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All correspondence should be addressed to:
DR. MARYF. KENNEDY
Editor — *CJEC*
Faculty of Education
Memorial University of Newfoundland
St. John's, Newfoundland
Al B 3X8

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Learning Environments and Interaction for Emerging Technologies: Implications for Learner Control and Practice[1]

Richard A. Schwier

Abstract: This paper describes a classification scheme for multimedia interaction based on the degree of control and type of cognitive engagement experienced by learners in prescriptive, democratic and cybernetic Independent learning environments. Reactive, proactive and mutual levels of interaction, and their associated functions and transactions are discussed. The paper also explores principles for designing interactive multimedia instruction which emerge from this classification and from current research on learner control and practice.

Resume: Get article decrlt un precede de classification d'Interactions multimedia! base sut le degre de controle et sur le type d'engagement cognltlf utilise par les etudlants evoluant dans des envlronnements favorables a I'apprentlssage Independent, normatlf, democratlque et cybernetique. On y discute egalement les nlveaux d'interactions reclproques, reactlfs et proacflfs alnsi que les fonctions et les transactions connexes, On y explore egalement les prlncipes soustendants la conception des programmes d'apprentissage multimedlas interactlfs qul emergent decette class ifteat lon et des courantsderecherchesur les contrdles des etudiants et leurs pratiques.

Multimedia-based instruction is shaped by the instructional designer's knowledge of the learning task, learner and context—knowledge which can be gleaned from elaborate front-end analyses. But instruction is also influenced by an instructional designer's assumptions about the learner and learning—assumptions which are not publicly analyzed, yet are revealed in design features of the learning materials. One such feature is how prescriptive the instruction is. Is the entire learning experience structured for the learner, or is the learner invited and empowered to construct a personal learning experience from the materials?

This paper extends an earlier paper entitled *A Taxonomy of Interaction for Instructional Multimedia,* by Richard Schwier presented at the annual meeting of the Association for Media and Technology in Education in Canada, Vancouver, British Columbia, June, 1992.

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Instructional designers acknowledge the important role played by prescriptive learning environments; indeed, prescriptive instruction dominated the attention of instructional design for decades and continues to be expressed in significant instructional products today. Some types of learning, say performing double-ledger accounting or studying for university entrance examinations, may be appropriately addressed in a confined, externally defined and structured, highly procedural fashion. An instructional designer can develop effective, reliable — and prescriptive — instructional materials to address these types of problems.

But emerging technologies coax us to look at multimedia learning systems in a new way — as environments which promote the learner's role in regulating learning. An emerging technology is not hardware; rather, it is a systematic and highly integrated architecture for learning. Emerging technologies are those which focus on an ability to manage, deliver and control a wide range of educational activities (Hannafin, 1992). To take full advantage of emerging technologies, instructional designers must look beyond the attributes and differences of individual media components, and extend their individual attributes across developing technologies. Given that interactive multimedia instruction by its very nature combines the attributes of several media, it is an important platform for developing emerging technologies. But having an appropriate platform is not sufficient. To fully exploit the capabilities of more powerful instructional technologies, designers must also reexamine the assumptions and expand the strategies we employ in instructional design (cf. Cognition and Technology Group at Vanderbilt, 1992; Jonassen, 1991; Osman and Hannafin, 1992;Rieber, 1992;Schott, 1992;Spector,MuraidaandMarlino, 1992; Tennyson, Elmore and Snyder, 1992).

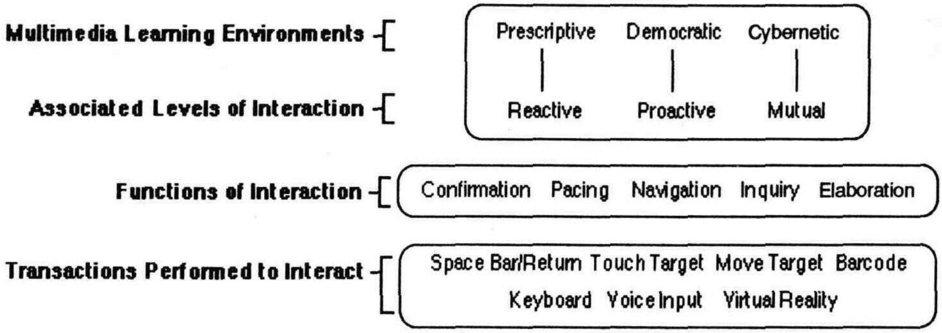
Multimedia-based technologies offer an expanding range of interactive possibilities which are remarkably consistent, regardless of the platform used to deliver the instruction. Because a computer acts as the heart of a multimedia learning system, and because most multimedia computer systems have similar devices for communicating (e.g., keyboard, mouse, touch screen, voice synthesis), the quality of interaction is more the product of the way instruction is designed, and less the result of the system on which it is delivered. In order to describe a taxonomy of interaction for multimedia instruction, this paper describes three learning environments within which interactive multimedia functions, suggests three levels of interaction associated with these environments, examines functions played by interaction within these levels and enumerates several types of overt transactions available at each functional level of interaction (Figure 1).

Multimedia Learning Environments

Romiszowski (1986) used the terms prescriptive, democratic and cybernetic to describe a schemata of systems for individualizing instruction; systems which may also be considered *environments* in multimedia instruction.

Prescriptive instruction specifies what the learner is to learn. Instruction is based on specific objectives and the instructional system is used as a primary

Figure 1.
Components of a Taxonomy of Interaction for Multimedia Instruction.



delivery medium. In many, if not most, cases the instructional content and boundaries of learning are decided by the instructional design team, and the learner's role is to receive and master the given content. A popular breakdown of prescriptive instructional designs for computer-based instruction includes drill and practice, tutorials, games and simulations (e.g. Alessi and Trollip, 1985; Hannafin and Peck, 1988; Heinich, Molenda, and Russell, 1993; Romiszowski, 1986).

