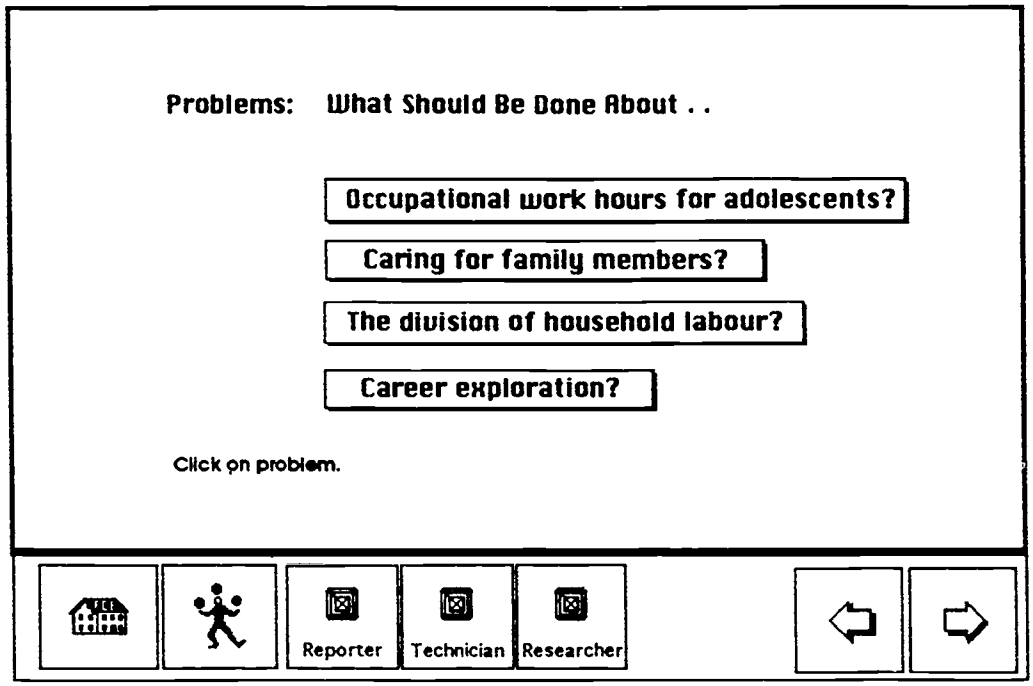

Facts About Balancing Work and Family
Eating Habits:
56 percent of American families say they eat dinner together every day.
95 percent of American families say they ate their last dinner at home.
The average time a family spends eating dinner is 32
Reporter
Technician
Researcher
GO BACK

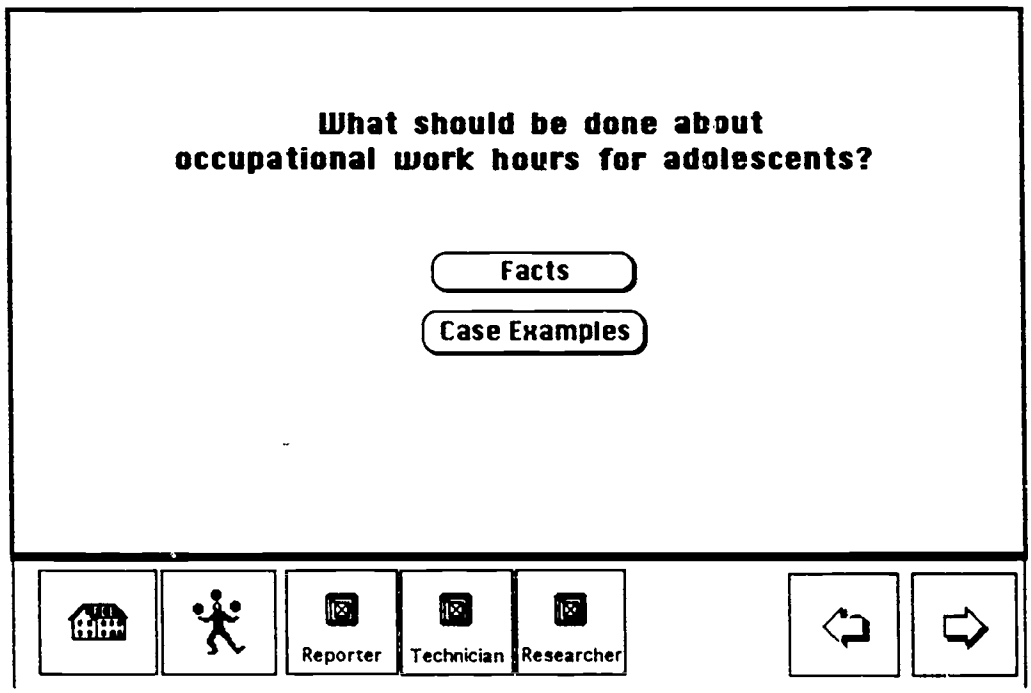

Facts About Balancing Work and Family
Children of Poverty
Of the 33 milion poor Americans, 13 million are children; 500,000 of those children are homeless.
The United States ranks 20th worldwide in infant-survival rates behind Japan, East Germany, Ireland, Australia and Canada.
Reporter
Technician
Researcher
GO BACK


FAMILY
"Happiness is having a large, loving, caring, close-knit family in another city." George Burns
Source
Newsweek Special Edition: The 21st Century Family. Winter/Spring 1990. pg. 10.
Reporter
Technician
Researcher
GO BACK

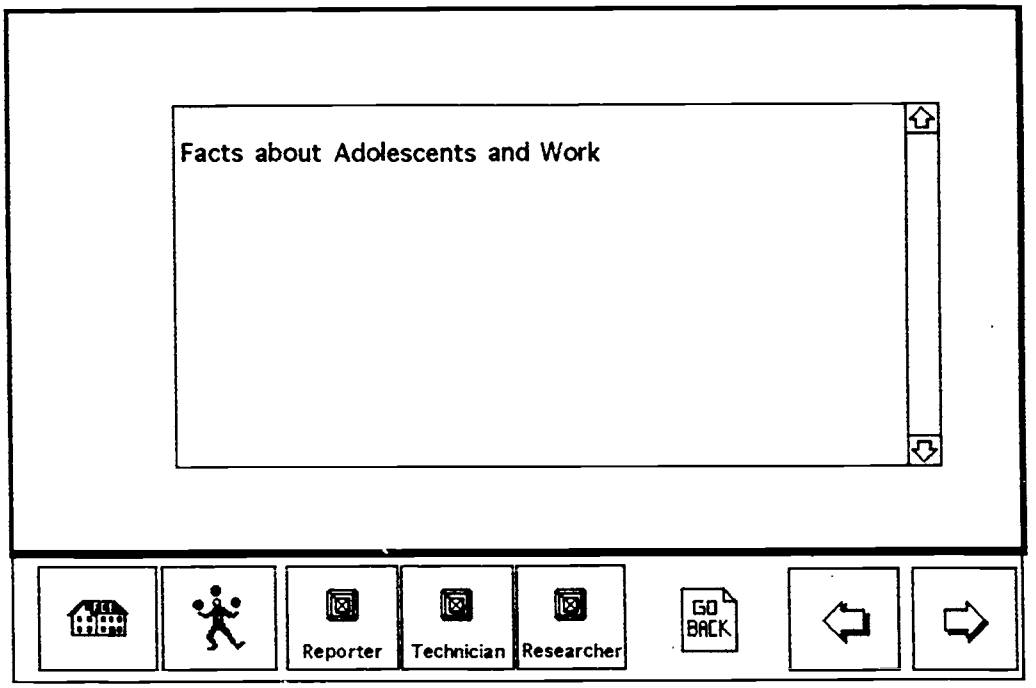

FAMILY
"It takes a whole village to raise a child" (African Proverb.)
Reporter
Technician
Researcher
GO BACK

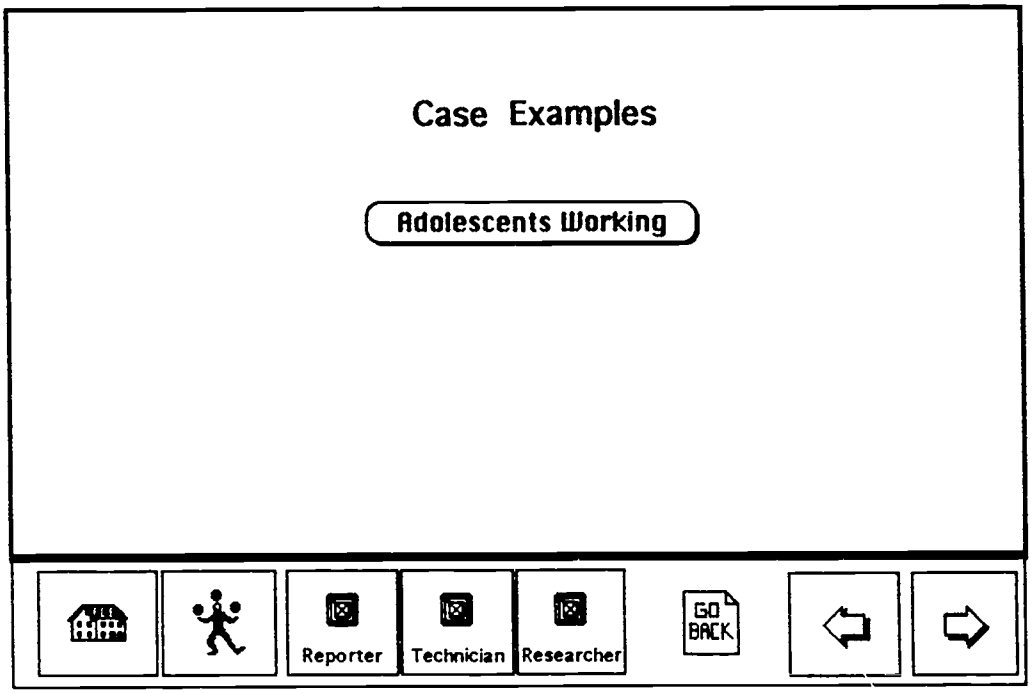
123


Problems: What Should Be Done About . .
Occupational work hours for adolescents?
Caring for family members?
The division of household labour?
Career exploration?
Click on problem.
Reporter
Technician
Researcher

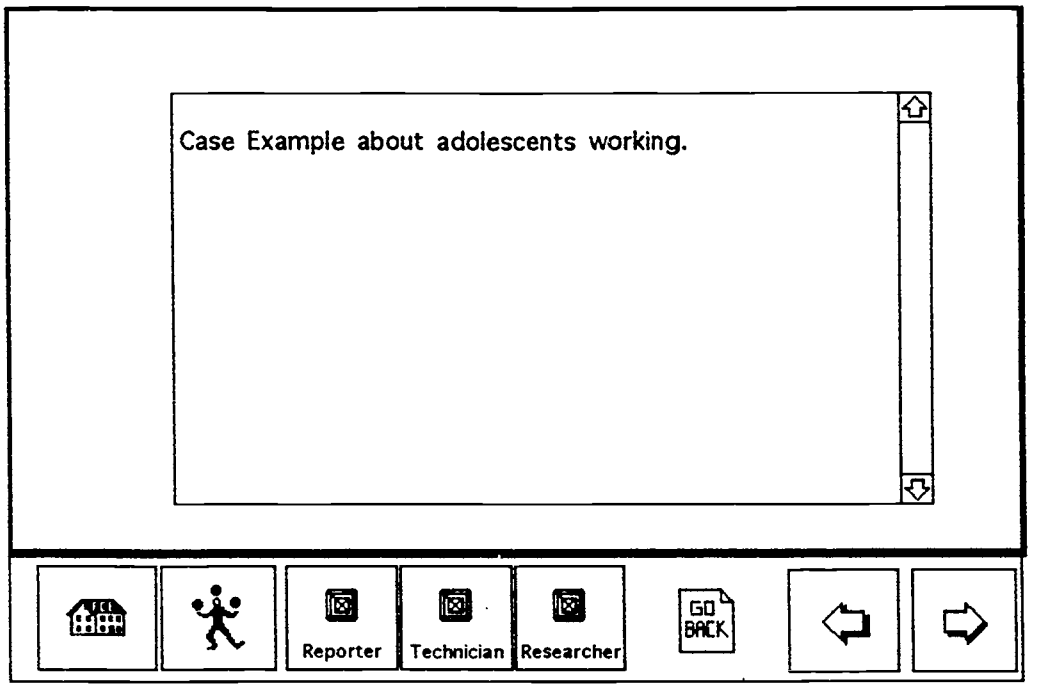

What should be done about
occupational work hours for adolescents?
Facts
Case Examples
Reporter
Technician
Researcher