Democratic environments turn over control of instruction to the user. Unlike prescriptive environments, democratic environments do not impose highly structured learning strategies on the learner. Rather, democratic environments emphasize the learner's role in defining what is learned, how it is learned, and the sequence in which it is learned. The most apparent difference between democratic and prescriptive environments is the level of learner control, and they do not always operate in isolation from one another. Democratic environments may be used to support prescriptive instruction, acting as a supplementary resource to the primary instruction. For example, a learner following a self-instructional program on a comparison of British and American forms of government (prescriptive) might choose to explore a learning resource on the Canadian House of Commons to elaborate information for an assignment (democratic). For other democratically oriented learning resources stand alone, without reference to prescribed instruction, and the learner makes virtually every decision about how the materials are used. These types of learning resources emphasize navigation, motivation and access, and they down-play objectives and evaluation.

Cybernetic environments emphasize a complete, multi-faceted system in which the learner can operate fluidly, albeit synthetically. Intelligent interactive multimedia, based on expert systems, heuristic designs, and virtual reality can provide rich, dynamic and realistic artificial environments for learning. In cybernetic environments, the learner maintains primary control of the learning, but the system continually adapts to learner activity, and may even adapt in novel ways based on heuristic interpretations of learner actions. The learning environment may adapt either actively or passively by advising the learner about the patterns and consequences of actions taken. The cybernetic instructional environment, unlike instruction provided in prescriptive and democratic environments, actually expands beyond the initial design decisions made during its development. This expansion marks its difference from being merely a sophisticated prescriptive environment; the very substance of the learning landscape is changed by the nature of interactions during instruction, not just the path followed by an individual through existing material (whether prescribed or democratic). This is certainly more evident in predictions for the 21st century than in practice , as few products to date offer a truly cybernetic environment.

Jonassen (1991) might use the term *objective* (encompassing both behavioural and cognitive orientations) to describe prescriptive environments, as they are based on assumptions of a single, externally defined reality, wherein the goal of instruction is to bring the learner into line with these externally defined goals. Democratic and cybernetic environments might emphasize a more constructivist orientation — one in which multiple realities are recognized as legitimate, and therefore, learners may be empowered to express an array of appropriate directions, processes and outcomes for learning. For example, given a CD-ROM disc of clips from classic films, one learner might gather examples of racism and sexism from the classics for comparison with contemporary films; another learner might look at the impact of colorization on the visual impact of black-and-white classic films. Fundamental to the movement toward more constructivist orientations in instructional design is a respect for the learner's ability to understand and select from a number of personally satisfying strategies for learning. For example, Osman and Hannafin (1992) challenge designers to go beyond content acquisition in designs, and cultivate metacognitive capabilities and strategies of learners. This, in turn, requires that instructional designers include procedures and tools learners can generalize to other settings, rather than focus solely on specific content to be learned.

The three learning environments described above each allow interaction, but the nature of the interaction is fundamentally different in each environment. A prescriptive environment will largely present interactive events to which learners can react, such as embedded questions. In democratic and cybernetic environments, all interactivity will not be pre-ordained. The learner will have a hand in shaping the interaction. The next section will examine the type of interaction associated with each of the three environments.

Levels of Interaction

The different multimedia environments will emphasize different types of interaction. Such interaction can be characterized as reactive, proactive or mutual depending upon the level of engagement experienced by the learner.

In a reactive interaction a learner responds to stimuli presented to the learner by the program, for example by making a selection from a menu (Lucas, 1992; Thompson and Jorgensen, 1989). Such approaches are typified by tutorial designs wherein the learner and computer are engaged in a preordained discussion which is initiated by the program, not the learner.

By contrast, proactive interaction requires the learner to initiate action or dialog with the program. Proactive interaction promotes generative activity; that is, the learner goes beyond selecting or responding to existing structures and begins to generate unique approaches and constructions other than those provided in instructional materials. The learner organizes, shapes and in a sense creates a personal expression of learning. An example of this is when a learner uses key word searching of a hypermedia database, and organizes resultant information to address a self-generated question. The question is the learner's, the collection of data is unique to the learner, and the boundaries of the search and the personal level of satisfaction with the completed product are the learner's.

The highest level of interaction, mutual interaction, is characterized by artificial intelligence or virtual reality designs. In such programs, the learner and system are mutually adaptive. Sometimes this is referred to as recursive interaction. Recursion is based on the mathematical notion of indefinite repetition, and in multimedia, it suggests a conversation which can continue indefinitely. This is a useful distinction, but it falls short of the potential capabilities of multimedia systems in the future. Because multimedia systems may ultimately be capable of cybernetic conversation-actually learning from and adapting to conversation with a learner-the term mutual interaction is used here. At a less sophisticated level, mutual interaction can be used to describe the appearance or trappings of meaningful conversation. Mutual interactivity is still in its infancy, but the area is attracting a great deal of research and development interest.

The three categories of interaction do not exist as discrete categories in most instructional software — interactive multimedia programs often incorporate a combination of reactive and proactive approaches (although very few are sophisticated enough to incorporate mutual approaches). But the levels are hierarchical, in that one subsumes the other. In other words, mutual interactions contain proactive elements, and proactive interactions contain reactive elements. For example, when learners generate new questions and approaches (proactive) they can, in turn, be used by the system to formulate new conversation (mutual). Similarly, when learners generate their own strategies (proactive) they are responding to existing stimuli at a sophisticated level (reactive).

Functions ofInteraction

Hannafin (1989) identified five functions interaction can serve in independent learning materials: confirmation, pacing, inquiry, navigation and elaboration. Confirmation verifies whether intended learning has occurred (e.g., learners responding to questions during instruction can measure performance). Pacing gives control of the timing of instruction to the learner (e.g., the learners selecting an abbreviated or elaborated version of instructional content). Navigation determines the amount of freedom and ease of access learners have to instructional components (e.g. learners choosing segments from a menu). Inquiry allows learners to ask questions or construct individual pathways through instruction (e.g. learners searching supplementary material). Elaboration allows learners to move from known to unknown information or expand what is already knowr.

Each function is expressed differently during instruction, depending upon the level of interaction. For example, reactive navigation is typified by menus or prescribed branching options presented to learners. Proactive navigation, by contrast, would permit the learner to initiate searches or participate in open-architecture movement throughout material. Mutual navigation might happen when a program anticipates navigation routes of the learner based on previous movement, and advises the learner about the nature of choices made. In mutual navigation, the learner could could follow or ignore the advice, and also advise the system about about the nature of navigation opportunities desired. Figure 2 gives one example of interaction obtained at each functional level of the taxonomy.

Figure 2.

Example of an Interactive Event at Each Functional Level of Interaction.

	Confirmation	*Pacing*	*Navigation*	*Inquiry*	*Elaboration*
Reactive	Learner matches answer given by system	Learner turns page when prompted	Learner selects choice from a menu	Learner uses "help" menu	Learner reviews a concept map
Proactive	Learner requests test when offered	Learner requests an abbreviated version of instruction	Learner defines unique path through instruction	Learner searches text using keywords	Learner generates a concept map of the instruction
Mutual	System adapts to progress of learner and learner may challenge assessment	System adapts speed of presentation to the speed of the learner	System advises learner about patterns of choices being made during instruction	System suggests productive questions for the learner to ask given previous choices	System constructs an example based on learner input, and revises it as learner adds information

Transactions During Interaction

Transactions are what learners do during interaction; they are the mechanics of how interaction is accomplished. For example, learners type, click a mouse, touch a screen or scan a virtual environment. Learners can also engage in many productive types of covert transactions, mentally engaging themselves in the construction of metaphors, questioning the validity of content, constructing acronyms to remember material and the like. This discussion will focus on overt transactions, but the reader should realize that covert transactions can be employed whenever overt transactions are unavailable to the learner. Also, the use of one does not preclude the use of another.

The level of interaction can be influenced by the type of transaction permitted by hardware configurations and instructional designs. Several transactions cannot be easily adapted to higher levels of interaction. For example, the range of possible interactions is confined if a spacebar is the only means of transacting with a program. Devices such as the mouse and instructional design strategies such as touch screen menus do not permit the learner to construct inquiries, thereby eliminating the possibility of adopting a proactive or mutual orientation. For example, a learner can use a touch screen or use a single keyboard entry to make menu selections or answer questions (reactive interaction). Touch screens and single keyboard entries are too restrictive, however, to be used for generative activities such as on-line note taking (proactive interaction).

Conversely, transactional methods serving proactive or mutual interactions can also be used in reactive interactions. For example, a keyboard synthesizer can be used by a learner to compose a new song (proactive interaction), while the same keyboard synthesizer can be used to have learners mimic a score played by a program (reactive interaction). In this way, transactions conform to the hierarchy of this taxonomy. Transactional events available for higher levels of interaction can be adapted to lower levels of interaction, but the relationship is not reciprocal.

IMPLICATIONS OF THE TAXONOMY OF INTERACTION FOR LEARNER CONTROL AND PRACTICE

The taxonomy of interaction carries implications for designing interactive multimedia-based instruction, primarily concerning questions of learner control and practice. Control and practice events in multimedia-based instruction are expressed in the nature of interaction provided learners. How do learner control and practice converge with the proposed taxonomy?

This taxonomy is meant to be descriptive, not prescriptive, yet each point of interaction in an instructional treatment represents a decision point for an instructional designer. An instructional developer constantly weighs the need to be prescriptive versus the need for learners to explore. As levels of interaction are ascended by the instructional designer, and reflected in the design of interaction and practice, the amount of control abdicated to the learner changes. At a reactive level of interaction, the instructional developer retains almost complete control over the content, its presentation, sequence and level of practice. A proactive level of interaction relinquishes much of the developer's control over instruction, as the learner determines what content to encounter, the sequence and how much time to devote to any particular element, how much practice with any particular content is required, and whether additional content will be explored or ignored. An instructional designer must struggle with whether the learners have the necessary skills and motivation to work successfully in a democratic environment, and therefore whether proactive interaction strategies will be beneficial to the learner. At a mutual level the system and the learner negotiate control of instruction. The learner engages the instruction and makes decisions, but as instruction proceeds, the system adopts the role of wise advisor (or tyrant) and attempts to structure the instruction for the learner, based on needs revealed by the learner. Thus, the amount of learner control is shared at a mutual level of interaction.

One problem an instructional developer faces is when to assert and when to relinquish control. This decision will, in turn, influence which level of interaction may be appropriate to employ in the design of instruction. The issue has moral and ethical overtones. Certainly, it would be inappropriate to set unprepared learners adrift in a sea of learning resources without the skills necessary to navigate their craft, and then expect them to operate successfully. Learners need to be sufficiently mature, and have access to the necessary problem solving and attack skills, such as metacognitive practice strategies, to perform successfully in less structured learning environments. Osman and Hannafin (1992) point out that significant variables in the acquisition and use of metacognitive strategies are the age of learners, previous experience and their belief in their abilities. Programs need to emphasize not only knowledge about strategies, but also knowledge about maintaining and transferring strategies to other settings. Cybernetic systems may be able to "tune" themselves to the metacognitive strategies employed by learners, adjust to them, and advise learners of trends which emerge. Systems can, by advising the learner in an organized fashion about decisions made, promote the development of personal metacognitive strategies.