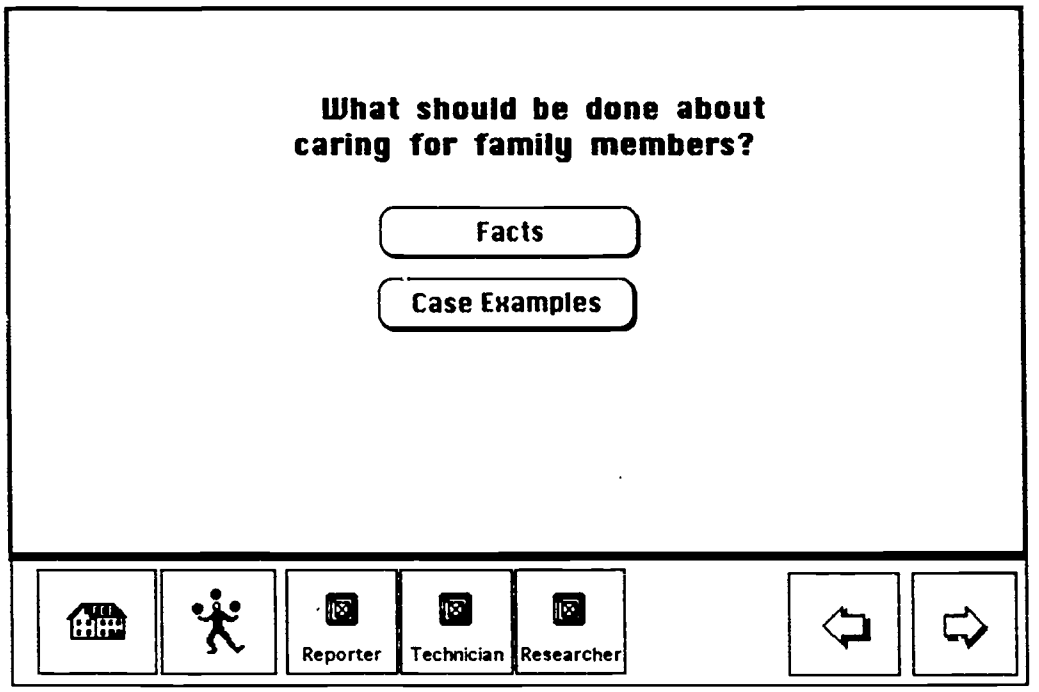
124


Facts about Adolescents and Work
Reporter
Technician
Researcher
GO BACK

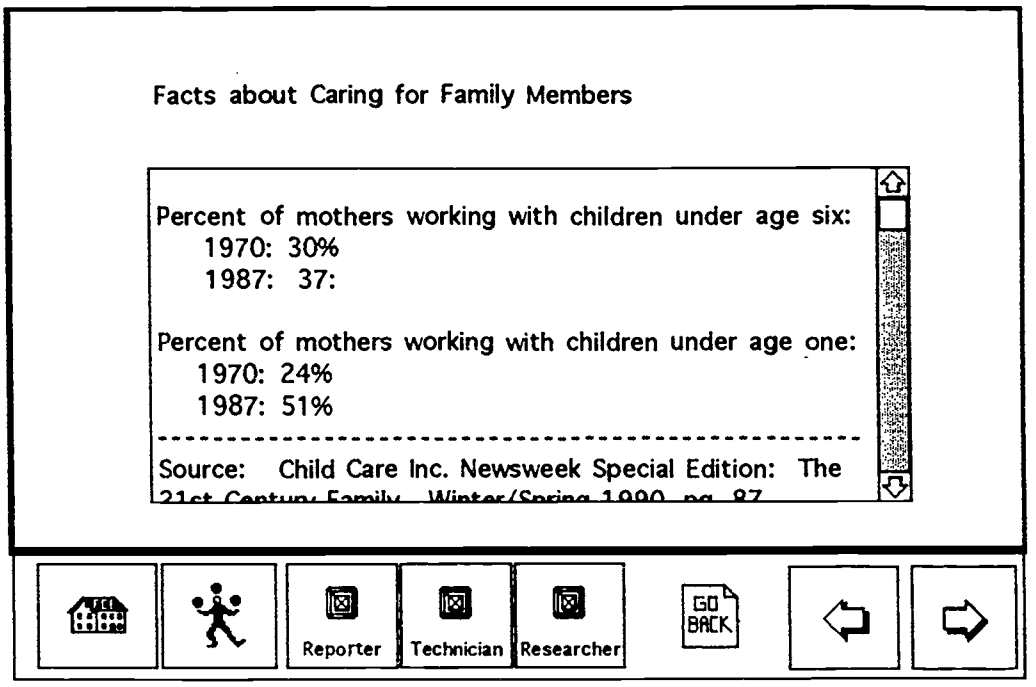

Case Examples
Adolescents Working
Reporter
Technician
Researcher
GO BACK

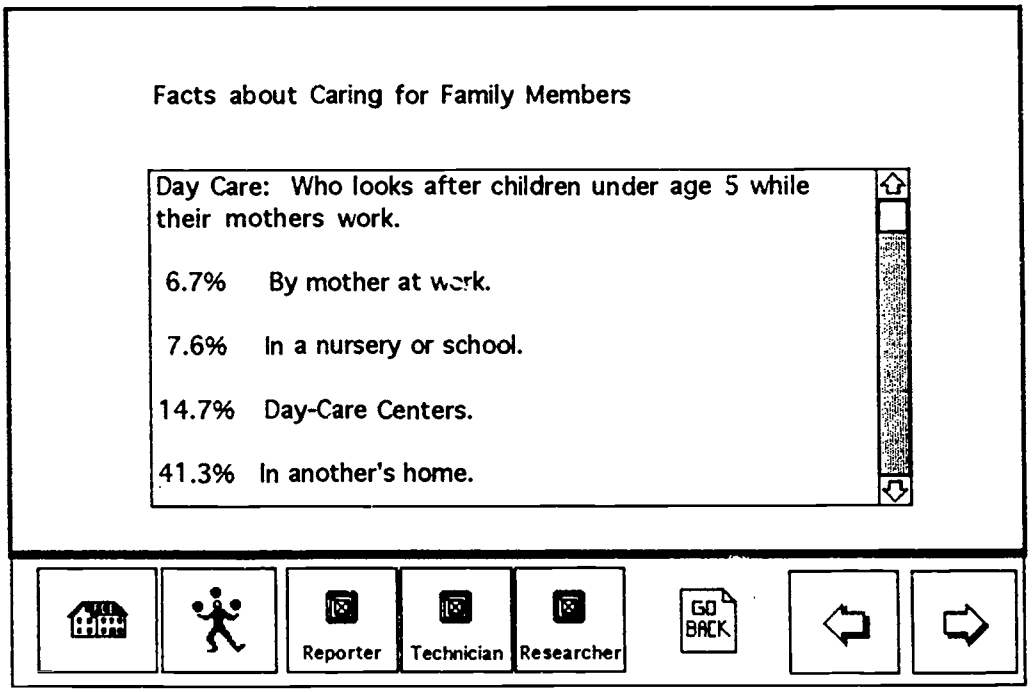
125

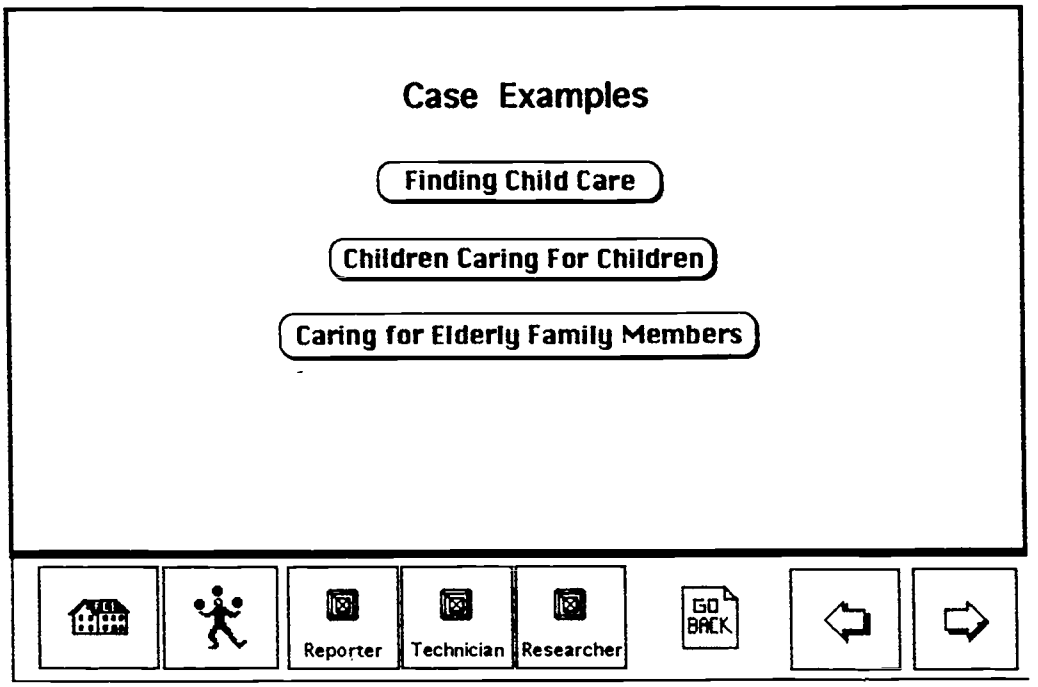

Case Example about adolescents working.
Reporter
Technician
Researcher
GO BACK

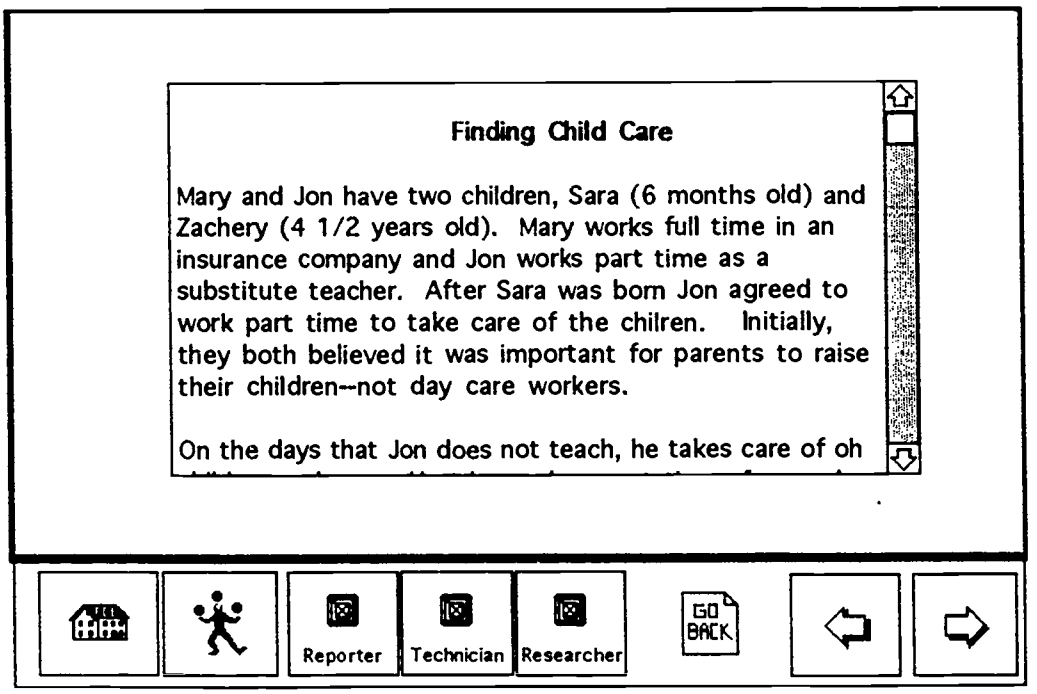

What should be done about caring for family members?
Facts
Case Examples
Reporter
Technician
Researcher

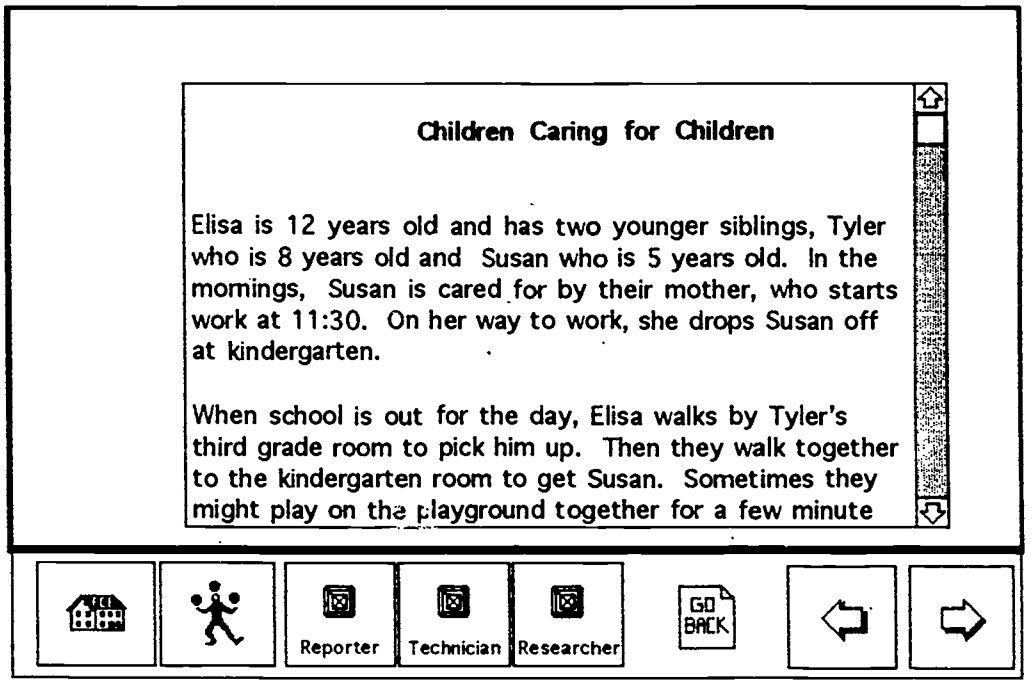
126

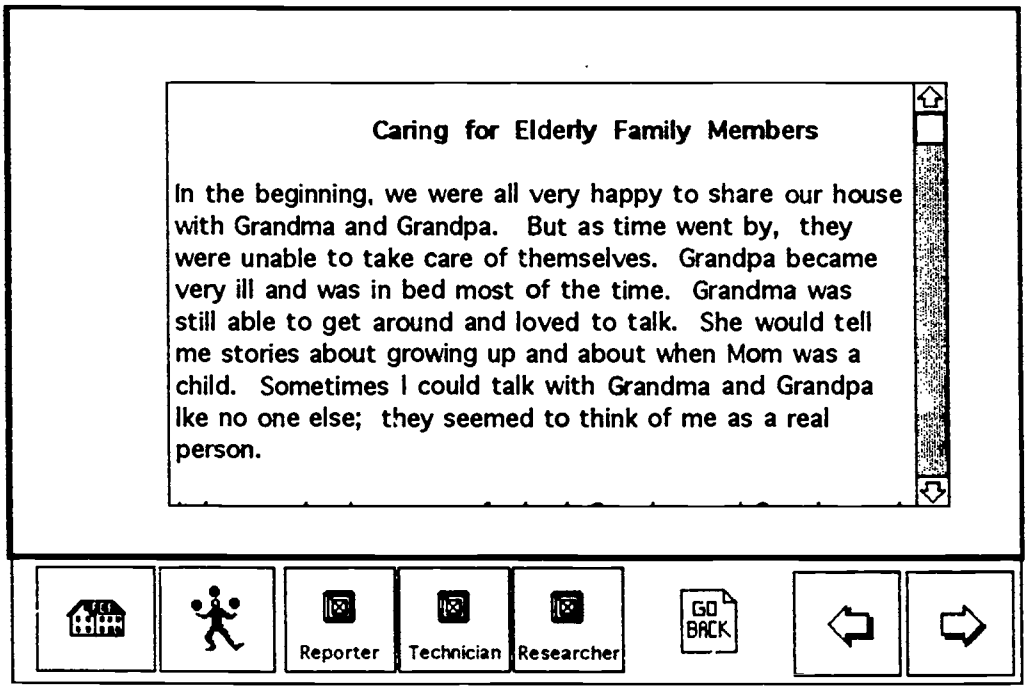

Facts about Caring for Family Members
Percent of mothers working with children under age six:
1970: 30%
1987: 37:
Percent of mothers working with children under age one:
1970: 24%
1987: 51%
Source: Child Care Inc. Newsweek Special Edition: The
Reporter
Technician
Researcher
GO BACK

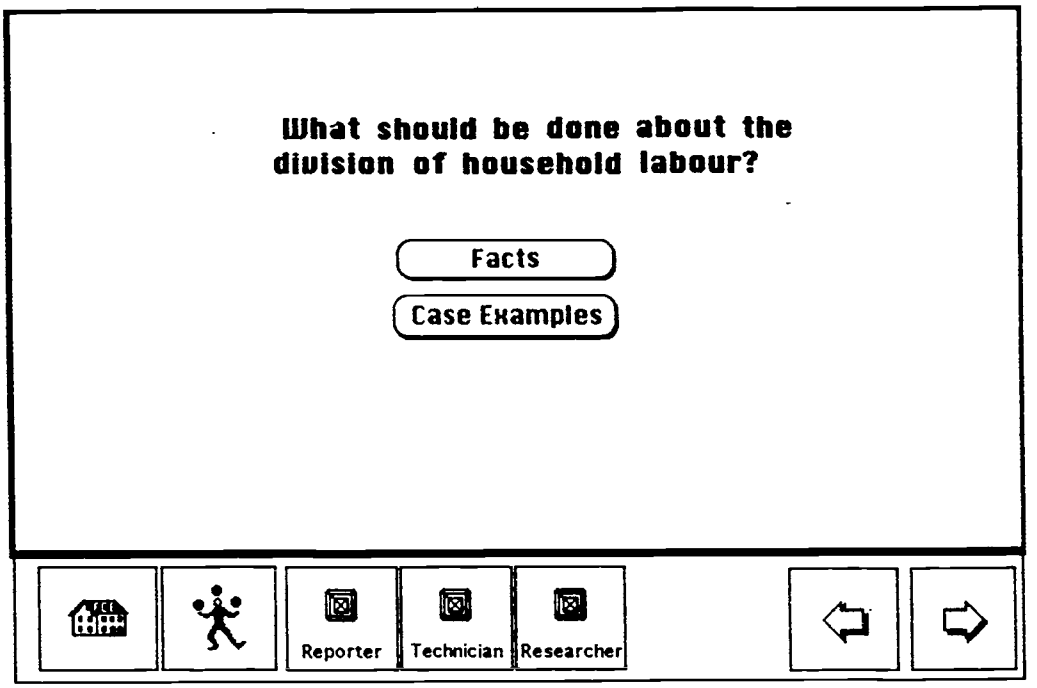

Facts about Caring for Family Members
Day Care: Who looks after children under age 5 while their mothers work.
6.7% By mother at work.
7.6% In a nursery or school.
14.7% Day-Care Centers.
41.3% In another's home.
Reporter
Technician
Researcher
GO BACK

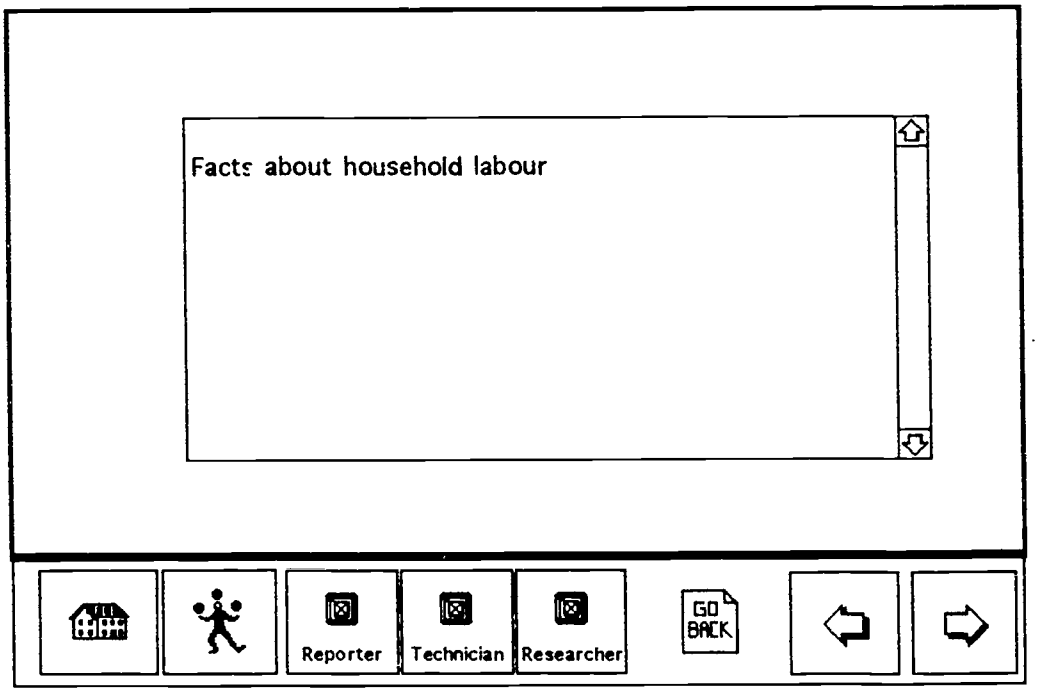

Case Examples
Finding Child Care
Children Caring For Children
Caring for Elderly Family Members
Reporter
Technician
Researcher
GO BACK


Finding Child Care
Mary and Jon have two children, Sara (6 months old) and Zachery (4 1/2 years old). Mary works full time in an insurance company and Jon works part time as a substitute teacher. After Sara was born Jon agreed to work part time to take care of the chilren. Initially, they both believed it was important for parents to raise their children--not day care workers.
On the days that Jon does not teach, he takes care of oh
Reporter
Technician
Researcher
GO BACK

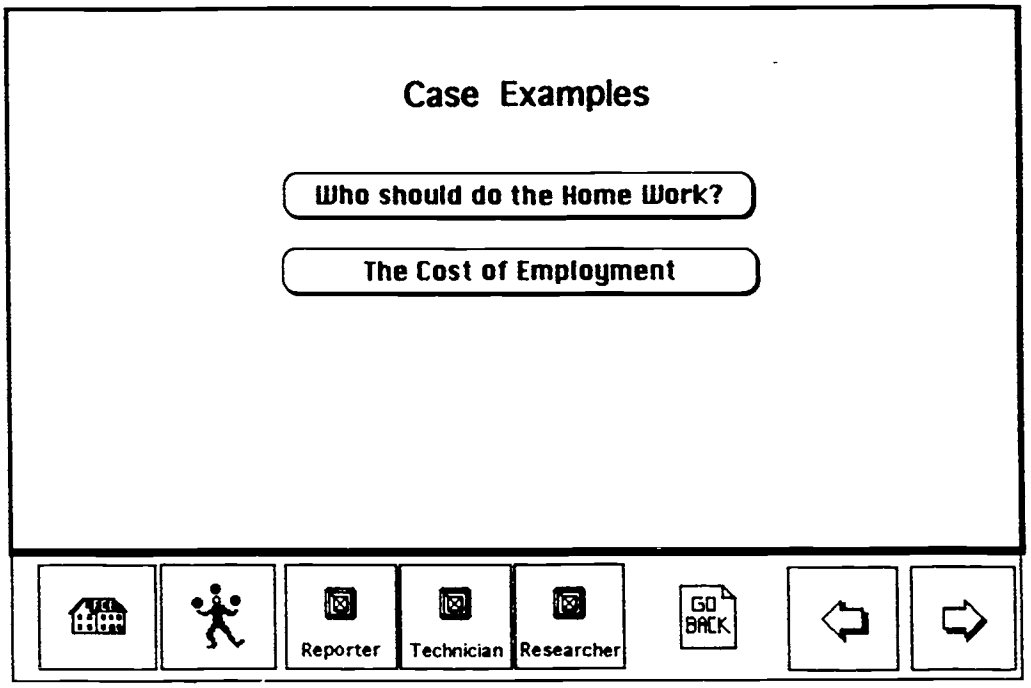

Children Caring for Children
Elisa is 12 years old and has two younger siblings, Tyler who is 8 years old and Susan who is 5 years old. In the mornings, Susan is cared for by their mother, who starts work at 11:30. On her way to work, she drops Susan off at kindergarten.
When school is out for the day, Elisa walks by Tyler's third grade room to pick him up. Then they walk together to the kindergarten room to get Susan. Sometimes they might play on the playground together for a few minute
Reporter
Technician
Researcher
GO BACK

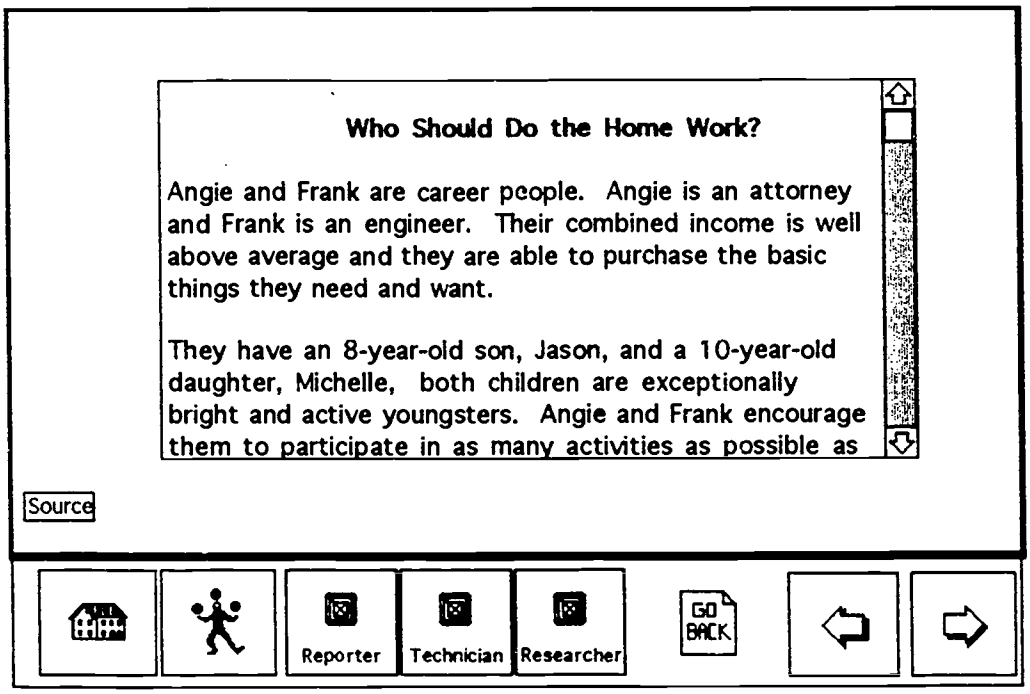

Caring for Elderly Family Members
In the beginning, we were all very happy to share our house with Grandma and Grandpa. But as time went by, they were unable to take care of themselves. Grandpa became very ill and was in bed most of the time. Grandma was still able to get around and loved to talk. She would tell me stories about growing up and about when Mom was a child. Sometimes I could talk with Grandma and Grandpa like no one else; they seemed to think of me as a real person.
Reporter
Technician
Researcher
GO BACK


What should be done about the division of household labour?
Facts
Case Examples
Reporter
Technician
Researcher