Decisions about control form part of the art of instructional design. One should not assume that proactive and mutual forms of interaction do not impose external elements of learner control. On the contrary, considerable control of the learner can be exercised by the instructional designer in subtle and passive forms, such as the design of the access structure available to the learner. For example, a designer might unintentionally use confusing or obscure icons and thereby discourage learners from exploring associated material in a learning resource. If control is to be given to learners, attention must be paid by instructional designers to the covert elements of a design which may frustrate learners from exercising that control. In other words, control must not only be given to learners, it must be taken by learners, and design factors may inhibit or encourage their decision to take control.

A significant amount of research about practice and control has been conducted over the past several years. Although prescriptions regarding the use of learner control and practice in multimedia-based learning designs would be premature, tentative advice is available. The following conclusions have implications for the design of interactive multimedia instruction, and especially illuminate when it might be appropriate to move from prescriptive environments to democratic environments. Generally speaking, the decision to relinquish control of instruction to the learner carries with it the assumption that the learner will be empowered by that decision. Most of these conclusions speak to when learners might be empowered by being given more control over instruction and conversely when learners might be hampered by having such control. As a general observation, it is worth noting that most of these studies emphasized a logicalpositive orientation—one in which the measures of learning and performance are externally defined. Terms such as "efficiency," "perform optimally," "effectiveness" betray a positivist orientation. It is possible, from a constructivist point of view, to suggest that learners construct multiple—and equally valuable—realities from their unique interactions with multimedia, thereby challenging external definitions of "effective" performance. Some of the more recent studies have begun to focus on generative and collaborative approaches. Some of the conclusions, most notably those concerning practice strategies, adopt a more constructivist posture.

General Conclusions About Practice

- Practice should be available to the learner at any time, and in several forms to satisfy self-determined needs in democratic and cybernetic environments. In prescriptive environments, practice should be imposed often during early stages of learning and less often as time with a particular topic progresses (Salisbury, Richards, & Klein, 1985).
- Practice during instruction should be varied.
- As facility and familiarity with the learning task increase, so should the difficulty of practice. In prescriptive environments, the difficulty level would be managed externally by the instructional designer. In democratic and cybernetic environments the learner may be advised about difficulty levels and productive choices, but the decision will be left in the hands of the learner.
- Practice events should require learners to use information and discover and derive new relationships in information.
- Give learners opportunities to practice using higher-order cognitive strategies, such as metacognitive procedures and mental modelling to promote complex learning and transfer (Osman & Hannafin, 1992; Jih & Reeves, 1992).
- Cooperative learning strategies can be applied to computer-based instruction, but learners may need to learn and practice using collaborative skills for collaborative strategies to be successful (Hooper, 1992).
- Practice should include practice with strategies for learning, not just practice with specific content or skills. Learners can benefit from memory and organizational strategies to make information more meaningful. Metacognitive strategies can promote learning and can be generalized across learning situations, but they must be learned and practiced (Osman & Hannafin, 1992).

General Conclusions About Control

- Control is often used to refer to the selection of content and sequence, but may also include the full range of learner preferences, strategies and processes used by the learner.
- Relinquishing control of the instruction and giving the learner control may increase motivation to learn (Santiago & Okey, 1990; Steinberg, 1Q771

- When control of the learning is given over to the learner, so also is the external definition of efficiency. Learner control does not necessarily increase achievement and may increase time spent learning (Santiago & Okey, 1990).
- Learner control may permit students to make poor decisions about how much practice they require, which are reflected in decremented performance (Boss;, 1984). On the other hand, metacognitive strategies can be acquired by the learner which will help the learner make more productive decisions (Osman & Hannafin, 1992).

Control Issues Related to Learner Characteristics

- Learners who are generally high achievers or who are knowledgeable about an area of study can benefit from a high degree of learner control (Borsook, 1991; Gay, 1986; Hannafin & Colamaio, 1987).
- Naive or uninformed learners require structure, interaction, and feedback to perform optimally (Borsook, 1991; Carrier & Jonassen, 1988; Higginbotham-Wheat, 1988, 1990; Kinzie, Sullivan, & Berdel, 1990; Schloss, Wisniewski, & Cartwright, 1988).
- The effectiveness of giving control to the learner is positively correlated with learner ability, previous knowledge of the subject matter, and locus of control (Santiago & Okey, 1990).

Control Issues Related to Program Variables

- Learner control with advisement seems to be superior to unstructured learner control for enhancing achievement and curiosity, promoting time-on-task, and stimulating self-challenge (Arnone & Grabowski, 1991; Hannafin, 1984; Mattoon, Klein, & Thurman, 1991; Milheim & Azbell, 1988; Ross, 1984; Santiago & Okey, 1990).
- Learner control of presentations has been shown to be beneficial with respect to text density (Ross, Morrison, & OT)ell, 1988) and context conditions (Ross, Morrison, & O'Dell, 1990).
- Courseware should be adaptive. It should be able to alter instruction dynamically, based on learner idiosyncrasies (Borsook, 1991; Carrier & Jonassen, 1988).
- One opinion holds that learners should be given control over contextual variables such as text density, fonts, and backgrounds, but not over content support variables such as pacing, sequence, and examples (Higginbotham-Wheat, 1988; 1990).

These suggestions, however inviting, should be approached with caution. Not only are they tentative, they are also contradictory in some cases. For example, the advice offered by Higginbotham-Wheat (1988; 1990) can be interpreted to mean that learners should influence only variables which have little instructional import, and be denied control of significant instructional variables. Certainly this contradicts the intentions and findings of many of the other studies cited, as some argue that we need to go beyond objective and prescriptive designs, and embrace generative and constructivist approaches (Jonassen, 1991; Hannafin, 1992). Inherent in these arguments is the concept of empowering learners, an issue which will occupy a central position in multimedia research during this decade.

SUMMARY

The classification of interaction for multimedia instruction offered in this paper is descriptive, temporal and developmental. The purpose of the taxonomy is to help us understand how we can and should express interaction within different learning environments. As instructional design advances, and as the development of instructional technologies continues to bluster, the categories offered herein will likely evolve. Certainly our understanding of productive avenues for instructional design and practice will also grow. Increasing attention is being given to democratic and cybernetic environments for learning, and this, in turn, requires instructional designers to reconsider the roles played by interaction during instruction.

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AUTHOR

Richard Schwier is Professor of Curriculum Studies, College of Education, University of Saskatchewan, Saskatoon, Saskatchewan S7NOWO.

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Instruction CoPlanner: A Software Tool to Facilitate Collaborative Resource Teaching

Leonard Haines
Robert Sanche
Gladene Robertson

Abstract: In the present paper the authors describe Instruction CoPlanner, a computer software system designed to facilitate the emerging collaborative role of the special education resource teacher. They then explain the subsystemsof CoPlanner and show how each part of the software Is used to enhance the work of teams of special education support staff. Finally, they present preliminary evaluative feedback and discuss the potential value of Instruction CoPlanner as a system of computer-supported instruction for resource teachers and other "helping" professionals.

Resume: Dans cet article, les auteurs decrivent lesysteme logiciel Instruction CoP/annerconcu pour faciliter Emergence du role collaborafeur des enselgnants dans I'enselgnement specialise. Les auteurs nous expllquent ensultelefonctionnementdusous-systemedeCoP/anner et demontrent comment chaque portion du logicielest utllisee pour etendre la portee du travail des equlpes de soutien en enseignement specialise. Enfin, Ils nous font part des retroacitons preliminaires de leur evaluation et discutent de la valeur potentlelle du systeme logfciel comme outll d'enseignement assiste par ordinateur pour les formateurs specialises et pour les autres Intervenants professionnels.

The role of the special education resource teacher in Saskatchewan and elsewhere in North America has changed markedly in recent years. As mainstreaming and, more recently, "inclusion" of students with special needs have become common practice in schools (Gartner & Lipsky, 1987; Sanche & Dahl, 1991; Will, 1986), the role of the resource teacher has evolved from that of instructional "expert" to instructional "collaborator" (Friend & Cook, 1992; Giangreco, Dennis, Cloninger, Edelman, & Schattman, 1993; Idol, 1989; Pugach & Johnson, 1988, 1989). Prior to this change, school-based resource teachers typically withdrew students with special needs from the regular classroom and, after assessing them, provided developmental or remedial instruction in the resource room. This "pull-out" service delivery model has had potentially harmful effects on students (Allington & McGill-Franzen, 1989; Gersten & Woodward, 1990). Awareness of these negative effects has given rise to a major paradigm shift to collaborative special education service delivery in the student's mainstream classroom (Sanche&Dahl, 1991;Stainback&Stainback, 1991). Further, resource teachers often provide their services as members of professional teams sharing responsibility for the student's total education program. This change has meant that these teachers now have an even greater need for the problem-solving and interpersonal skills which underpin and facilitate collaborative teaching.

A second major factor beginning to affect the role of the resource teacher is the increasing availability of microcomputers in society generally and in the schools. Computer assisted instruction, which was relatively rare a decade ago, is now common in classrooms, and especially in those in which students with special needs require individualized teaching and support. New "tool" software designed to facilitate the teachers' instructional planning and administrative duties is also now becoming more available (Budin, 1991; Lillie, Hannum, & Stuck, 1989). Competency in the use of the computer in teaching is rapidly becoming a requirement for all teachers (Fulton, 1993;Norvak&Berger, 1991) and especially for resource teachers.

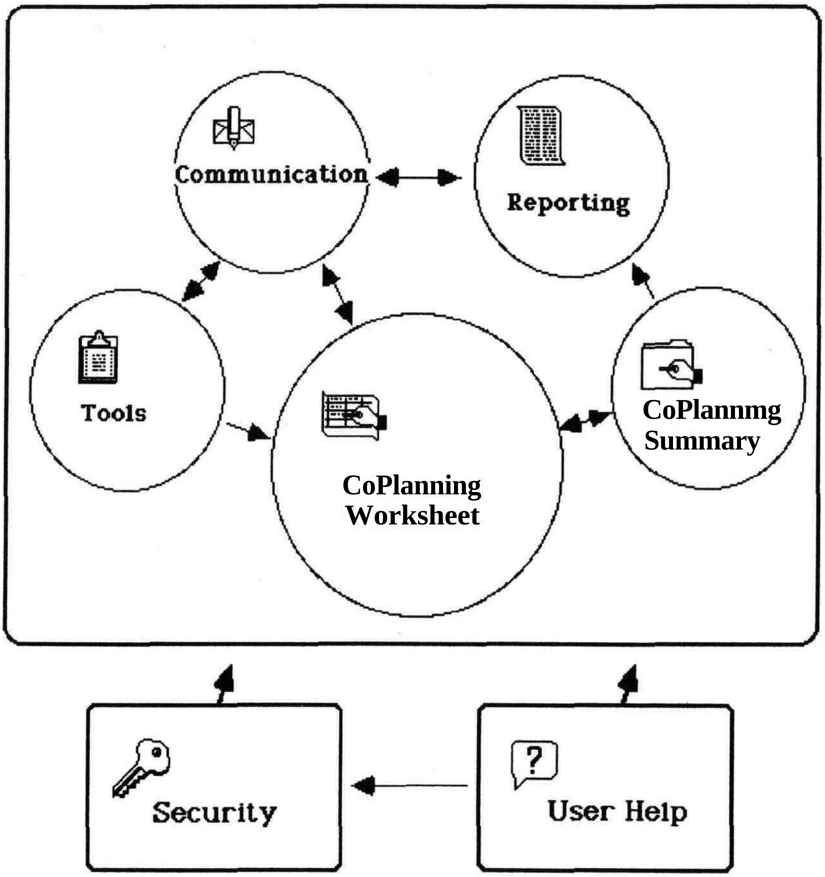
College of Education faculty at the University of Saskatchewan have been involved in the professional preparation of resource teachers for approximately the past two decades. Over the years, past graduates have been surveyed to determine how well prepared they had been for their subsequent resource teaching positions. Through the surveys they were also able to suggest new elements they felt should be added to the program. In response to the last survey, former students recommended that the use of computers be included in the core of the resource teacher education program, and that more content on the basic skills needed to work in a collaborative service delivery model also be incorporated into the courses offered. Our response was to develop Instruction CoPlanner, a software system to support collaborative special education service delivery. The purposes of this paper are to describe Instruction CoPlanner, to show how it is used, and to report evaluative feedback about the potential value of the software.