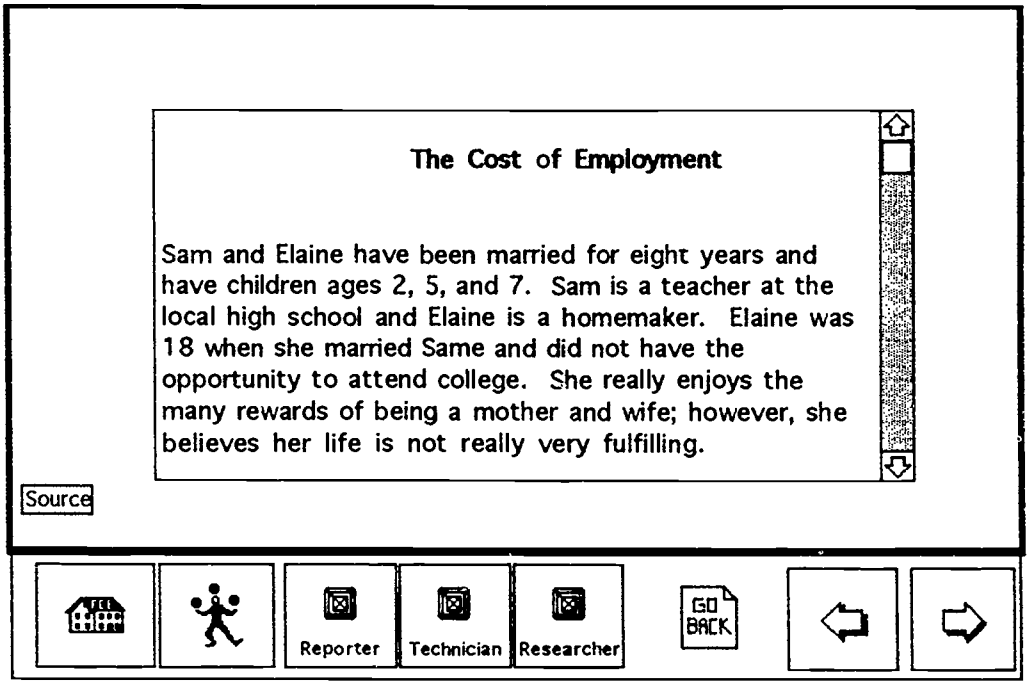

Facts about household labour
Reporter
Technician
Researcher
GO BACK

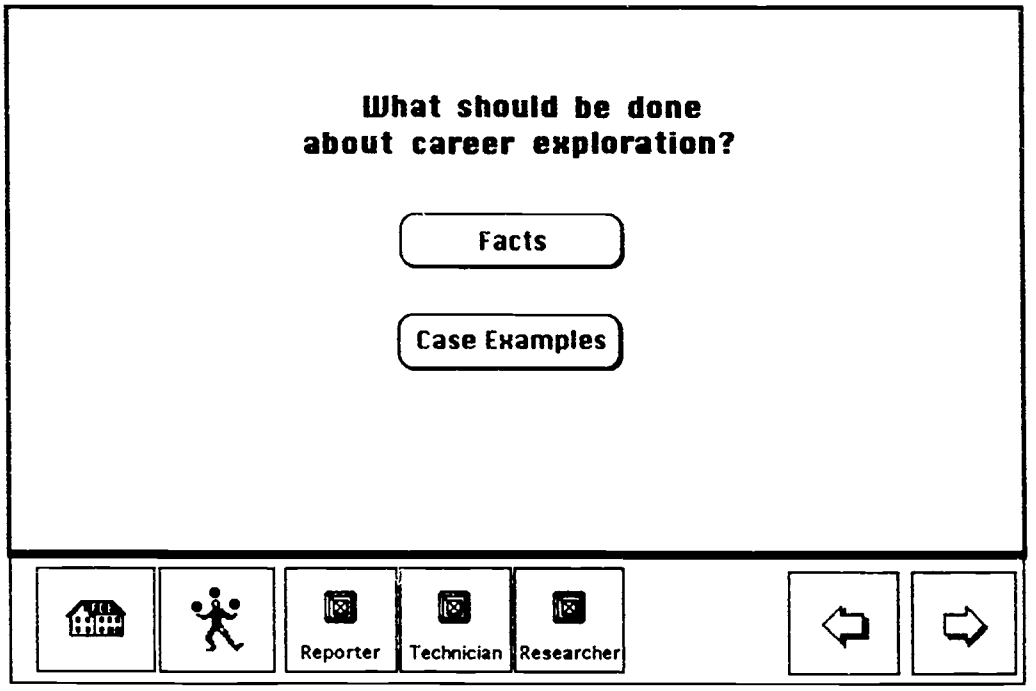
130


Case Examples
Who should do the Home Work?
The Cost of Employment
Reporter
Technician
Researcher
GO BACK

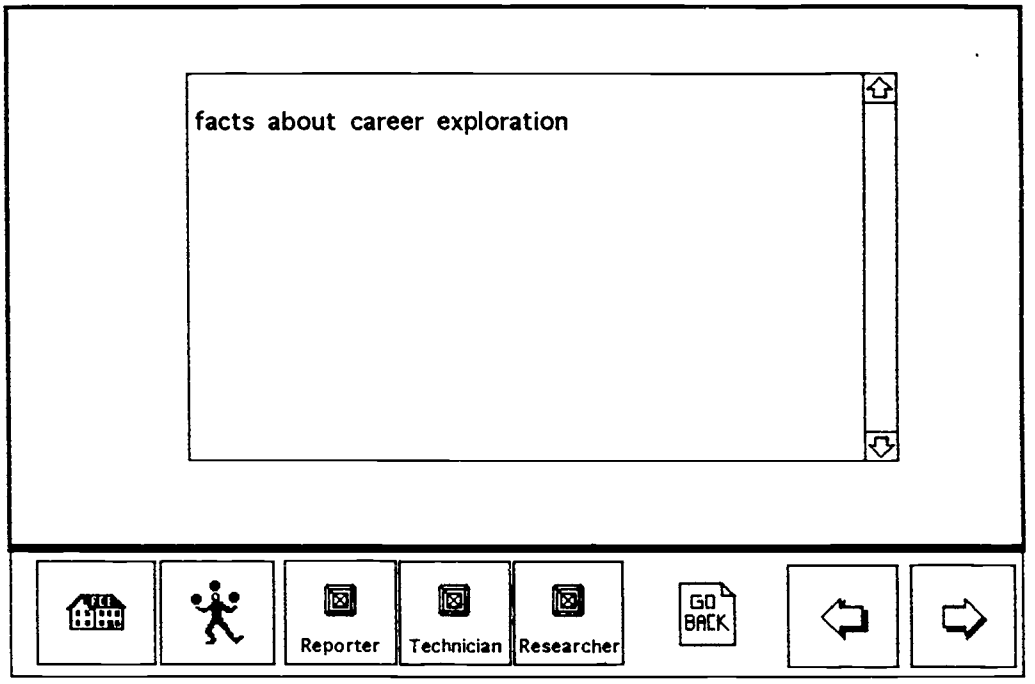

Who Should Do the Home Work?
Angie and Frank are career people. Angie is an attorney and Frank is an engineer. Their combined income is well above average and they are able to purchase the basic things they need and want.
They have an 8-year-old son, Jason, and a 10-year-old daughter, Michelle, both children are exceptionally bright and active youngsters. Angie and Frank encourage them to participate in as many activities as possible as
Source
Reporter
Technician
Researcher
GO BACK

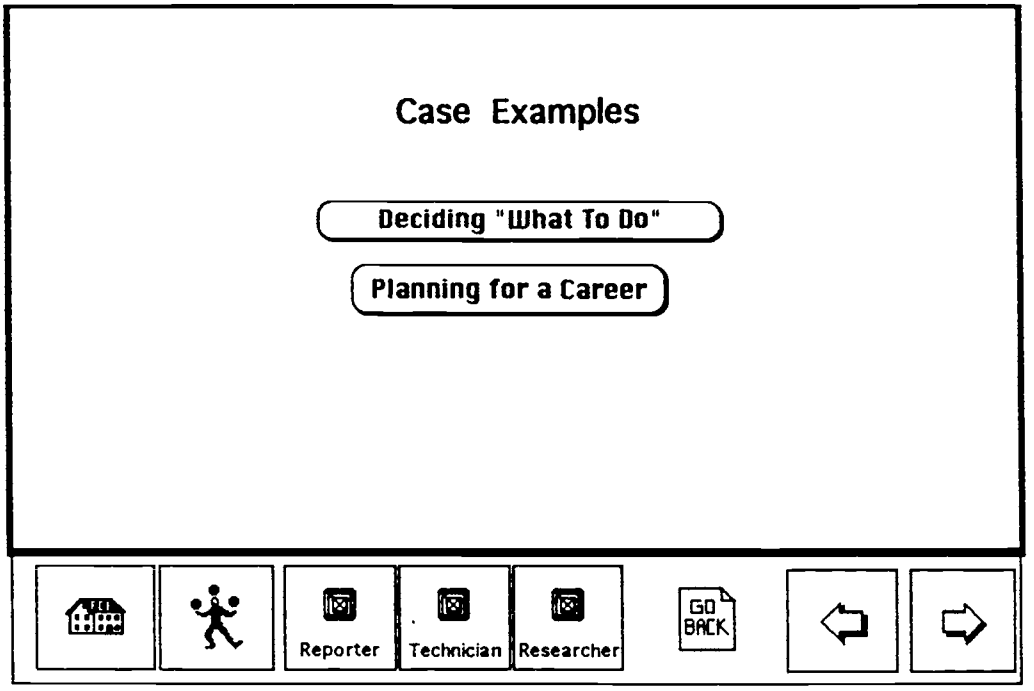
131


The Cost of Employment
Sam and Elaine have been married for eight years and have children ages 2, 5, and 7. Sam is a teacher at the local high school and Elaine is a homemaker. Elaine was 18 when she married Same and did not have the opportunity to attend college. She really enjoys the many rewards of being a mother and wife; however, she believes her life is not really very fulfilling.
Source
Reporter
Technician
Researcher
GO BACK

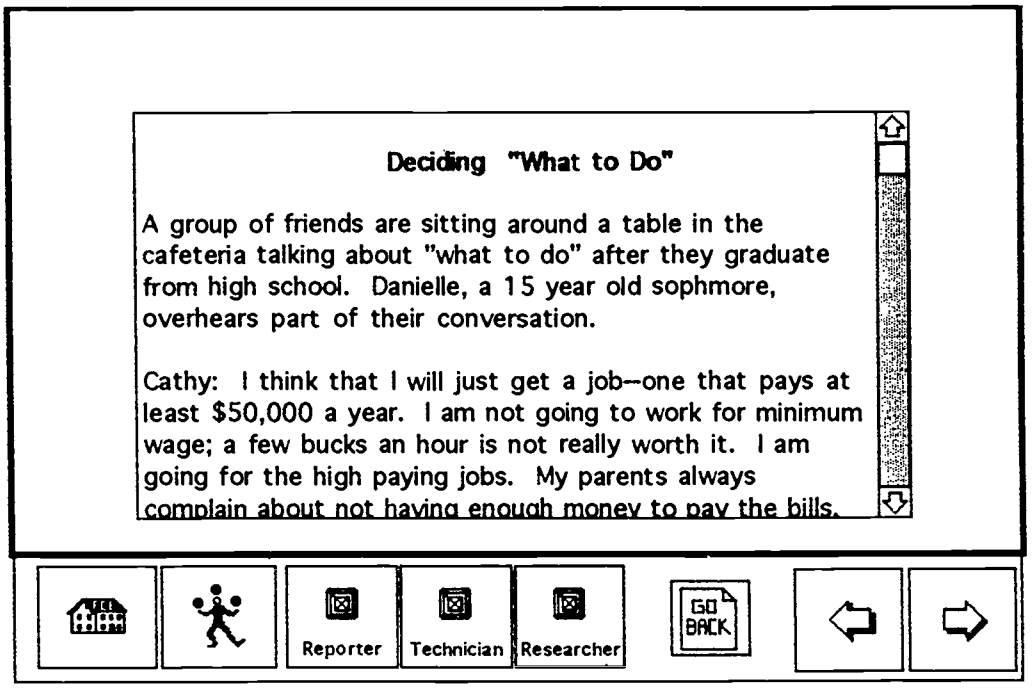

What should be done about career exploration?
Facts
Case Examples
Reporter
Technician
Researcher

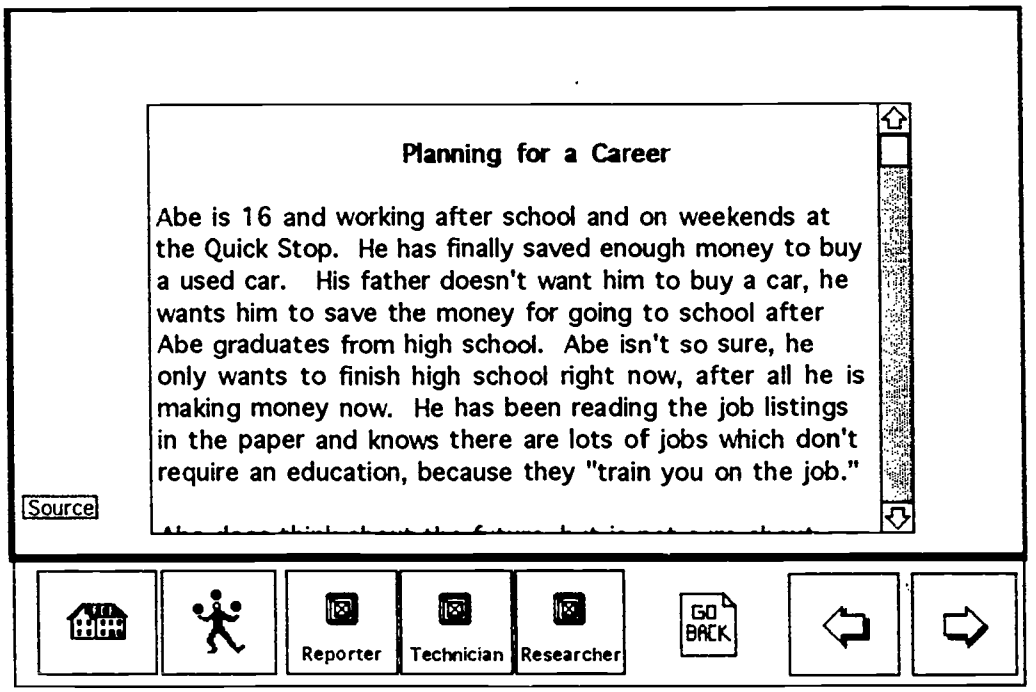
132

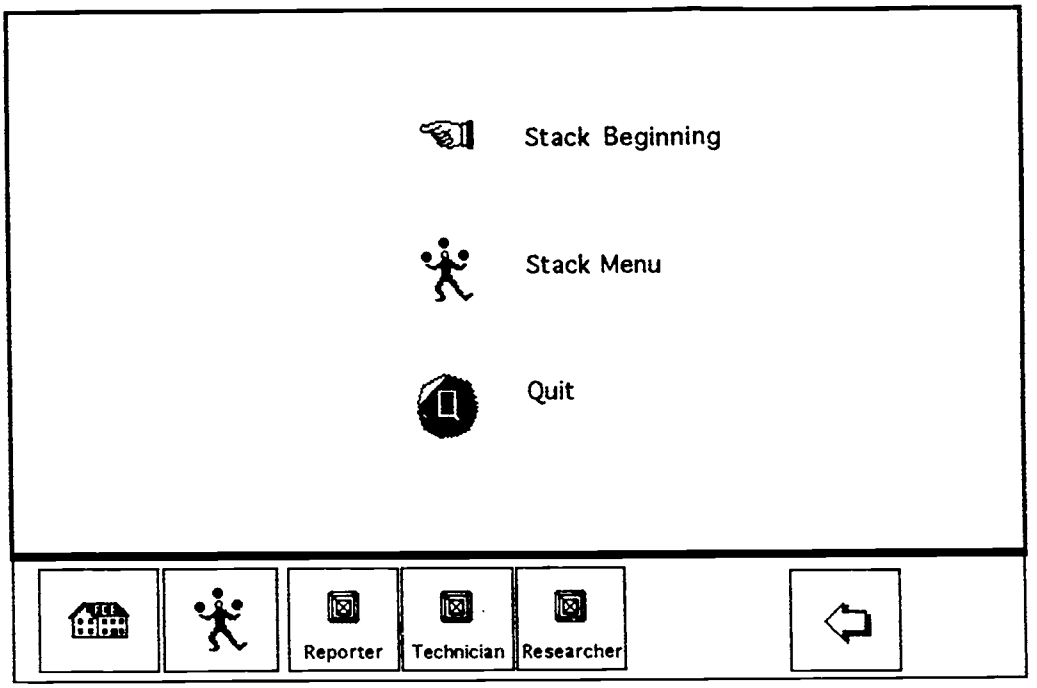

facts about career exploration
Reporter
Technician
Researcher
GO BACK


Case Examples
Deciding "What To Do"
Planning for a Career
Reporter
Technician
Researcher
GO BACK

133

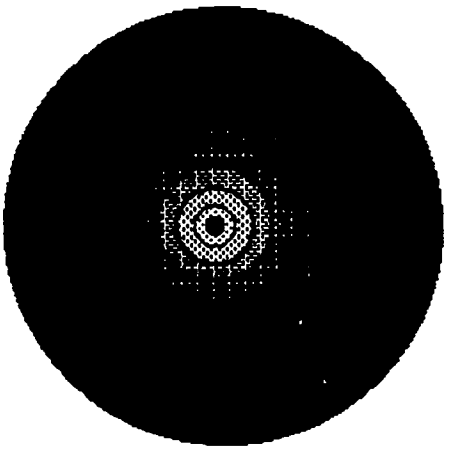

Deciding "What to Do"
A group of friends are sitting around a table in the cafeteria talking about "what to do" after they graduate from high school. Danielle, a 15 year old sophmore, overhears part of their conversation.
Cathy: I think that I will just get a job--one that pays at least $50,000 a year. I am not going to work for minimum wage; a few bucks an hour is not really worth it. I am going for the high paying jobs. My parents always complain about not having enough money to pay the bills.
Reporter
Technician
Researcher
GO BACK


Planning for a Career
Abe is 16 and working after school and on weekends at the Quick Stop. He has finally saved enough money to buy a used car. His father doesn't want him to buy a car, he wants him to save the money for going to school after Abe graduates from high school. Abe isn't so sure, he only wants to finish high school right now, after all he is making money now. He has been reading the job listings in the paper and knows there are lots of jobs which don't require an education, because they "train you on the job."
Source
Reporter
Technician
Researcher
GO BACK