A Description of Instruction CoPlanner

Instruction CoPlanner is a software package designed to facilitate collaborative instructional planning among teams of educators. It is a tool for teachers rather than for students, and is especially useful when two or more staff members share responsibility for planning and providing individualized instruction for a student with special needs. Embedded questions in the software focus the team on the specific needs of the student and help members to achieve consensus on the need for and the components of a student's instructional program. CoPlanner is also an "open" system, in which users can adapt the ways in which they use the software to accommodate their own teaching styles and preferred approaches to service delivery. Users can modify both the specific areas of intervention and the order in which intervention tasks are pursued.

The software design consists of a set of six highly interactive systems (see Figure 1). Thecollaboratingteamusesthesoftwaretosupportthefollowingtasks:

Figure 1.
Elements of Instruction CoPlanner



1) *Communication:* Frequent, effective communication is fundamental for the success ofcollaborative special education service delivery. CoPlanner therefore includes an on-line, networkable *mail* system to support communicationamongmembersofthecollaboratingteamduringface-to-face meetings as well as between meetings.

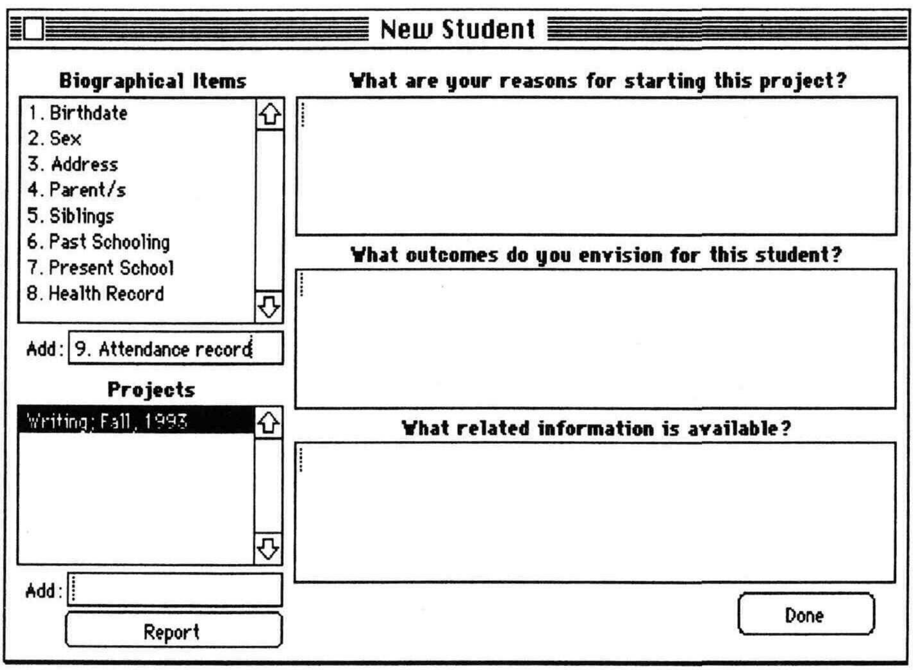
2) *Planning:* Joint planning is required to ensure that all those who share responsibility for a program have a common understanding of the student's educational needs and how those needs are to be met. The *CoPlanning Worksheet* provides space for joint instructional planning and the *CoPlanning Summary* accumulates the on-going results of instructional planning into an electronic record, which can be output as a draft report, ready for editing.
3) *Assessment, Reflection, and Teaching:* Assessment, reflection and teaching are the universal, shared responsibilities of collaborative special education teams. CoPlanner includes a question-driven work space for the collaborating team to use during instructional planning and service delivery. The *CoPlanning Worksheet* is automatically formatted into rows by the computer according to the areas of intervention chosen by the team and into columns according to the four-stage intervention model. Guiding questions for each column of the Worksheet are those which experienced resource teachers or consultants would ask while trying to be thorough and systematic in working with the student. The resulting cells of the CoPlanner Worksheet are active text fields in which planning information may be entered, edited, and printed out. A database of on-line assessment and teaching *Tools* is also available to facilitate the main tasks of the team.
4) *Monitoring:* Keeping track of the student's progress is also a shared responsibility of a collaborative team serving a student with special needs. The software includes question-driven space in the Worksheet to help the team to be thorough and systematic in monitoring student progress. The questions embedded in the software focus the team on the relevant areas of student need identified in the original intervention plan.
5) *Reporting:* Every team responsible for the education of a student with special needs is also expected to report student progress. CoPlanner provides a question-driven *Report Planning* form to assist the team to achieve consensus on the purpose and form of a report. The software also generates a draft report from the *CoPlanner Summary,* which can then be edited on-line and output in any format the team desires. A *Thesaurus* is provided to assist the team to modify terminology used in reports. The thesaurus will quickly scan the text of a draft report for any instances of a target word or term, provide a list of alternatives, and allow replacement of the target word with a preferred alternative.