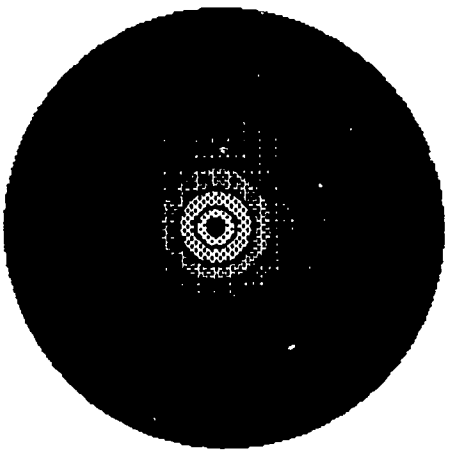

Stack Beginning
Stack Menu
Quit
Reporter
Technician
Researcher

Learning Options: Overview

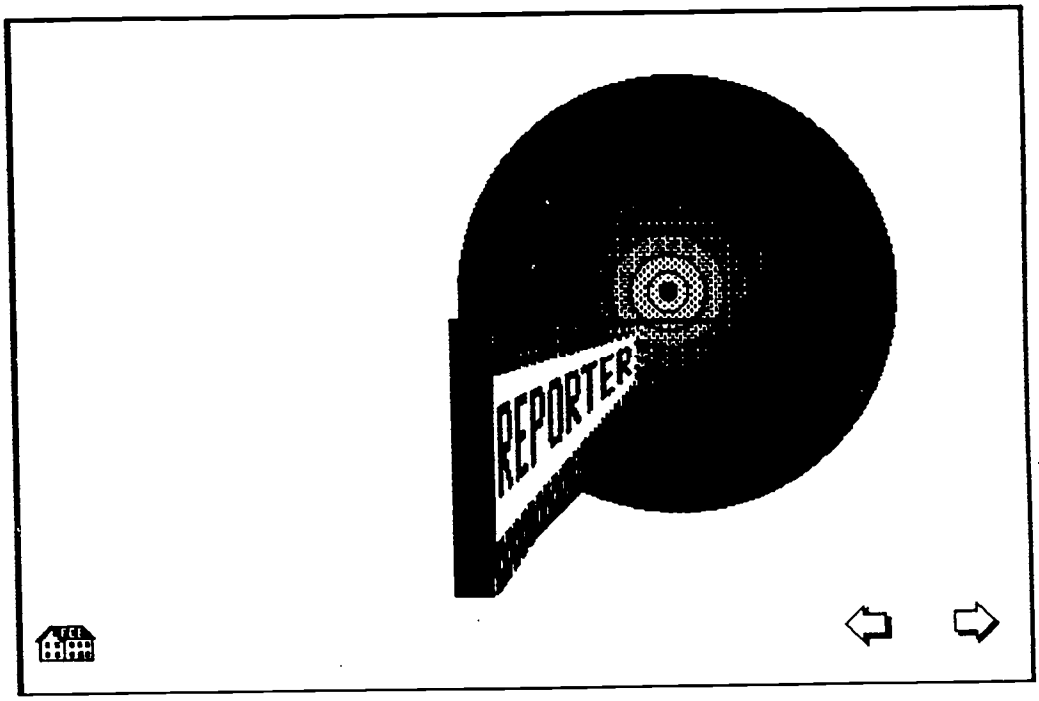
Learning Options
Overview

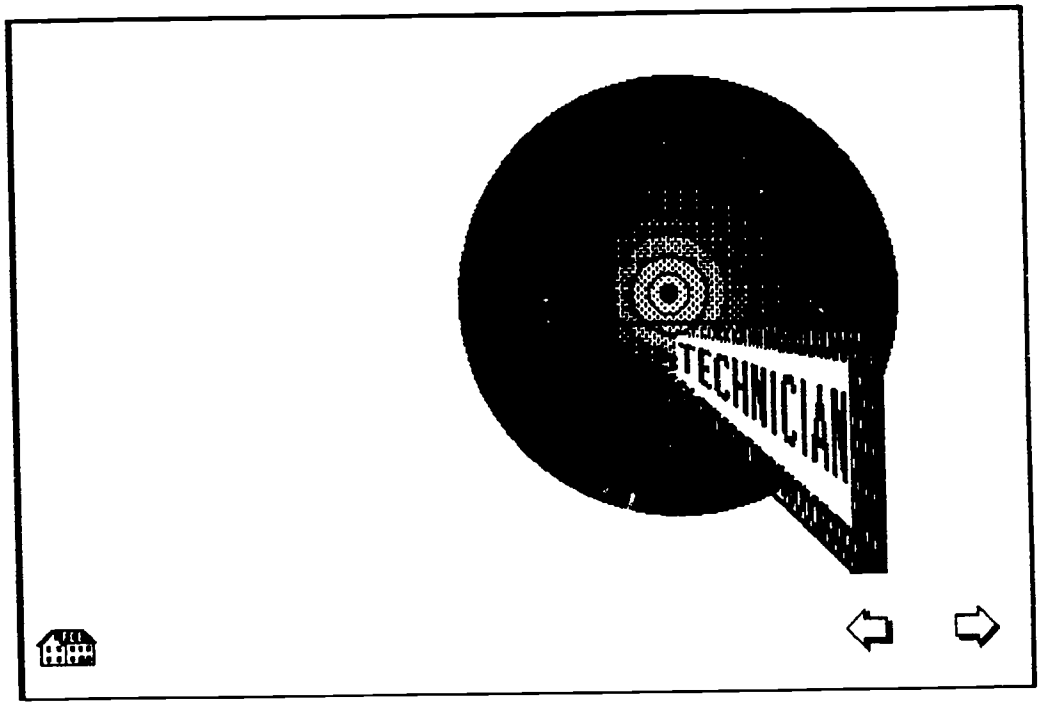


There are three different learning options from which to choose.

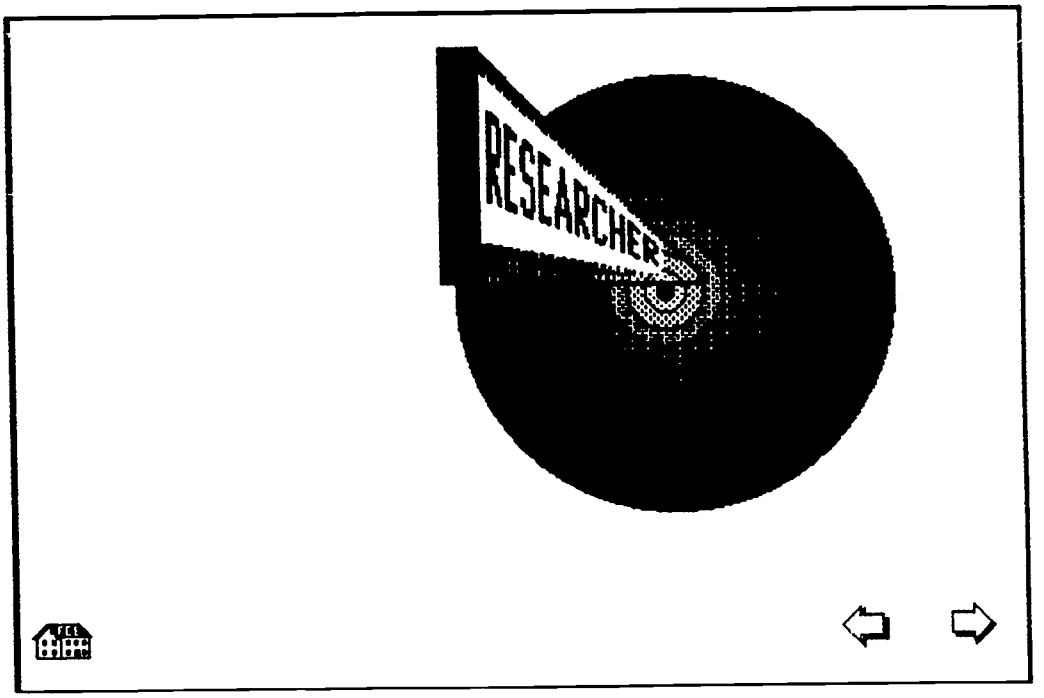


137

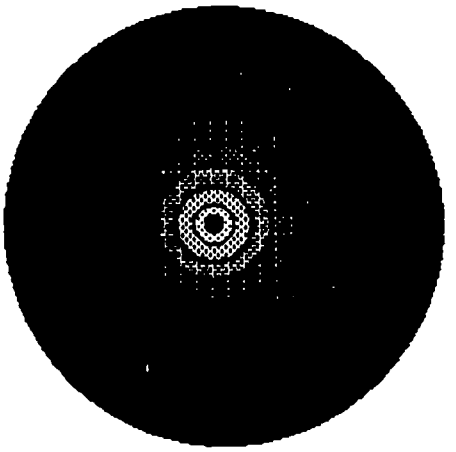




138



Each option seeks to find solutions to continuing concerns of the family.

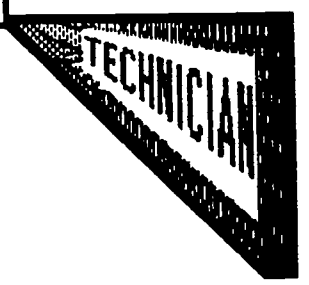


139

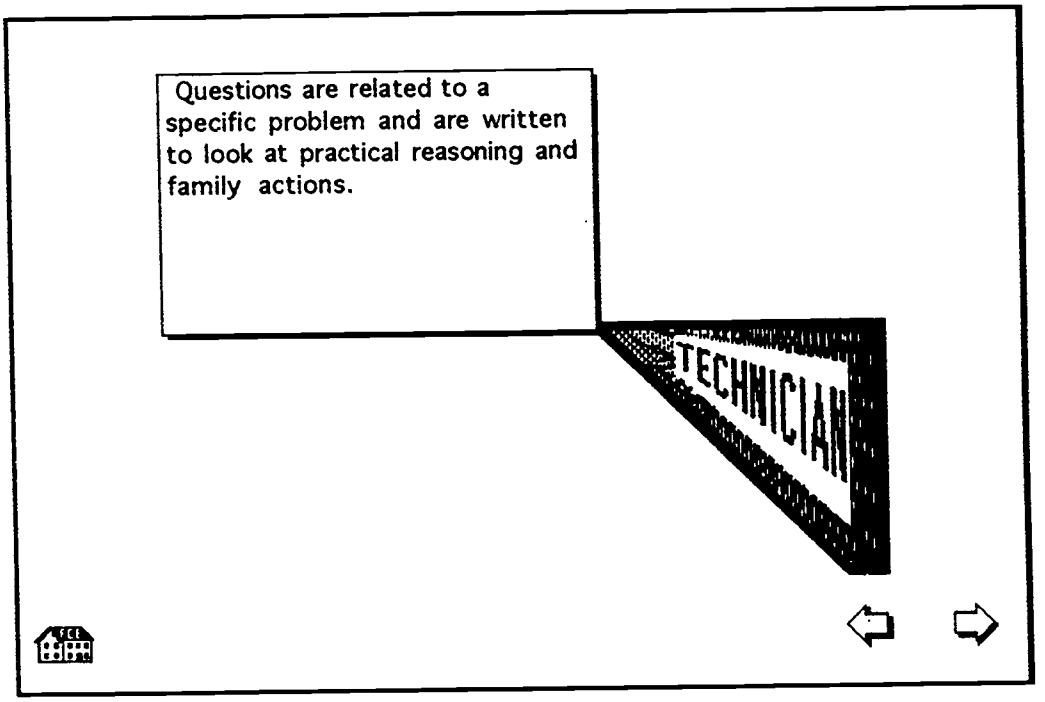
Click on an option for an overview.

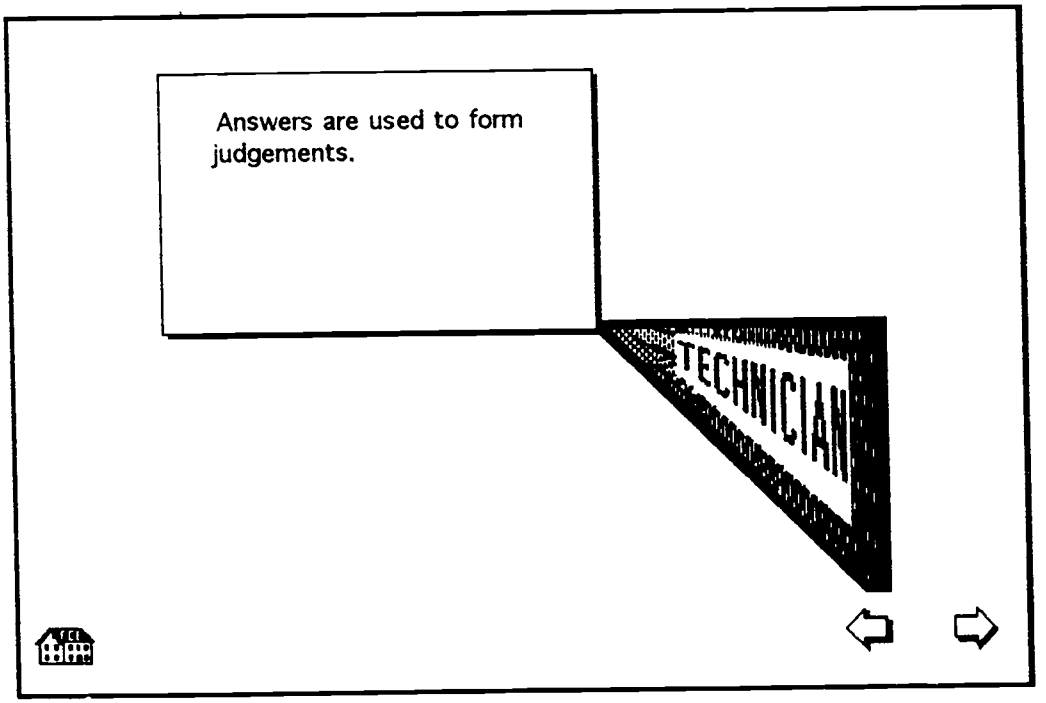
A technician is one who seeks the answers to questions.

Questions are intended to provoke thinking.

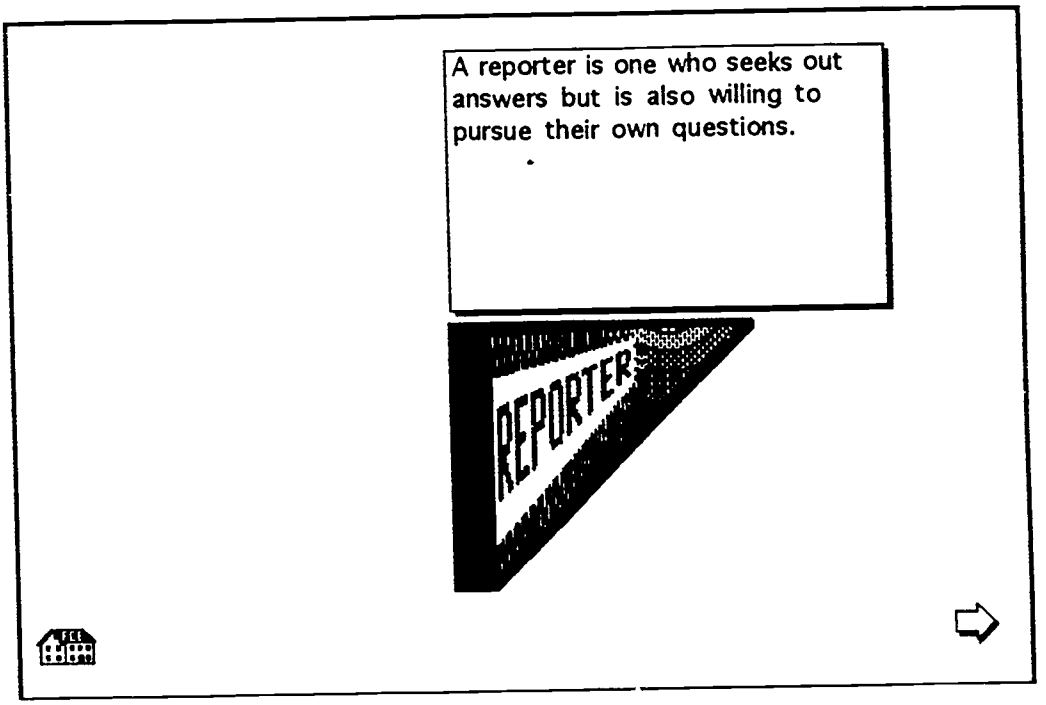


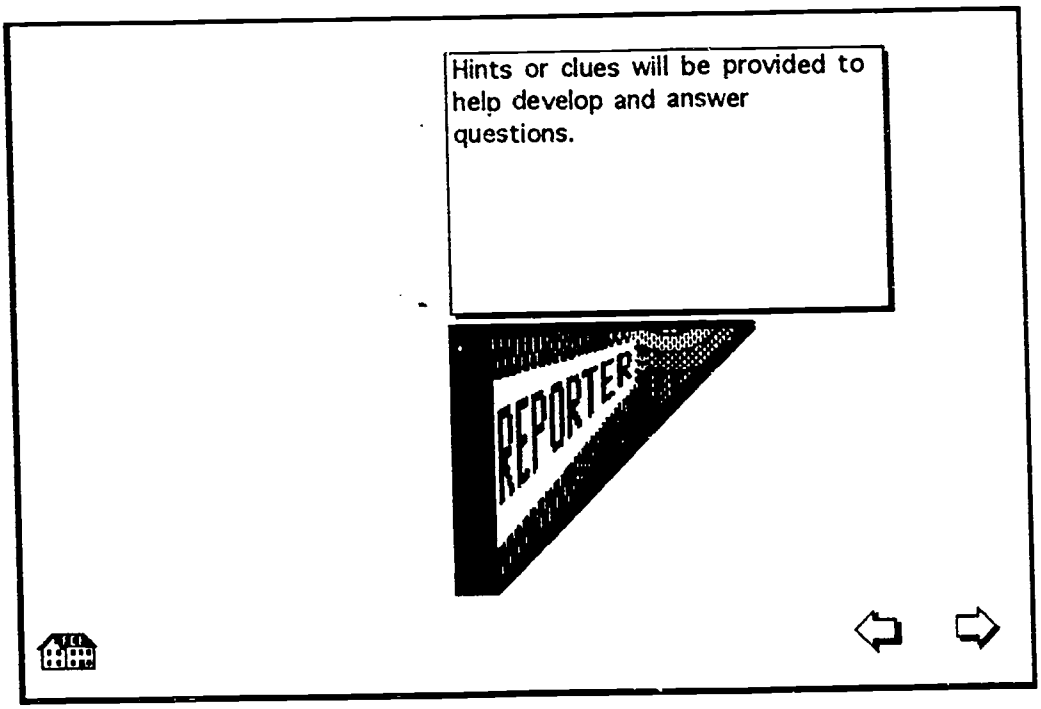
140


Questions are related to a specific problem and are written to look at practical reasoning and family actions.
TECHNICIAN


Answers are used to form judgements.
TECHNICIAN

141


A reporter is one who seeks out answers but is also willing to pursue their own questions.
REPORTER

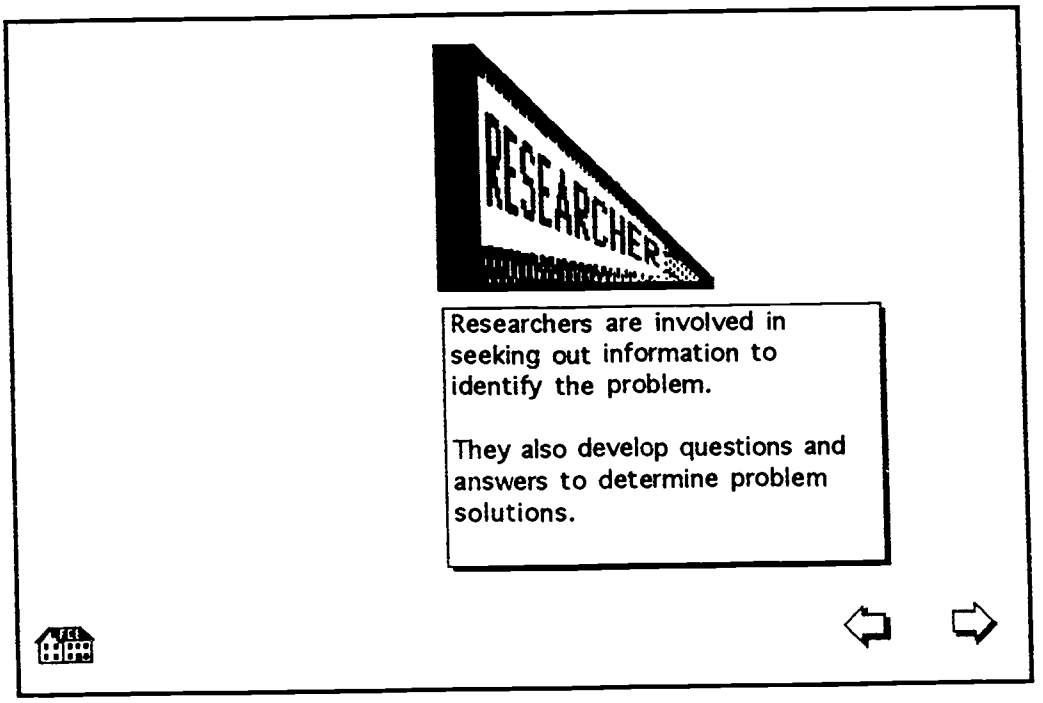

Hints or clues will be provided to help develop and answer questions.
REPORTER

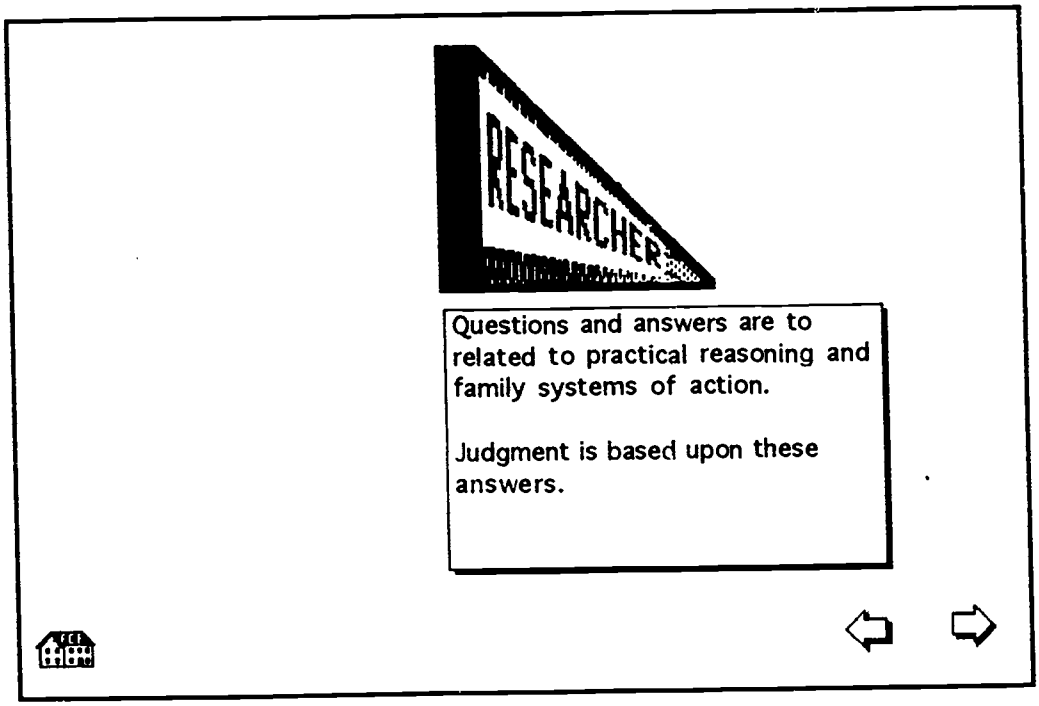
142

Judgment is based upon both practical reasoning and family actions.

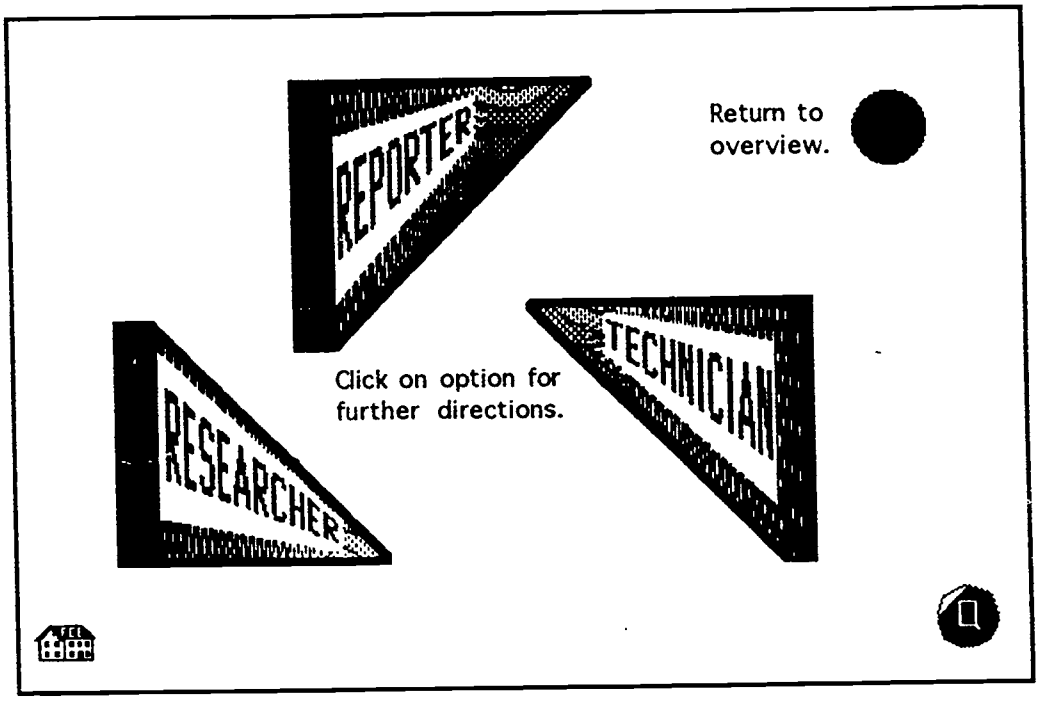
A researcher is one who identifies a problem on their own.

143

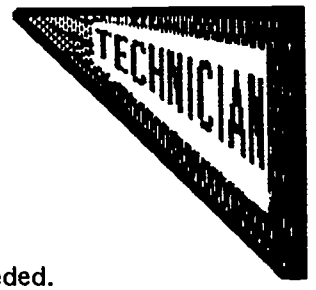

RESEARCHER
Researchers are involved in seeking out information to identify the problem.
They also develop questions and answers to determine problem solutions.


RESEARCHER
Questions and answers are to related to practical reasoning and family systems of action.
Judgment is based upon these answers.

144

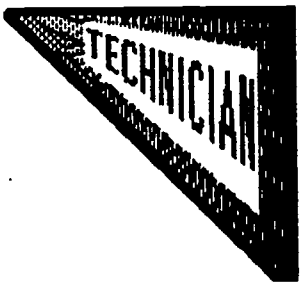

REPORTER
Return to overview.
TECHNICIAN
Click on option for further directions.
RESEARCHER

Technician - Learning Option



Make a copy of this stack on which to write and save your own answers.

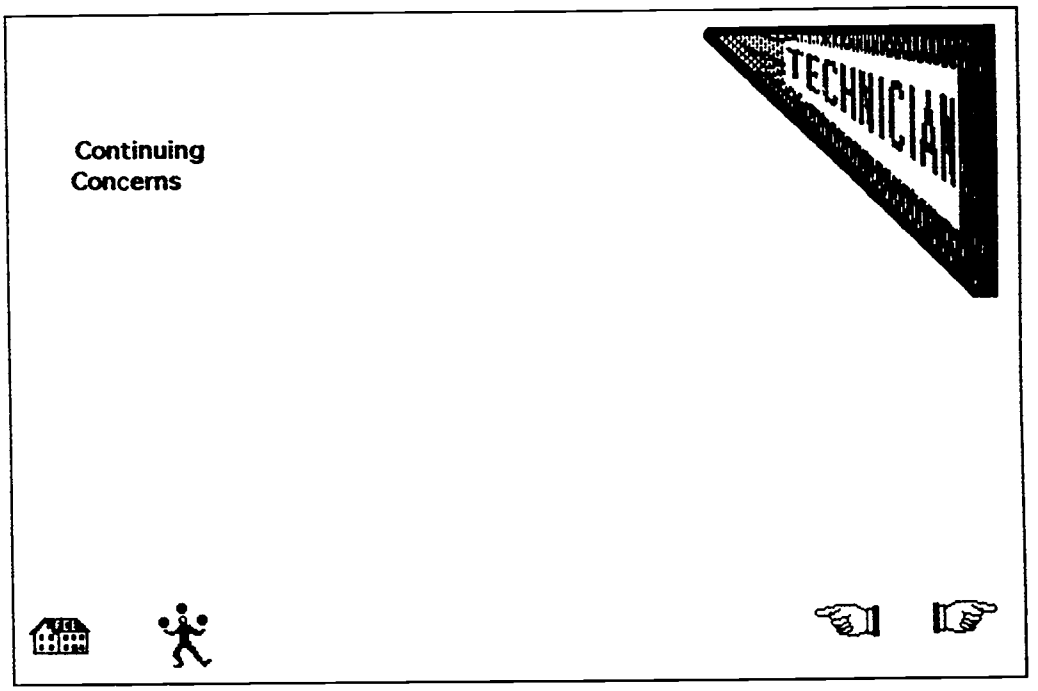
Change fields and add text or pictures as needed.

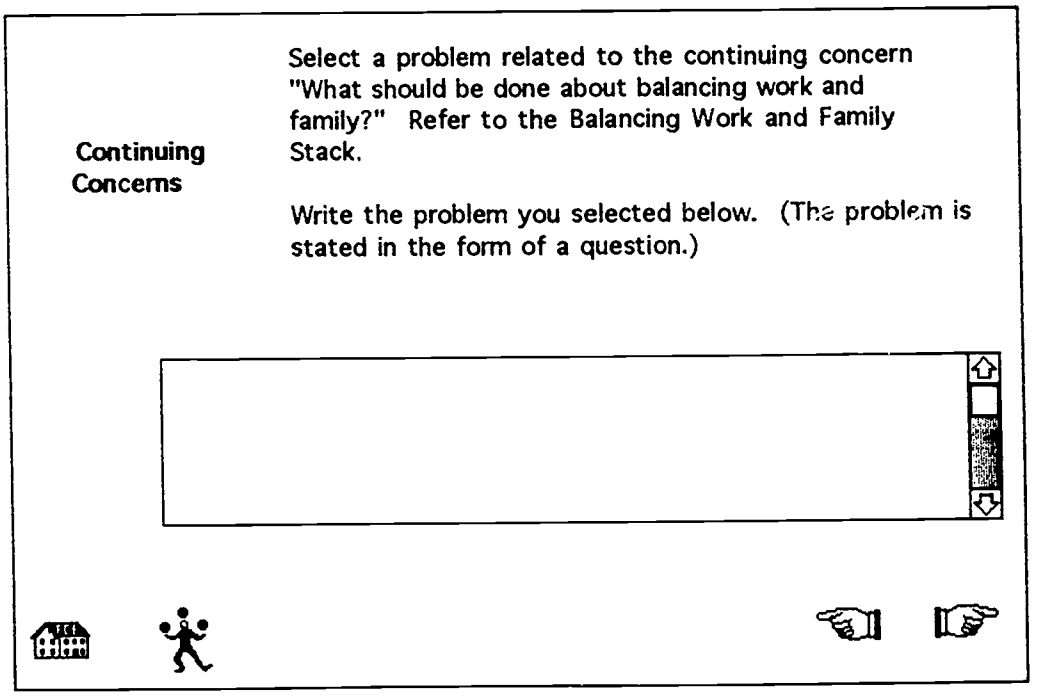


This stack is focuses on three sections:

- continuing concerns
- practical reasoning
- family systems of action

For assistance in these areas, return to the "Family Issues for Analysis" Stack by clicking on the house icon in the corner below.


TECHNICIAN
Continuing
Concerns


Continuing
Concerns
Select a problem related to the continuing concern "What should be done about balancing work and family?" Refer to the Balancing Work and Family Stack.
Write the problem you selected below. (The problem is stated in the form of a question.)

Continuing Concerns

Select a case study from the Balancing Work and Family Stack related to that problem. Write the highlights of the case study in the space below.

Continuing Concerns

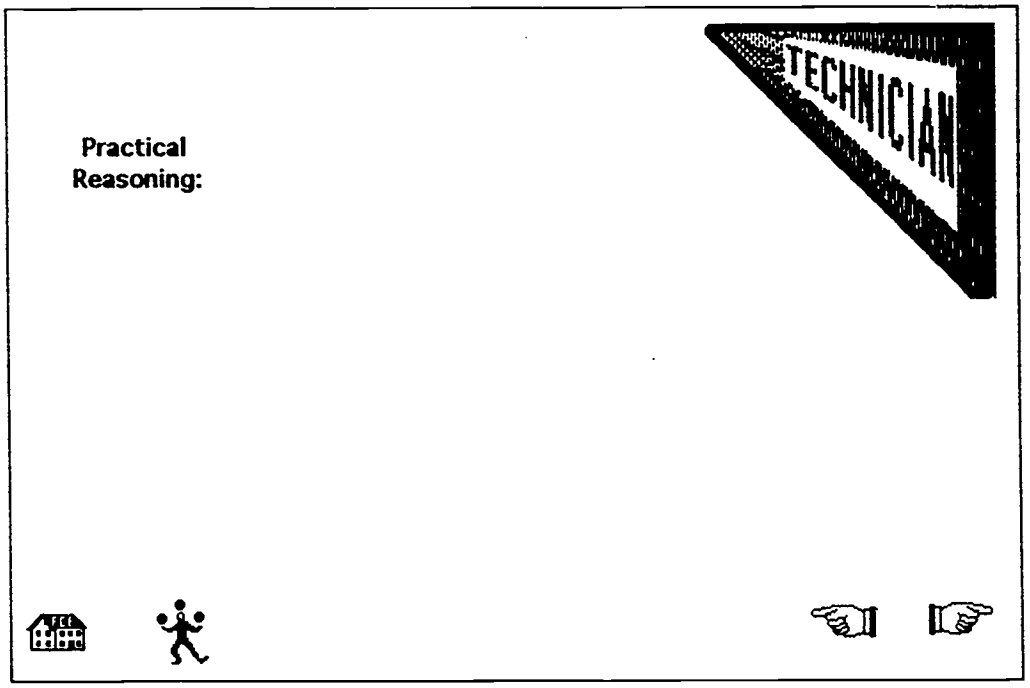
Describe the specific problem(s) in this case study. If the problem did not exist, what would be the ideal situation?

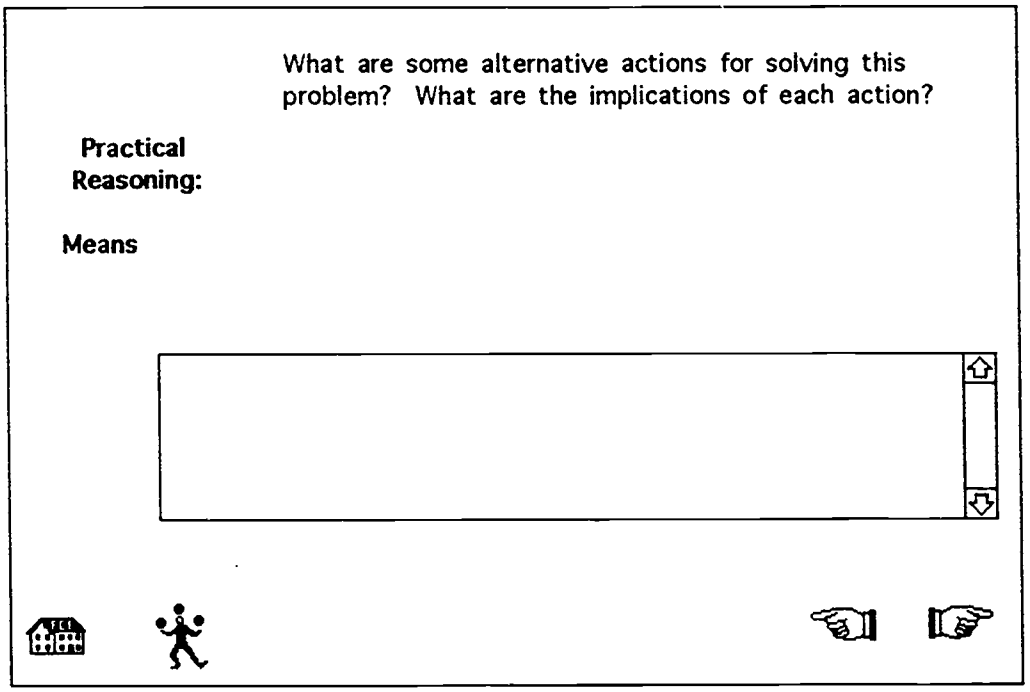
How does this problem relate to others? Would other families experience the same or a similar problem?

Continuing Concerns

How might this problem relate to the future?

Continuing Concerns


TECHNICIAN
Practical
Reasoning:


What are some alternative actions for solving this problem? What are the implications of each action?
Practical
Reasoning:
Means

151

What specific steps might be taken to reach valued ends?

Practical Reasoning:

Means

What are the consequences related to each action?

Practical Reasoning:

Consequences

Identify three sources which discuss these consequences. How are these sources reliable?

Practical Reasoning:

Consequences

What are possible outcomes or goals related to the problems described in the case study?

Practical Reasoning:

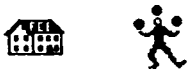
Valued Ends

153

What are the different views or perspectives of those people who are involved?

Practical Reasoning:

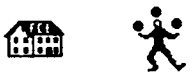
Valued Ends



Describe the facts or condition related to the problem.

Practical Reasoning:

Context

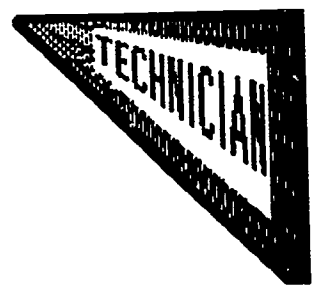


1.54

Form a judgement about what ought to be done.

Practical Reasoning:

Judgment

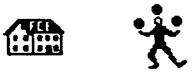


Family Systems of Action

155

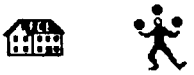
Describe technical action which may be taken in answering this problem.

Family Systems of Action: Technical



What are the consequences related to each of these actions?

Family Systems of Action: Technical



What are some possible communicative actions which might be taken?

Family Systems of Action: Communicative

What are the meanings behind these actions?

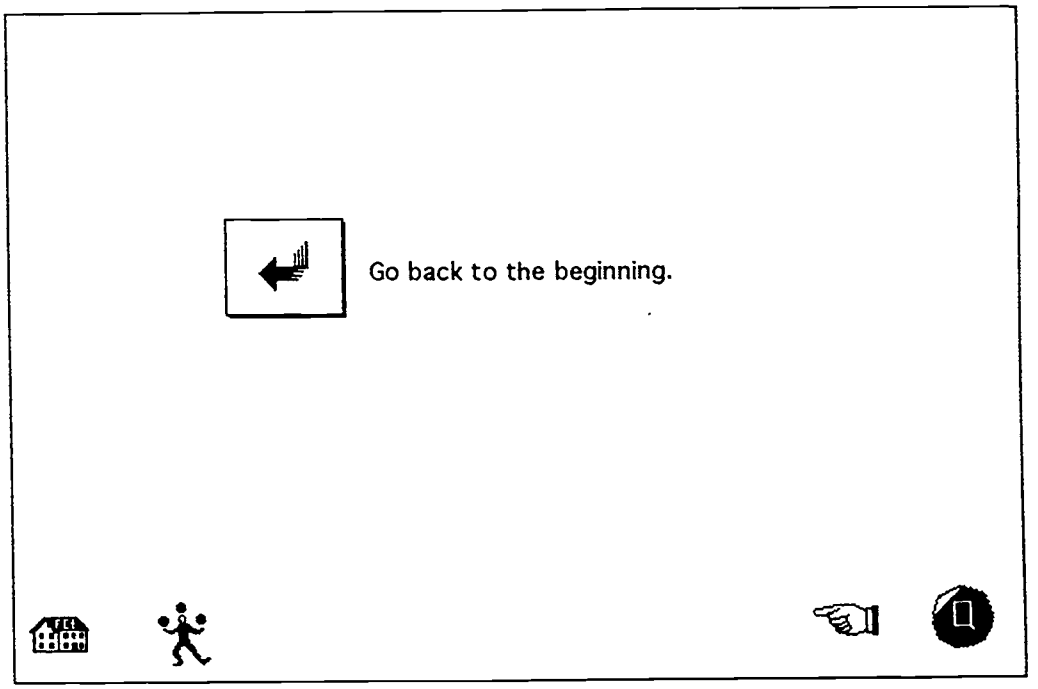
Family Systems of Action: Communicative

What are some possible reflective actions which may be taken with regard to this problem?

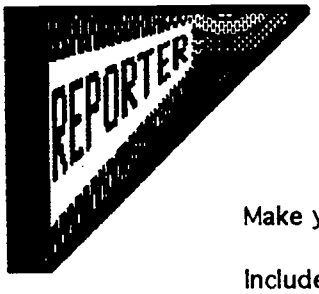
Family Systems of Action: Reflective

What are the facts and context related to these reflective actions?

Family Systems of Action: Reflective


Go back to the beginning.

Reporter - Learning Option



Make your own stack.

Include text, graphics and pictures as support to your stack.