Instruction CoPlanner is currently programmed in C language for use only on the Macintosh computer. Users with operating System 7 software can take advantage of the *Balloon Helps* which are incorporated throughout CoPlanner, providing context-specific help.

How CoPlanner Works

Instruction CoPlanner is used by a collaborating team of educators to initiate a "project" for a student with special needs. A project is a clearly delineated, joint plan for addressing a student's specific educational needs. Each project has a specific curriculum focus, time-frame, and a group of educators responsible for serving the student. The software is used by the team at its first meeting to develop a common set of objectives for the project, to achieve consensus on the desired outcomes of the project, and to record biographical and other educationally relevant information about the student. During this first meeting, one educator (usually the resource teacher) enters the substance of the group's planningdecisions into the student's project file (See Figure 2). Guidingquestions in the software keep the group focused on the task at hand, and help them be

Figure 2.
Beginning a New Instruction CoPlanner Project for a Student.



thorough in their initial planning. Often at this first meeting the team will also use the Information Gathering section of the CoPlanner Worksheet (see Figure 3) to plan any further assessment required before detailed instructional planning

Figure 3.
Completing the Information Gathering Part of the CoPlanner Worksheet.

Worksheet:Writing; Fall, 1993

Information Gathering Plan			
What additional information is needed, and where can it be found?	When can the needed information best be obtained?	How can the needed information be obtained?	Who can best collect this information?
Need to find out how Billy goes about preparing a plan for his writing. We can get this info from his language arts class in his grade 5 classroom.	Tuesday at 10:30 there is a writing assignment based on the science study of ants.	Use the "Writing Observation Checklist". A description is located in the Tools, and a copy can be printed.	Mrs. Weise, resource teacher, will observe and complete the checklist.

is begun. The plans developed at this first meeting can be printed out at the end of the meeting, and distributed with each team member's responsibilities highlighted.

At all subsequent meetings, the team uses the Reflection, Teaching, Monitoring, and Reporting features of CoPlanner to support them in carrying out the project. Between face-to-face meetings, members of the team use the Mail system to maintain communication, record observational data, note student progress, leave preliminary reports, or make teaching suggestions. In those ways, CoPlanner functions as a support system for joint planning and communication among members of the team.

Preliminary Evaluative Feedback on CoPlanner

Instruction CoPlanner was conceptualized and developed as a three year project (1990-1993), with both formative and summative evaluation plans included. In May and June, 1992, a two month formative evaluation of the software was carried out at five schools in Saskatoon, with the resulting information used to enhance the initial version of CoPlanner and the user's manual. The revised version of CoPlanner was then placed in more than twenty field sites during October, 1992 for the duration of the 1992-93 school year. A combined formative and summative evaluation from this extended field testing will be completed in late 1993.

During the past year, CoPlanner has been shown to experienced resource and regular classroom teachers at "Showcase "93", the 60th Anniversary conference of the Saskatchewan Teachers' Federation, the Teacher Education Division and Technology and Media Division conferences of the Council for Exceptional Children in the United States, and at regional meetings of special education teachers and administrators in the Perth area of Western Australia. At each conference, all of the features of the CoPlanner software were demonstrated using a Macintosh PowerBook, an LCD panel, and a worked example. Following the presentations, the project team used the Conference Participant Feedback Checklist to obtain ratings of the potential value of each of the components of CoPlanner. Respondents used a six-point scale ranging from 1 = "Not Valuable", to 6= "Very Valuable", to rate each of the 13 components of CoPlanner and to rate two general items concerning the overall potential of Instruction CoPlanner. Seventy-one respondents returned completed Checklists, including biographical information about their professional status as teachers.

Table 1 shows mean scores for the 71 respondents on all items of the checklist. Teachers rated the potential of all elements of CoPlanner very highly. Only the Thesaurus was rated marginally below 5 on the six-point scale. The features rated most highly were the potential for Networking with CoPlanner, the on-line Help features, the overall potential value of computers in educational planning, and the potential overall value of CoPlanner as an instructional support system. CoPlanner's emphasis on professional collaboration and its Reporting features were also rated above 5 on the 6 point scale.

In addition to this preliminary evaluation of the potential of CoPlanner, the project team submitted the software and manual for adjudication at the June, 1993, conference of the Association for Media and Technology in Education in Canada (AMTEC). CoPlanner was gran ted an Award Of Merit. Both experienced teachers and the computer software specialists appear to recognize the potential value of CoPlanner as instructional support software.