Select a specific problem related to the continuing concern "What should be done to balance work and family?"

Include the following parts:

Continuing Concerns

Write a case study which is an example of a specific problem (related to the continuing concern of balancing work and family). Clearly define the problem and gap betwen what is and what should be?

Practical Reasoning

What are the valued ends, context, means and consequences related to the problem?

Form a judgement regarding the specific problem.

Family Systems of Action

Examine possible technical, communicative and reflective actions that familes might take in solving the specific problem.

Return to the begining.

Researcher - Learning Option

Researcher

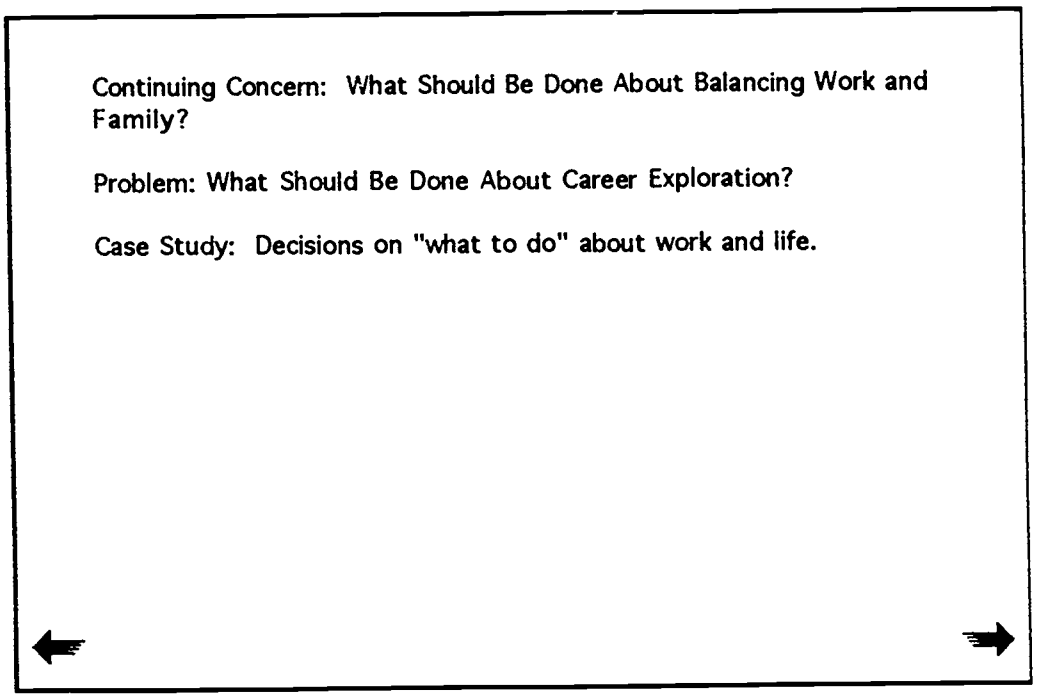
Make your own stack.

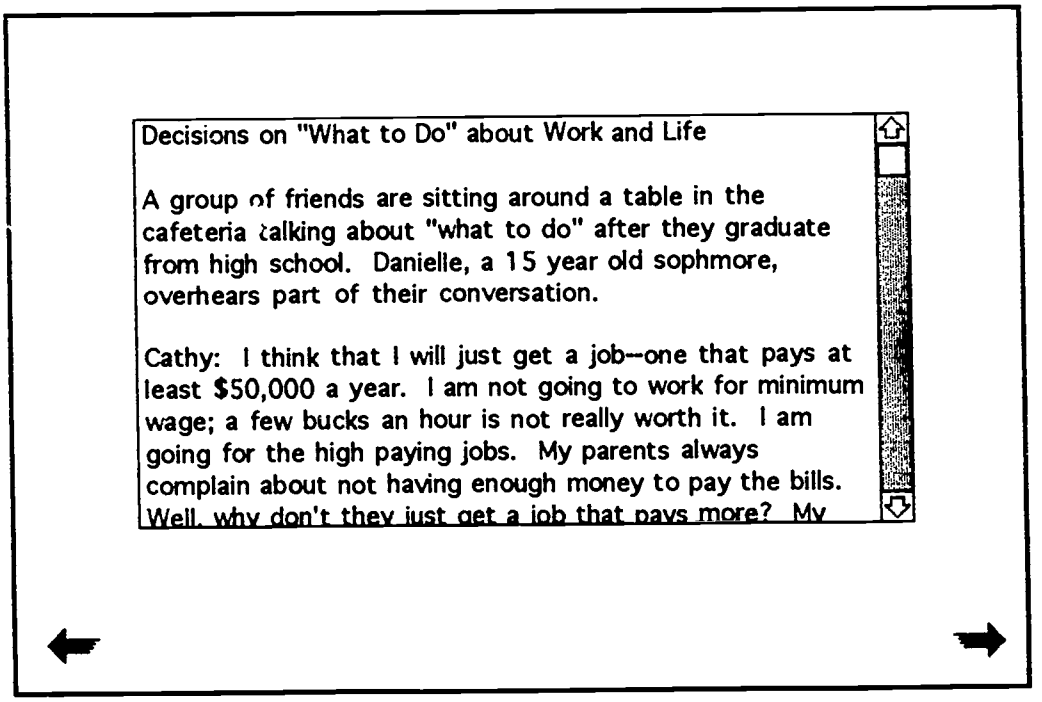
Identify a continuing concern and specific problem related to that concern.

Write a case study which illustrates the problem. Examine various actions which familes might take in solving this problem.

Form a judgement regarding what to do about the problem.

Sample Student Investigative Project


Continuing Concern: What Should Be Done About Balancing Work and Family?
Problem: What Should Be Done About Career Exploration?
Case Study: Decisions on "what to do" about work and life.


Decisions on "What to Do" about Work and Life
A group of friends are sitting around a table in the cafeteria talking about "what to do" after they graduate from high school. Danielle, a 15 year old sophmore, overhears part of their conversation.
Cathy: I think that I will just get a job--one that pays at least $50,000 a year. I am not going to work for minimum wage; a few bucks an hour is not really worth it. I am going for the high paying jobs. My parents always complain about not having enough money to pay the bills. Well, why don't they just get a job that pays more? My

What is the problem in this case study?

All the people in this case study do not seem to look at their future realistically. People have different experiences, some prepare people better than others for work roles.

What "should be"?

We need to think about our experiences and influences on our lives when preparing for work roles.

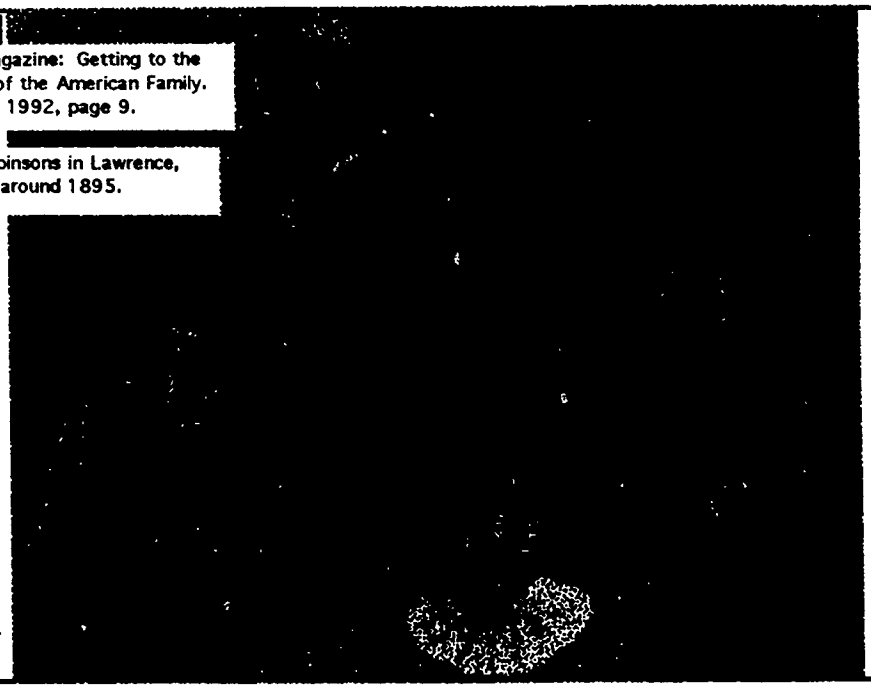
The history of our families influences "who we are."

Source

Life Magazine: Getting to the Heart of the American Family. July 1, 1992, page 9.

Info

The Robinsons in Lawrence, Kansas around 1895.



Source

Life Magazine: Getting to the Heart of the American Family. July 1, 1992, pg. 12.

Info

The Templins in Birmingham, Alabama, 1956.

BEST COPY AVAILABLE

At birth males and famales are treated differently.

Set Player

1. Click here to set laserdisc player model.

Play Laser Disc

2. Click here to play a segment of the videodisc "Secret of the Sexes" about the sex roles we teach children. Source

Young, Veronica L. (1980). Secret of the Sexes (Laserdisc). Nova Series.

BEST COPY AVAILABLE

We are given messages from many sources about work and families . . .

. . . from children's stories . . .

"While her brother worked sixteen-hour days at the grit factory, Wilhelmina Sloath lay on her sofa, munched one-pound bags of potato chips, watched people win huge prizes on televison game shows, and sighed "Life is no fair." "

Manes, Stephen (1985). Life is no fair. NY: E.P. Dutton.

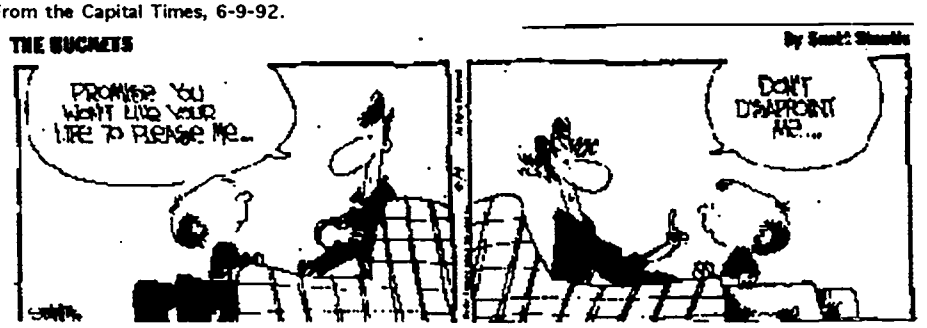
BEST COPY AVAILABLE

Source

The Buckets by Scott Stantis.

. . .from comics . . . .

From the Capital Times, 6-9-92.



. . . .from music . . . .

Play It

Click here to here the song
"Working Nine to Five" by Dolly Parton.

. . . and "Dear Abby" . . .

Respect person's 'honest work'

Source

DEAR ABBY: I cannot forget a letter you had written in your column some time ago. It was written by a person who didn't know what to say when he (or she) was asked what he did for a living. From the tone of the letter I concluded that the person was working for minimum wage, or doing some kind of manual labor of which he was somewhat ashamed.

This, coupled with tne remark a school principal made, prompts this letter.

My son was having problems in school, so his teacher took him to the principal. In talking to may son, the

End of Stack

Chapter 5
Availability and Use of Computer Technology in Wisconsin Family and Consumer Education Programs

Survey Overview

As a part of this project, a survey of Wisconsin Family and Consumer Education teachers was conducted to determine the present availability and use of computer technology that may have implications for the application of hypermedia in Wisconsin Family and Consumer Education programs. A questionnaire regarding both the availability and present use of computers was developed and mailed to a random sample of 200 Family and Consumer Education teachers in February, 1992. After a follow-up to non-respondents, a total of 96 instruments were returned. Of these, 92 contained usable information and were included in the final data analysis. Follow-up calls to a sample of 14 nonrespondents did not indicate significant differences in the responses between respondents and nonrespondents. The survey instrument, and responses organized according to survey questions, are included in the following pages.

Two-thirds of the respondents were in high schools and the rest in elementary, middle, or multi-grade schools. About 70% of the respondents reported using computers for direct instructional purposes; most of these reported using computers just once or twice per class. Only a third of the teachers used computers in at least half of their classes (question 1). About a third of the teachers apparently do not use computers for direct instructional purposes at all.

Slightly more teachers reported using computers for purposes other than direct instruction. Close to 60% indicated they used the computer at least monthly and only about one-fourth said they did not used computers at all.

Respondents indicated they most often used computers for individual (31.5%) and small group (15.2%) instructional purposes, or both (14.1%) (question 3). For instruction-related purposes, computers

are used mostly for word processing (40%) and grading (question 4).

Well over half of the teachers reported talking with teachers in other departments about sharing computer equipment or facilities (56.2%, question 5), but fewer than one-fourth (question 6) reported ever having discussed interdisciplinary computer-based instructional applications. Only 7.6% have thus far used hypertext or hypermedia technology applications (question 7). Computers appear to be used mostly for drill and practice and for assistance with short term tasks, such as carrying out nutrient analysis of dietary intake, simulating budgeting situations or estimating recipe and/or meal costs (question 8).

Interestingly, teachers report access to computer hardware as both the greatest facilitator and barrier to the use of computers (questions 9 and 10). Other barriers reported by teachers were software available, time, and teacher knowledge.

Responses indicate that teachers are aware of computer literacy initiatives in their schools; nearly all reported it being addressed either as a separate course or in integrated fashion. Almost half of the schools reported that students are required to take a separate course or unit of instruction (questions 11 and 12) in computer science. Teachers with business or business and math backgrounds appear to be doing most of the instructing in the separate computer courses offered in these schools (question 13).

Family and Consumer Education teachers reported a range of levels of personal comfort with their present ability to use computers. Less than one in five is completely comfortable. Close to half are somewhat comfortable, and nearly 30% are not comfortable at all.

Results indicate that some type of computer is available to 53% of the teachers in their own classrooms and to 89% of the teachers elsewhere in school. Almost 50% of the respondents reported having one or more Apple computers in their classroom and over 80% reported having Apple computers available elsewhere in their school (question 15). Macintosh and IBM computers are not frequently found

in individual classrooms, however, about half of the teachers reported having Macintosh computers available elsewhere in their schools, and 40% of the teachers reported the same with respect to IBM computers (questions 16 and 17). Equipment suitable for hypermedia applications is beginning to become available in the schools for Family and Consumer Education teachers. Of the respondents, approximately one third indicated they had access to a CD-ROM player and scanner, and one-fourth to a laserdisc player. Computer controlled videoplayers seem to be less available (question 19).

The results of this short survey suggest that computers and related technology are much more readily available to Family and Consumer Education teachers than they were only a few years ago. Petrich reported in 1987, for example, that only 4% of Wisconsin Family and Consumer Education teachers had one or more computers in their department and that there was no computer available in the building for 37% of teachers.

An important question is whether the equipment that is now available to Family and Consumer Education teachers will be appropriate for taking full advantage of the potential of hypertext/hypermedia for fostering thinking and reasoning skills.

Hypermedia software is available for the Apple II line of computers that seem to be so popular in schools (for example, HyperStudio and Tutor-Tech) and this may be a good place for teachers to begin. Before proceeding, however, teachers will likely want to explore what other equipment is available elsewhere in their schools, and whether and how it might be used for hypermedia applications. Software developed for use on Macintosh computers (especially HyperCard) is more sophisticated and has been more widely used generally. Thus, there are more application examples available that are consistent with the Macintosh format. These include thousands of educational HyperCard stacks available in the public domain or as shareware in addition to many commercial products based on HyperCard (Franklin & Kinnell, 1990).

An equally important need will likely be for teachers to have an opportunity to become familiar with possible hypertext/hypermedia applications from a program planning perspective. Very few Family and Consumer Education teachers appear to have had the opportunity to become familiar with hypertext software. The majority of the teachers appear to have been using computer technology in very traditional ways; for linear and/or teacher-directed activities. The concern about availability of equipment may related to how the teachers have traditionally thought about computer use; mainly as a tool for individuals, or shared by small groups for individual purposes. Use for collaborative activities may not be considered as an important possible application.

Part of the teachers' hesitancy about their computer expertise may be related to the notion that the teacher must function as the director of learning and the major classroom "expert" when using technology. This philosophy need not prevail when using hypertext authoring systems. A major strength of such systems is their ability to facilitate greater learner initiative and control. However, given that 30% of the teachers do not feel at all comfortable with computer technology, and half feel only somewhat comfortable, it does appear that there is a need for a good deal more teacher inservice on the use of computer hardware and software.

Given that relatively few teachers have initiated discussions with teachers in other departments about collaborative teaching and learning, there appears to be a need for further exploration of this kind. Family and Consumer Education teachers may want to investigate the possibility of more collaborative learning ventures with teachers of computer sciences courses as well as teachers of other vocational and academic subject areas. Results of the survey indicate that business and math teachers may be important first contacts. Hypermedia applications lend themselves well to interdisciplinary and multidisciplinary educational efforts.

References

Franklin, C. and Kinnell, S.K. (1990). Hypertext/hypermedia in schools. Santa Barbara, CA: ABC-CLIO.

Petrich, B. (1987). Computers in home economics teacher education: Survey data related to decision-making. Journal of Vocational Home Economics Education, 5(1), 51-58.

Computers in Family and Consumer Education Questionnaire

This Questionnaire is designed to gather information about the present availability and use of computer-based technology in Family and Consumer Education programs in Wisconsin, the information is essential for future-oriented program planning efforts that take into account the short and long-term contributions technology can make to family-focused and other major contemporary school restructuring initiatives.

Please answer the questions below as completely as possible, fold the questionnaire as indicated and return as a self-mailer. Because you were selected as part of a carefully constructed Wisconsin sample, you help in developing a complete state picture is vital! Thank you in advance for your help and cooperation.

I. Computer Use - Please check the most appropriate response.

1. My use of computers for direct instructional purposes (those involving students) can be characterized mostly as:

Check one:
_____ Daily
_____ Weekly
_____ Monthly
_____ Once or twice per class
_____ Not at all

Check one:
_____ At least half of my classes
_____ Less than half of my classes

2. My use of computers for purposes other than direct instruction (e.g. word processing, record keeping, grading) can be characterized mostly as:

_____ Daily
_____ Weekly
_____ Monthly
_____ Once or twice per term
_____ Not at all

3. My most frequent direct instructional use of computers involves mainly:

_____ individual student use (students work alone on activities such as drill & practice, diet analysis, word processing, games)

_____ small group use (students work in pairs or small groups on activities such as drill & practice, games, other programs)

_____ large group (whole class presentations)

_____ not applicable

4. My most frequent instruction-related use of computers involves:

_____ word processing
_____ departmental record keeping/data base management
_____ grading
_____ other (please describe)_____
_____
_____
_____ not applicable

5. I have talked with teachers in other departments about sharing computer equipment and/or facilities;

_____ no
_____ yes (please describe)_____
_____
_____

6. I have talked with teachers in other departments about developing interdisciplinary lessons and/or courses:

_____ no
_____ yes (please describe)_____
_____
_____

7. I have used hypertext/hypermedia software (for example, HyperCard, ToolBook, Guide):

_____ no
_____ yes (please describe software and specific use)_____
_____
_____

8. An example of my favorite instructional use of computers is as follows:

Lesson title:

Software program title and publisher:

Student activity:

Especially desirable characteristics of this use:

9. The three factors that most serve to facilitate my use of computers are:

1.

2.

3.

10. The three factors that are the greatest barriers to my use of computers are:

1.

2.

3.

11. Computer literacy is addressed in my school mainly by:

_____a. having students take a separate computer course or unit
_____b. integrating computer use in subject-area classes
_____c. both separate course(s) and integration

12. A separate computer course or unit is required for all students in my school:

Check one:	Check one:
_____ no	_____ course
_____ yes	_____ unit

13. If applicable, the subject-matter background of the person who teaches the separate course is:

_____

14. My comfort with my present ability to use computers for instructional purposes could best be described as:

_____ Completely comfortable
_____ Somewhat comfortable
_____ Not comfortable at all

II. Equipment Availability - Please list the computer equipment available for use by you and your students.

15. Apple Computer

Model	No. available in your classroom	No. available elsewhere in school

16. Macintosh Computers

Model	No. available in your classroom	No. available elsewhere in school

17. IBM Computers

Model	No. available in your classroom	No. available elsewhere in school

18. Printers

Model/Brand	No. available in your classroom	No. available elsewhere in school

19. Other Computer-Controlled Equipment

	No	Yes	If yes, brand
CD-ROM player			
Laserdisc Player			
Scanner			
LCD Overhead Projector (for computer)			
Computer-controlled Videotape player			

Computers in Family and Consumer Education Summary Data

	number	percentage
surveys sent	200	
returns	96	
used in summary	92	

Type of School

elementary	2	2.2
middle school	21	22.8
junior high	7	7.6
middle school/high school	2	2.2
high school	59	64.1
other	1	1.1

I. Computer Use

Question 1: Teacher use of computers for direct instruction purposes

	number	percentage
daily	1	1.1
weekly	6	6.5
monthly	10	10.9
once or twice per class	42	69.6
not at all	28	30.4
no response	5	5.4
at least half of my classes	31	33.7
less than half of my class	30	32.6
no response	31	33.7

Question 2: Teacher use of computers for other than direct instruction

daily	15	16.3
weekly	26	28.3
monthly	13	14.1
once or twice per term	12	13.0
not at all	24	26.1
no response	2	2.2

Question 3: Most frequent direction instructional use of computers

individual student	29	31.5
small group	14	15.2
large group	5	5.4
not applicable	27	29.3
no response	2	2.2

additional responses:

individual and small group	13	14.1
small group and large group	1	1.1
ind., small and large group	1	1.1

Question 4: Most frequent instruction-related use of computers

word processing	37	40.2
record keeping/data management	3	3.3
grading	4	4.3
other	6	6.5
not applicable	20	19.8
no response	1	1.1

additional responses:

wp and record/data	4	4.3
wp and grading	9	9.8
wp, record/data and grading	1	1.1
wp, grading and other	2	2.2
wp and other	4	4.3
record/data and grading	1	1.1

Question 5: Teacher has talked with teachers in other departments about sharing computer equipment and/or facilities

no	39	42.4
yes	52	56.3
no response	1	1.1

Question 6: Teacher has talked with teachers in other departments about developing interdisciplinary lessons and/or courses

no	68	76.1
yes	22	23.9
no response	2	2.2

Question 7: Teacher use of hypertext/hypermedia software

no	83	90.2
yes	7	7.6
no response	2	2.2

Question 8: Teacher's favorite instructional use of computers

answers are ordered as follows:

survey number
lesson title
student activity
especially desirable characteristics of his use
software program title and publisher

38
resumes
students type up resume for join in food related career

PFS write

40
create a t-shirt
design and print up; heat transfer
creativity-motivation-shows wide range

86
diet analysis
diet analysis
meet RDAs
Orange Juice Software System

106
(no title)
students enter what they ate
computer program prints out nutritional evaluation
What Did You Eat Yesterday?

108
You are What you
eat
Analyze family dies, basic food nutrients and calorie information; challenge games at 3 different levels. has us FDA values
Enables students to think logically and critically about nutrition. Include carts, matching, planning and puzzles. Analyses nutrition label.
Food for thought. Sunburst Grades 6-12

118
(no title)
diet analysis
printout is given along with suggestions for diet changes
What did you eat yesterday?

135
Budgeting
group use of simulation
lends itself to unit-math based worksheets
Managing LIfestyles- Sunburst

139
Throughout Consumer Education Course
Problem solve ; compare alternatives
Students can create and solve their own problems
Financial cookbook, South-Western

145
Nutritional intake
record 1 day food intake/analyze
Good information print out and provides a sheet for follow-up
What did you Eat Yesterday? Learning Seed

152
Diet Analysis
Compute food intake
Analysis of diet (I have one for housing simulations)
1. What did I eat yesterday? 2. Eating Machine

154
Money Management
Planning expenditures

CW Publishing Lifestyles, You Decide I, II Making Ends Meet

162
Fibers
Fiber Basics
Cannot go to next until scoring high on a quiz

171
Amortization of loans
run amortization of loans for economics unit
immediate feedback to students
MECC business Vol. 1 ver 4.3

175
sugar and fat in diet

Sweet tooth - Apple, Grease - Apple

177
There's a Career in HE
input by answering
infor. about jobs, student can se change based on different likes/dislikes

190
Job preparation/ HERO
resume writing/lette· writing/ prep of employee portfolio for STAR competitive events
an class requirements
print quality, revisions required to update and correct

205
floor plan arranging
floor plan arranging for a room have already built in tech ed and decorate in FCE
saves kids time and "doodle paper"; much more realistic to them
Floor Plan, The Learning Seed

218
Career interest inventory
find careers related to their interest
self pace, outcome individualized
Voca. Interest Profile Report, Cambridge Career Products and Career Interest Program
Opportunities for Learning, Inc

239
Eating Machine
for nutrition

252
(no title)
Word processing hand outs. Assignments and unit tests
efficiency
Microsoft Works

262
You are what you eat
students analyze diets
It gives students a detailed print out

333
You are what you eat
nutrition information

354
Finding housing to meet specific needs

very practical for students
House Hunt, Orange Juice

395
Career Options
students fill out self exploration workbook
use computer to sort through carers and "spit out" choices based on their self assessments
WCIS

435
Body Language

ease

468
Nutritious eating in a fast food restaurant
compare restaurants and foods
Can evaluate their menus choice at their favorite restaurant
Fast Food, the Learning Seed

483
Eating Healthy
students check out foods they like or have eaten in terms of these aspects
Easy for students to use; gives graphs and charts, not all words
Sweet Tooth, Salty Dog, Grease

489
Understanding taxes

Understanding Taxes

532
(comment: I don't like the available software! However, I have used lesson on table setting and pattern layout)

539
Dietary analysis
pregnancy (for child care) and regular diet analysis, fad die analysis, etc
individual or group, "easy math" instead of adding from books, all work done
MCC Nutrition I; Eatright or Eatsmart - Pillsbury

610

One that goes with book- help teach vocabulary

628
Dietary analysis
analysis of dietary intake
immediate feedback/results
MECC

647
Resume
write a resume

Appleworks

648
Nutrition
diet evaluation
individual evaluation with privacy, too
"Your are what you eat," Orange Juice Pub.

725
Apartment rental
home hunter
lets students assess needs make choices
Orange Juice Software

735
Eat smart
diet analysis
students easily see relevance to self
Eat Smart, Pillsbury

737
Facts about eggs and nutrition
maze game
graphics-movement
Incredible Egg, Egg Institute

739
Colorite (?)
Run program after lesson as test

757
child development
question and answer
independent study
Orange Juice

774
Review or introduction depending on background of students
large group complete viewing work sheet as one student operates computer attached to "Telex" on overhead (note: Telex = LCD proj. panel)
Cuts cost of individualized discs, cuts time and students still enjoy using the computer
Design Elements and Principles, Orange Juice Software Systems

786
Diet analysis
analysis of 3 day diet

The Dine System, DineSystems, Inc.

827
Nutrition Assessment
students check personal menu for nutrient
It is easier to do than on paper and can be personalized
Not chosen yet, have looked at several; will occur next year

836
children or communication
simulations giving 3 choices
realistic, encourages negotiation
Elhc (?), Changing Times

842
Food buying
team games
rounding, ingredient list awareness, amount of at and sodium in products, Fun - group building skills
Grocery Games, The Learning Seed

848
Diet analysis
analysis of diet
print out with a break down by meal

913
Interior design simulator
design rooms

Orange Juice Software systems

925
controlling costs
cost recipe, put recipe into food service format
accuracy, time, printouts
Menu cost FSS software Pesiwrite

951
career awareness
interest survey career exploration
students like to be able to work at a computer
Career Planning System, Conover Omro, WI

BEST COPY AVAILABLE

Question 9: Three factors which serve to facilitate teacher's use of computers

	number	percentage
knowledge related to use		
teacher knowledge	15	5.4
student knowledge	4	1.4
content		
types of programs available	17	6.2
indirect learning or outcomes		
teacher related (word processing, record keeping, developing worksheets)	10	3.6
student related	5	1.8
access		
availability/access to computers	54	19.5
interest		
teacher interest/attitude	3	1.1
student interest/attitude	5	1.8
cost		
cost	1	.4
cost of programs	3	.4
other responses		
time (general)	4	1.4
other facilitators	13	4.7
no response	142	51.4

Question 10: Three factors which are the greatest barriers to teacher's use of computers

	number	percentage
knowledge related to use		
teacher knowledge	27	9.8
student knowledge	2	.7
content		
types of programs available	30	10.8
indirect outcomes		
indirect outcomes	1	.4
access		
availability/access to computers	72	26.1
cost		
cost	3	1.1
cost of programs	11	4.0
cost of computers	3	1.1
other responses		
time (general)	22	8.0
other barriers	18	8.4
no response	83	30.1

Question 11: Computer literacy addressed in school

	number	percentage
a. separate course or unit	18	19.6
b. integrating in subject-area	6	6.5
c. both	59	64.1
no response	1	1.1
other responses:		
a,b,c checked	5	5.4
a,c checked	1	1.1
a,b checked	2	2.2

Question 12: A separate computer course or unit is required for all students in school

no	47	45.7
yes	45	48.9
no response	5	3.3
course	40	43.5
unit	7	7.6
both checked	3	3.3
no response	42	45.7

Question 13: Subject-matter background of person who teachers the separate course

business	57	62.0
science	1	1.1
computer	6	6.5
math	7	7.6
business and . . .		
math	9	9.8
library science	1	1.1
science	1	1.1
computers	3	3.3
computers and . . .		
math	3	3.3
technology	1	1.1
science	1	1.1
other	2	2.2
no response	35	38.0

Question 14: Teacher's comfort with present ability to use computers for instructional purpose

a. completely comfortable	17	18.5
b. somewhat comfortable	43	46.7
c. not comfortable at all	26	28.3
a and b checked	1	1.1
no response	5	5.4

II. Equipment Availability

Question 15: Apple Computers

	number	percentage
number of Apple computers available in class		
at least 1-5	44	47.9
6 - 10		
11 - 20	1	1.1
21 - 40		
41 - 60		
61+		
teachers with computers - total	45	49.0
no response	47	51.1

number of Apple computers available elsewhere in school		
at least 1-5	17	18.5
6 - 10	7	7.7
11 - 20	12	13.2
21 - 40	28	30.4
41 - 60	9	9.9
61+	1	1.1
teachers with computers - total	74	80.8
no response	18	19.6

Question 16: Macintosh Computers

number of Macintosh computers available in classroom

at least 1-5	3	3.3
6 - 10		
11 - 20		
21 - 40		
41 - 60		
61+	1	1.1
teachers with computers - total	4	4.4
no response	88	95.7

number of Macintosh computers available elsewhere in school

at least 1-5	17	18.6
6 - 10	5	4.2
11 - 20	10	10.9
21 - 40	11	12.1
41 - 60	4	4.4
61+	1	1.1
teachers with computers - total	48	51.3
no response	45	48.9

Question 17: IBM Computers

number of IBM computers available in classroom

at least 1-5	5	5.4
6 - 10		
11 - 20	1	1.1
21 - 40	2	2.2
41 - 60		
61+		
teachers with computers - total	8	8.7
no response	84	91.3

number of IBM computers available elsewhere in school

at least 1-5	9	9.8
6 - 10	4	4.4
11 - 20	6	6.6
21 - 40	14	15.3
41 - 60	4	4.4
61+		
teachers with computers - total	37	40.5
no response	55	59.8

Question 18: Printers

number of printers available in classroom

at least 1-5	36	39.2
6 - 10		
11 - 20		
21 - 40		
41 - 60		
61+	1	1.1
teachers with printers - total	37	40.3
no response	55	59.8

number of printers available elsewhere in school

at least 1-5	21	22.8
6 - 10	10	10.9
11 - 20	19	20.7
21 - 40	12	13.2
41 - 60		
61+	1	1.1
teachers with printers - total	63	68.7
no response	29	31.5

Questions 19: Other Computer Controlled Equipment

		number	percentage
CD-ROM Player	no	31	33.7
	yes	29	31.5
	no response	32	22.8
Laserdisc Player	no	33	35.9
	yes	23	25
	no response	36	39.1
Scanner	no	29	31.5
	yes	28	30.4
	no response	35	38.0
LCD Projection Panel	no	22	23.9
	yes	45	48.9
	no response	25	27.2
Computer Controlled VCR	no	41	44.6
	yes	7	7.6
	no response	44	47.8

Chapter 6
Bibliography of Hypermedia Resources

Hypermedia/Computer Texts

Ambron, Sueann and Hooper, Kristina (eds.) (1990). Learning with interactive multimedia. Redmond, WA: Microsoft Press. Note: Excellent overview of hypermedia in classroom; currently out of print.

Anderson, Carol J. and Veljkov, Mark D. (1990). Creating interactive multimedia. Glenview, IL: Scott, Foresman and Company. Note: Takes the approach of developing a presentation with a design team; particularly useful in "what to look for" in peripherals and authoring software.

Apple Computer (1989). HyperCard stack design guidelines. New York: Addison-Wesley Publishing Company. Note: Very useful and practical information for designing stacks.

Beekman, George (1992). HyperCard 2 in a hurry. Belmont, CA: Wadsworth Publishing Co. Note: May be used with Mac version of HyperCard or expanded Claris version.

Bowers, C.A. (1988). The cultural dimension of educational computing: Understanding the non-neutrality of technology. New York: Teachers College. Note: Theoretical in nature; examines assumptions that the computer is a neutral tool.

Bull, Glen L. and Harris, Judi (1991). HyperCard for educators: An introduction. Eugene, OR: International Society for Technology in Education. Note: Practical guide in "how to use" HyperCard.

Bullough, Robert V., Sr. and Beatty, Lamond, F. (1991). Classroom applications of microcomputers. Second edition. New York: Macmillan Publishing Company. Note: General overview of computers; one section focuses specifically on planning and implementations of computers in the school.

DeVillar, Robert A. and Faltis, Christian I. (1991). Computers and cultural diversity. Restructuring for school success. New York: State University of New York Press. Note: Excellent book which takes the stance that the computer should be used within the context of cooperation and communication in hetrogeniously integrated classrooms.

Fraase, Michael (1990). Macintosh hypermedia. Volume I: Reference guide. Glenview, IL: Scott, Foresman and Company. Note: Gives overview of hypermedia and its foundations, uses and applications and social implications; provides product information.

Frasse, Michael (1990). Macintosh hypermedia. Volume II: Uses and Implementations. Glenview, IL: Scott, Foresman and Company. Note: Expands on uses and implementations; highlights specific programs and their features; good source of product information.

Franklin, Carl and Kinnell, Susan K. (1990). Hypertext/hypermedia in schools. A resource book. Santa Barbara, CA: ABC-CLIO. Note: Excellent book; give background, theoretical foundations, examples of school projects; software reviews; good source to find further information about software products.

Cassel, Don (1990). Understanding computers. Englewood Cliffs, NJ: Prentice-Hall, Inc. Note: Textbook on computers.

Criswell, Eleanor, L. (1989). The design of computer-based instruction. New York: Macmillan Publishers. Note: Focuses specifically on CBI.

Geisert, Paul and Futrell, Mynga (1990). Teachers, computers and curriculum: Microcomputers in the classroom. Boston: Allyn and Bacon. Note: Good book for general background and framework for using computers in the school setting.

Hirschbuhl, John J. and Wilkinson, Loretta, F. (eds.) (1992). Computers in education. Guildford, CN: Dushkin Publishing. Note: General information about computers.

Jonassen, David H. (1989). Hypertext/hypermedia. Englewood Cliffs, NJ: Educational Technology Publications. Note: Provides overview of hypertext and hypermedia; more theoretical in nature; includes disk.

Landow, George P. (1992). Hypertext. The convergence of contemporary critical theory and technology. Baltimore: Johns Hopkins University Press.
Note: Theoretical in nature.

Lehrer, Richard; Littlefieid, Joan; Wottreng, Betty (1991). Seeding mindstorms with LOGO writer: Using LOGO in the elementary classroom. Fontana, WI: Interactive Education Technologies. Note: Section on leaming theory and computers.

Lillie, David L.; Hannum, Wallace H. and Stuck, Gary B. (1989). Computers and effective instruction: Using computers and software in the classroom. New York: Longman. Note: Focuses specifically on computers in school setting.

Lockard, James; Abrams, Peter D. and Many, Wesley A. (1990). Microcomputers for educators. Second edition. Glenview, IL: Scott, Foresmam/LIttle, Brown Higher Education. Note: General overview of computer; focuses on computer as tool, tutor and leamer.

Long, Larry and Long, Nancy. (1990). Computers. Englewood Cliffs, NJ: Prentice-Hall, Inc. Note: Textbook on computers.

Merrill, Paul F.; Hammons, Kathy; Tolman, Marvin, N.; Christensen, Larry; Vincent, Bret R.; Reynolds, Peter L. (1992). Computers in Education. Second edition. Boston: Allyn and Bacon. Note: Overview of computers and use in educational settings.

Neilsen, Jakob (1989). Hypertext & hypermedia. Boston: Academic Press, Inc. Note: Gives overview of hypertext and hypermedia.

Nix, Don and Spiro, Rand (eds.) Cognition, education and multimedia. Hillsdale, NJ: Lawrence Erlbaum. Note: Chapter 6 focuses on "Should computers know what you do with them?"; Chapter 7 focuses on cognitive flexibility and hypertext.

Patterson, Janice H. and Smith, Marshall S. (1986). Chapter V. The role of computers in higher-order thinking. In Jack A. Culbertson and Luvern L. Cunningham (eds.) Microcomputers and education. Chicago, IL: University of Chicago Press.

Price, Robert V. (1991). Computer-aided instruction: A guide for authors. Pacific, Grove, CA: Brooks/Cole Publishing Company. Note: Focuses specificially on CAI including hypertext/hypermedia.

Steinberg, Esther R. (1991). Teaching computers to teach. Second edition. Hillsdale, NJ: Lawrence Erlbaum Associates. Note: Focuses specificially on computer assisted instruction.

Tolman, Marvin N. and Allred, Ruel, A. (1991). The computer and education. Washington, D.C.: National Education Association. Note: General overview and application.

Van Horn, Royal (1991). Advanced technology in education. An introduction to videodiscs, robotics, optical memory, peripherals, new software tools, and high-tech staff development. Pacific Grove, CA: Brooks/Cole Publishing Company. Note: Excellent source; useful in developing understanding of peripheral equipment and how they operate.

Technology, Computers and Education

Allen, Camille, A. (1988). Social interaction between a teacher and small groups of students working with a microcomputer. Computers in the Schools 5 (1/2) 271-284.

Collins, Allan (1991). The role of computer technology in restructuring schools. Phi Delta Kappan 73 (1) 28-36,

Crowell, Sam (1989). A new way of thinking: The challenge of the future. Educational Leadership (September) 60-63.

David, Jane L. (1991). Restructuring and technology: Partners in change. Phi Delta Kappan 73 (1) 37-40, 78-82.

Dede, Christopher (1989). The evolution of information technology: Implications for Curriculum. Educational Leadership 47 (1) 23-26.

D'Ignazio, Fred (1988). Bringing the 1990s to the classroom of today. Phi Delta Kappan 70 (1) 26-27.

Fisher, Charles, W. (1989). Student empowerment in a high computer-access environment - An exploratory study. St.Paul, MN: Center fore the Study of Educational Technology. ERIC document number 318 453.

Martin, Ruth E. and Lundstrom, Karen (1988). Attitudes of vocational Home Economics teachers toward computers. Journal of Vocational Education Research 13 (1) 83-93.

Ornstein, Allan C. (1992). Making effective use of computer technology. NASSP Bulletin 76 (542) 27-33.

Sheingold, Karen (1991). Restructuring for learning with technology: The potential for synergy. Phi Delta Kappan 73 (1) 17-27

Sutton, Rosemary E. (1991). Equity and computers in the schools: A decade of research. Review of Educational Research 61 (4) 475-503.

Tesolowski, Dennis G. and Roth, Gene L. (1988). Identification and verification of microcomputer competencies in vocational education. Journal of Vocational Education Research 13 (1) 95-116.

White, Mary-Alice (1989). Current trends in education and technology as signs to the future. Education and Computing 5 (1 &2) 3-10.

Yuen, Steve Chi-Yin (1988). The challenge of microcomputer technology to vocational education. Journal of Studies in Technical Careers 5 (1) 49-59.

Multimedia, Hypermedia and Hypertext

Braswell, Ray (1991) . The use of hypercard and hypersound to design interactive videodisc instructional materials. Computers in the Schools 8 (1,2,3) 251-253.

Business Week (1991). PCs: What the future holds. (3226) 58-64.

Business Week (1989). It's a pc, it's a tv--it's multimedia. (3127) 152-155+.

Byrom, Elizabeth (1990). Hypermedia (Multimedia) Exceptional Children 22 (4) 47-48.

Free, John (1991). Multimedia. Popular Science 239 (6) 92-122.

Fletcher Allred, Kathie and Locatiz, Craig (1988). Research, instructional design, and new technology. Journal of Instructional Development 11 (1) 2-5.

Hansen, Edmund (1990). The role of interactive video technology in higher education: case study and a proposed framework. Educational Technology 30 (9) 13-21.

Harris, Margaret and Cady, Michael (1988). The dynamic process of creating hypertext literature. Educational Technology 28 (11) 33-40.

Heller, Rachelle S. (1990). The role of hypermedia in education: A look at the research issues. Journal of Research on Computing in Education 22 (4) 431-441.

Horney, Mark A. (1991). Uses of hypertext. Journal of Computing in Higher Education 2 (2) 44-65.

Jonassen, David H. (1988). Designing structured hypertext and structuring access to hypertext. Educational Technology 28 (11) 13-16.

Kearsley, Greg. (1989). Hypertext: A new way of accessing and organizing information. Helping Learners at a Distance. Annual Conference on Teaching at a Distance. Madison, WI. 55-58. ERIC Document No. 315 551.

Kearsley, Greg (1988). Authoring considerations for hypertext. Educational Technology 28 (11) 21-24.

Lin, Xia (1988). A selected hypertext bibliography. Educational Technology 28 (11) 41-42.

Landow, George P. (1989). The rhetoric of hypermedia: Some rules for authors. Journal of Computing in Higher Education 1 (1) 39-64.

Locatis, Craig; Charuhas, James and Banvard, Richard (1990) Hypervideo. Educational Technology Research and Development 38 (2) 41-49.

Locatis, Craig; Ullmer, Eldon; Carr, Victor; Banvard, Richard; Le, Quang; Lo, Raulie; and Williamson, Matthew (1991). Authoring systems: An introduction and assessment. Journal of Computing in Higher Education 3 (10) 23-34.

MacKnight, Carol B. and Balagopalan, Santosh (1990). An evaluation tool for measuring authoring performance. Journal of Computing in Higher Education 1 (2) 105-119.

MacKnight, Carol B. (1991). [A review of] Guide: A hypermedia information system. Journal of Computing in Higher Education 3 (1) 131-135.

Reynolds, Sharon B. and Dansereau, Donald, R. (199) The knowledge hypermap: An alterative to hypertext. Computers Education 14 (5) 409-416.

Reinking, David (1992). Differences between electronic and printed texts: An agenda for research. Journal of Educational Multimedia and Hypermedia 1 (1) 11-24.

Rezabek, Randall H. and Ragan, Tiliman J. (1989). Elaborated resources: An instructional design strategy for hypermedia. Paper presented at the annual meeting association fore Educational Communications Technology. Dallas, TX. ERIC document number 316 175.

Rogers, Michael (1987). Hyper-excitement at Apple. Newsweek 110 (9) 45.

Rogers, Michael (1988). Here comes hypermedia. Newsweek 112 (14) 44-45.

Rogers, Michael (1989). MTV, IBM, Tennyson and you. Newsweek Special Issue 116 (28) 50, 52.

Saffo, Paul (1988) What's beyond paper? Personal Computing 12 (12) 69-70,72, 74.

Saffo, Paul (1989). Multimedia: Seeing is deceiving. Personal Computing 13 (8) 181-182.

Stroot, Sandra A.; Tannehill, Deborah and O'Sullivan, Mary (1991) . Skill analysis utilizing videodisc technology. Computers in the Schools 8 (1,2,3) 271-291.

Stover, Dawn (1989). Hypermedia. Popular Science 23(5) 122-124, 160.

Thompson, Nancy S. (1988) Media and Mind: Imaging as an active process. English Journal 77 (1) 47-49.

Underwood, John (1989). Hypermedia: Where we are and where we aren't. CALICO Journal 6 (4) 23-26.

Veljkov, Mark D. (190). Managing multimedia. Byte 15 (8) 227-232.

Williams, Gregg (1987) HyperCard. Byte 12 (4) 109117.

Wilburn, Kenneth T. (1990). Hypermedia: What's all the hype about? In Marianne Barnes and Lynn Woods (eds.) Florida Council for the Social Studies Annual 1989-1990. North Palm Beach, FL: Florida Council for the Social Studies. ERIC Document No. 327 476.

Teachers and Teaching Related

Cory, Sheila (1991) Technology in schools: Who will provide leadership. Computers in the Schools 8 (1,2,3) 27-43.

Dwyer, David C.; Ringstaff, Cathy and Sandholtz, Judy (1990). The evolution of teachers' instructional beliefs and practices in high-access-to-technology classrooms. Paper presented at the Annual Meeting of the American Education Research Association. Boston, MA. ERIC Document No. ED 325 074.

Fish, Marian C. and Feldmann, Shirley C. (1990). Learning and teaching in microcomputer classrooms: Reconsidering assumptions. Computers in the Schools 7 (3) 87-96.

Grandgenett, Hela; Ziebarth, Ray; Koneck, Jeff; Farnham, Mary Laura; McQuillan, Jodi; Larson, Becky (1992). An investigation of e anticipated use of multimedia by pre-service teachers. Journal of Educational Multimedia and Hypermedia 1 (1) 91-101.

Litchfield, Brenda C. and Dempsey, John V. (1992). The IVD-equipped classroom: Integrating videodisc technology in the curricula. Journal of Educational Multimedia and Hypermedia 1 (1) 39-49.

Lucas, Leslie (1992). Interactivity: What is it and how do you use it? Journal of Educational Multimedia and Hypermedia 1 (1) 7-10.

Morariu, Janice (1988). Hypermedia in instruction and training: The power and the promise. Educational Technology 28 (11) 17-20.

Preston, Noel (1992). Computing and teaching: A socially-critical review. Journal of Computer Assisted Learning 8 49-56.

Rude-Parkins, Carolyn (1992). Computer-based curriculum development tools for teachers. Journal of Educational Multimedia and Hypermedia 1 (2) 179-186.

Ryba, Ken and Anderson, Bill (1990). Chapter one. A strategies approach to effective thinking and learning. Learning with computers: Effective teaching strategies. Eugene, OR: International Society for Technology in Educaion. ERIC Document No. 327 157.

Ryba, Ken and Anderson, Bill (1990). Chapter three. Strategies for teaching thinking skills with computers. Learning with computers: Effective teaching strategies. Eugene, OR: International Society for Technology in Education. ERIC Document No 327 157.

Stebbins, Barry (1990). HyperCard: The tool for the classrooms of tomorrow. Computers in the Schools 7 (4) 7-73.

Wilburg, Karin M. (1991). Teaching teachers about technology. Computers in the Schools 8 (1,2,3) 115-129.

Curriculum Development

Amthor, Geoffrey R. (1991). Interactive multimedia in education. Technological Horizons in Education (September supplement).

Apple, Michael W. (1991). The new technology: Is it part of the solution or part of the problem in education. Computers in the Schools 8 (1,2,3) 59-81.

Blanchard, Jay (1989). Hypermedia: Hypertext--Implications for reading education. Computers in the Schools 6 (3,4) 23-29.

Blanchard, Jay S. and Rottenberg, Claire, J. (1990). Hypertext and hypemedia: Discovering and creating meaningful learning environments. The Reading Teacher 43 (9) 656-661.

Dede, Christopher J. (1987). Empowering environments, hypermedia and microworlds. The Computing Teacher 15 (3) 20-24, 61.

Gay, Geri and Mazur, Joan (1989). Conceptualizing a hypermedia deign for language learning. Journal of Research on Computing in Education 22 (2) 119-126.

LeGrand, Barbara R. and Mehler, Gary. (1989). Developing hypermedia for the learning environment. Helping Learners at a Distance. Annual Conference on Teaching at a Distance. Madison, WI. ERIC Document No. 315 551

Mojkowski, Charles (1989). Transforming curriculum and instruction with technology. Paper presented at the Annual Meeting of the American Educational Research Association. San Francisco, CA. ERIC Document No. 309 746.

Rezabek, Randall, H. and Ragan, Tillman J. (1989). Elaborate resources: An instructional design strategy for hypermedia. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology. Dallas, TX. ERIC Document No. 316 175.

Riskin, Steve R. (1990). Teaching through interactive multi-media programming. An new philosophy of the social sciences and a new epistemology of creativity. CA State University. ERIC Document No. ED 327 133.

Learners and Learning Related

Anderson-Inman, Lynne (1990-91). Enabling students with learning disabilities: Insights from research. The Computing Teacher 18 (4) 26-29.

Kacer, Barbara ; Rocklin, Thomas; and Weinholtz, Donn (1991). The impact of small group instruction upon attitude and achievement of students learning computer applications. Computers in the Schools 8 (1,2,3) 357-360.

Black, John B.; Swan, Karen; and Schwartz, Daniel L. (1988). Developing thinking skills with computers. Teachers College Record 89 (3) 384-407.

Congress of the U.S. (1988). Power on! New tools for teaching and learning. Washington, D.C. ERIC Document No. 295 677.

Frey, Diane (1990). A hypermedia lesson about 1875-1855 costume: Cognitive style, perceptual modes, anxiety, attitude and achievement. Proceedings of selected paper presentations at the Convention of the Association for Educational Communications and Technology. ERIC Document NO. 323 929.

Hannafin, Michael, J. and Carney, Barry W. (1991). Effects of elaboration strategies on learning and depth of processing during computer-based instruction. Journal of Computer-Based Instruction 18 (3) 77-82.

Higgins, Kyle and Boone, Randall (1990). Hypertext computer study guides and the social achievement of students with learning disabilities, remedial students, and regular educational students. Journal of Learning Disabilities 23 (9) 529-540.

Hoyles, C.; Healy, L. and Sutherland, R. (1991). Patterns of discussion between pupil pairs in computer and non-computer environments. Journal of Computer Assisted Learning 7 210-228.

Lanza, Antonietta and Roselli, Teresa (1991). Effects of the hypertextual approach versus the structured approach on students' achievement. Journal of Computer-Based Instruction 18 (2) 48-50.

Mandinach, Ellen B. (1987). Computer learning environments and the study of individual differences in self-regulation. Paper presented at the Annual Meeting of the American Educational Research Association. Washington, DC. ERIC Document No. 281 871.

Marchionini, Gary (1988). Hypermedia and learning: Freedom and chaos. Educational Technology 28 (11) 8-12.

McNeil, Barbara A. and Nelson, Karyn R. (1991). Meta-analysis of interactive video instruction: A 10 year review of achievement effects. Journal of Computer-Based Instruction 18 1-6.

Mevarech, Zemira R.; Silber, Ora; and Fine, Deborah (1991). Learning with computers in small groups: Cognitive and affective outcomes. Journal of Educational Computing Research 7 (2) 233-243.

Milheim, William D. and Martin, Barbara L. (1991). Theoretical bases for the use of learner control: Three different perspectives. Journal of Computer-Based Instruction 18 (3) 99-105.

Morelli, Ralph (1990). The student as knowledge engineer: A constructivist model for science education. Journal of Computing in Higher Education 2 (1) 78-102.

Muhlhauser, Max (1992). Hypermedia and navigation as a basis for authoring/learning environments. Journal of Educational Multimedia and Hypermedia 1 (1) 51-64.

Patterson, Janice H. and Smit, Marshall S. (1986). Meeting the Challenge; Computers and higher order thinking. A research agenda. Report of a Research Conference held at the National Academy of Sciences. Washington, DC.: Wisconsin Center for Education Research, Madison). ERIC Document no. ED 286 467.

Pogrow, Stanley (1987). The HOTS program: The role of computers in developing thinking skills. TechTrends 32 (2) 10-13.

Roth, Gene L. and McEwing, Richard A. (1986). Artificial intelligence and vocational education: An impending influence. Educational Horizons 65 (9) 45-47.

Press, Laurence (1991). Application report: Two experiments with computer mediated lectures. Journal of Computer-Based Instruction 18 (2) 71-72.

Riber, Loyd P. and Kini, Asit S. (1991). Theoretical foundations of instructional application of computer-generated animated visuals. Journal of Computer-Based Instruction 18 (3) 83-88.

Steffin, Sherwin A. (1983). Using the micro as a weapon. Fighting against convergent thinking. Childhood Education 59 (4) 255-258.

Tessmer, Kathleen M. (1984). Children using computers: What are they doing? What are they really learning? Iowa City, IA: University of Iowa. ERIC Document No. ED 252 192.

Tierney, Robert J. (1989). Student thinking processes. The influence of immediate computer access on students' thinking. First- and Second-Year findings. Apple Classrooms of Tomorrow Research. ERIC Document No. ED 316 201.

Van den Berg, Sjef and Watt, James H. (1991). Effects of educational setting on student responses to structured hypertext. Journal of Computer-Based Instruction 18 (4) 118-124.

White, Charles S. (1988). Computers in social studies classrooms. Bloomington, IN: ERIC Clearinghouse for Social Studies/Social Science. ERIC Document No. 296 950.

Zeiser, Edward L. and Hoffman, Stevie (1983). Computers: Tools for thinking. Childhood Education 59 (4) 251-253.

Applications/Examples

Ashworth, David and Stelovsky (1989). Kanji city: An exploration of hypermedia applications for CALL. CALICO Journal 6 (4) 27-39.

Crane, Gregory and Mylonas, Elli (1988). The Perseus project: An interactive curriculum on classical Greek civilization. Educational Technology 28 (11) 25-32.

Harris, Wendy (1984). The California model curriculum for computers in education. In Making our schools more effective: Proceedings of three state conference. ERIC Document No. 249 599.

Goldman, Elizabeth and Barron, Linda (1990). Using hypermedia to improve the preparation of elementary teachers. Journal of Teacher Education 41 (3) 21-31.

Tucker, S.A.; Dempsey, J.V. and Strange, J.H. (1990). Training university faculty to integrate hypermedia into the teacher training curriculum. Paper presented at the International Conference on Technology and Education. Brussels, Belgium. ERIC Document No. 327 162.

Computers and Education Periodicals

Computers in the Schools. Subscriptions: The Haworth Press, Inc., 10 Alice Street, Binghamton, NY 13904-1580. Rates: $32 (individual), $60 (institutions). Published quarterly.

Computers and Education. An International Journal. Subscriptions: Pergamon Press Inc., 395 Saw Mill River Road, Elmsford, NY 10523. Rate: $550. Published eight times per year.

Computing Teacher, The. Subscriptions: International Society for Technology in Education, 1787 Agate St., Eugene, OR 97403-1923. Subscription/ Membership rate: $47. Published monthly, except June and July; bimonthly in August/September and December/January.

Education and Computing. The International Journal. Subscriptions: Elsevier Science Publishers, Journal Department, Postbus 211, 100 AE Amsterdam, Netherlands. Rate: $166. Published quarterly.

Educational Technology. Subscriptions: Educational Technology Publications, Inc., 700 Palisade Avenue, Englewood Cliffs, New Jersey 07632. Rate: $119 for one year. Published monthly.

Journal of Computer Assisted Learning. Subscriptions: Blackwell Scientific Publications Ltd, Journal Subscriptions Department, Marston Book Services, PO Box 87, Oxford OX2 oDT, UK. Rate: $160. Published quarterly.

Journal of Computer-Based Instruction. Subscriptions: Howard Troutner, Executive Director, ADCIS International Headquarters, 229 Ramseyer Hall, 29 West Woodruff, Columbus, OH 43210-1177. Rate: $36 (Free to members of the Association for the Development of Computer-Based Instructional Systems). Published quarterly.

Journal of Computing in Higher Education. Subscriptions: Carol B. MacKnight, Office of Instructional Technology, A115 Lederle 1Graduate Research Center, University of Massachusetts, Amherst, MA 01003. Rate: $35 (individual), $45 (institution).

Journal of Educational Computing Research. Subscriptions: Baywood Publishing company, Inc., 26 Austin Ave., P.O. Box 337, Amityville, N.Y. 11701. Rate: $75 (individual), $115 (institutional). Published quarterly.

Journal of Educational Multimedia and Hypermedia. Subscriptions: Journal of Education Multimedia, Association for the Advancement of Computing in Educaion, P.O. Box 2966, Charlottesville, VA 22902. Subscription/ membership rate: $45 (individuals), $68 (institutions). Published quarterly.

Journal of Research in Computing on Education. Subscriptions: International Society for Technology in Education, 1787 Agate Street, Eugene OR 97403-1923. Rate: $55 (for non-members), $30 (as part of membership dues).

Teaching and Computers. Subscriptions: Scholastic Inc., 730 Broadway, New York, NY 10003-9538. Rate: $25. Published six times per year.

Technological Horizons in Education. Subscriptions: T.H.E. Journal, 150 El Camino Real, Suit 1112, Tustin, CA 92680-3670. Rate: Free to qualified individuals ($29 for non-qualified). Published monthly except July.

Technology and Learning. Subscriptions: Peter Li, Inc., 2451 E. River Rd., Dayton, OH 45439. Rate: $24. Published monthly except for June, July, August, December.

TechTrends--For Leaders in Education and Training. Subscription: Association for Educational Communication and Technology, 1025 Vermont Ave., NW, Washington, DC 20005. Rate: $30 (Free to members of the Association for Educational Communication and Technology). Published six times per year.

Resources for Laserdiscs, CD-ROM and Hypermedia Software

Source	Catalog
Bureau of Electronic Publishing, Inc. 141 New Road Parsippany, NY 07054 Telephone: 1-800-828-4766	CD-ROM Product Guide
Educorp 7434 Trade Street San Diego, CA 92121-2410 Telephone: 1-800-843-9497	Educorp Catalog (Excellent source of HyperCard Stacks and CD-ROMs.)
Emerging Technolgoy Consultants P.O. Box 120444 St. Paul, MN 55112 Telephone: 612-639-3973	The Videodisc Compendium ($30 subscription; excellent source of educational videodiscs.)
Hypermedia and Instructional Software Clearinghouse University of Colorado at Denver Campus Box 106 P.O. Box 173364 Denver, CO 80217-3364 Telephone: 303-556-4364	Hypermedia Stacks
Laser Learning Technologies 3114 37th Place South Seattle, WI 98144 Telephone: 1-800-722-3505	Catalog '92 (Includes laserdiscs and CD-ROM)

LaserViews 561 Bloomfield Avenue Verona, NJ 07044 Telephone: 1-800-872-3472	Laser Video File
Optical Data Corporation 30 Technology Drive Warren, NJ 07059 Telephone: 1-800-524-2481	Educational Videodiscs and Multimedia Products
Pioneer (Midwest Region) 1263 Hamilton Parkway Itasca, IL 60143 Telephone: 708-285-4561	LaserDisc (Popular movies)
Queue, Inc. 338 Commerace Drive Fairfield, CT 06430 Telephone: 1-800-232-2224	Queue Educational CD-ROM
SilverPlatter Information, Inc. 100 River Ridge Drive Norwood, MA 02062-5026 Telephone: 1-800-769-8763	Directory of CD-ROM Databases
Video Discovery 1515 Dexter Avenue N. Suite 400 Seattle, WA 98109-3017 Telephone: 1-800-548-3472	Educational Videodisc Catalog
The Voyager Company 1351 Pacific Coast Highway Santa Monica, CA 90401 Telephone: 213-451-1383	Voyager Company Catalog (Laserdiscs and CD-ROMs) The Criterion Connection (Popular movies)

Wayzata Technology Inc.
P.O. Box 807
Grand Rapids, MN 55744
1-800-735-7321

CD-ROM Catalog

Ztek Company
P.O. Box 1055
Louisville, KY 40201-1055
1-800-247-1603

Interactive Videodiscs and
CD-ROMs for Education