CONCLUSIONS AND DISCUSSION

Instruction CoPlanner is a new software tool to facilitate collaborative resource teaching. It was designed specifically to support initial joint planning by teams of special educators and on-going communication during subsequent service delivery. In addition, it provides on-line access to assessment, teaching and reporting tools needed by these teams. Above all, it is an "open" instructional support system which can be easily modified to include the curriculum structure,

TABLE 1
Conference Participants' Mean Ratings of the Potential Value of Instruction CoPlanner: N=71 Experienced Teachers

Item Rated	Rating: not valuable 1	2	3	4	5	very valuable 6	Mean
1. The CoPlanning Worksheet feature	1	2	3	4	5	6	(5.1)
2. The CoPlanning Summary feature	1	2	3	4	5	6	(5.2)
3. The on-line Tools feature	1	2	3	4	5	6	(5.1)
4. The internal Mail system	1	2	3	4	5	6	(5.0)
5. The Thesaurus	1	2	3	4	5	6	(4.8)
6. The Report Planner	1	2	3	4	5	6	(5.4)
7. The Report Generator feature	1	2	3	4	5	6	(5.2)
8. The emphasis on Professional Collaboration	1	2	3	4	5	•6	(5.4)
9. The potential for Computer Networking	1	2	3	4	5	6	(5.5)
10. The Private Notes feature	1	2	3	4	5	6	(5.0)
11. The Security feature	1	2	3	4	5	6	(5.3)
12. The on-line Extended Help feature	1	2	3	4	5	6	(5.5)
13. The Balloon Help feature	1	2	3	4	5	6	(5.5)
14. The use of computers in educational planning	1	2	3	4	5 •	6	(5.5)
15. The overall value of Instruction CoPlanner as an instructional support system	1	2	3	4	5 •	6	(5.3)

assessment and teaching tools, and modes of service delivery preferred by the user. It is intended to be used as an integrated instructional support system.

Whenever two or more professionals share responsibility for the education of a specific student, there is potential for discontinuity in planning and service delivery. The greater the number of participants and the more diverse their specialties (for example; teaching, resource teaching, educational psychology, speech therapy, social work) the greater the need for collaboration. Using a question-driven computer program such as CoPlanner helps the team achieve consensus on the specific needs of a student, the details of the developmental or remedial program, and the individual responsibilities of each team member in carrying out the program. As a further benefit in using this approach to collaboration, the computer captures an enduring record of the planning, teaching, monitoring, and reporting activities of the group.

In order for collaborative planning among educators to yield the best possible program for the student with special needs, there must be shared responsibility for participation and decision making (Friend & Cook, 1992). When one or two members dominate teamwork, the resulting program tends to reflect their specific thinking and their professional orientations and to be less complete than it might if the input of all team members leads to consensus decisions. "Undominated dialogue" (Harrington, 1993; Sproull & Kiesler, 1991; Strike, 1991) leads to a greater sharing of ideas and professional expertise and therefore, presumably, to better planned programs. As one of the conference participants who had seen CoPlanner for the first time said, "What I like about it is that the question-driven software focuses all members of the team on the needs of the student and away from the issue of who should have the most say in planning the program." This conference delegate was highlighting one of the primary purposes for developing CoPlanner. In addition, the communication system will allow ongoing electronic conferencing, which Sproull and Kiesler (1991) have demonstrated to be at least as productive as face-to-face meetings.

Instruction CoPlanner has been developed to provide support for special educators, classroom teachers, consultants, parents, and others who engage in collaborative teamwork to provide effective instruction for students with special needs. Preliminary feedback from teachers who participated in extensive demonstrations of this new software tool suggests that its design is consistent with the needs of these professionals as they engage in collaborative instructional planning. The AMTEC Award also provides preliminary evidence of the technical quality of the software. Extensive and intensive evaluation data from field test sites will provide a detailed picture of CoPlanner's usefulness in a variety of applied situations. We anticipate that this field data will confirm the value of Instruction CoPlanner as a software tool to support collaborative resource teaching.

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AUTHORS

Leonard Haines is Associate Professor and Director, Project AIMS, Department for the Education of Exceptional Children, University of Saskatchewan, Saskatoon, SK, S7N OWO, Canada.

Robert Sanche is Professor, Department for the Education of Exceptional Children, University of Saskatchewan, Saskatoon, SK, S7N OWO, Canada.

Gladene Robertson is Associate Professor, Department for the Education of Exceptional Children, University of Saskatchewan, Saskatoon, *SK*, S7N OWO, Canada.

L'Impact de la vidéo sur l'apprentissage du vocabulaire en L2

Lise Duquette
Jean-Paul Dionne

Résumé: L'objectif de cette étude consiste à explorer l'apprentissage du vocabulaire à partir d'un dialogue présenté dans un contexte audio ou vidéo. L'hypothèse prédit que l'apprentissage du vocabulaire est favorisé par le contexte vidéo. L'échantillon est composé de 119 anglophones de niveau universitaire qui possèdent l'équivalent d'au moins 120 heures de FLS (français langue seconde). On a examiné les indices contextuels linguistiques et extralingulstiques de quarante mots du dialogue. Les résultats montrent que les stratégies d'apprentissage varient selon les contextes. Ainsi, le groupe audio a privilégié la stratégie du transfert pour les mots qui se ressemblent morphologiquement entre la Ll (langue maternelle) et la L2 (langue seconde): par exemple, des congénères ou des mots à racines communes. Pour le groupe vidéo, où la focalisation se trouve au niveau des indices extralinguistiques, les mots qui ont été appris et retenus sont ceux pour lesquels il y a une harmonisation entre l'interaction verbale et les indices visuels. Les résultats identifient certains paramètres à considérer dans la production de bandes magnétoscopiques et de vidéodisques comme outils favorisant l'Individualisât Ion et l'enseignement Interactif en FLS(français langue seconde).

Abstract: The objective of thé study Is to compare thé learnlng of vocabulary by students hearing dialogue in either audio or vidéo format. It was hypothesed that vocabulary learning is enhanced by eues from thé vidéo context. The sample consisted of 119 unlverslty English-speaking subjects who had studled French as a second language (FSL) for thé équivalent of 120 hours. Contextual eues (linguistlc and extralingulstlc) were examined for 40 words in thé dialogue. Results show that learnlng stratégies vary according to context. Where thé words were morphologically close in thé two languages (Le,.cognâtes, corn mon roots) resultsshow that thé audio group favoured a transfer strategy from their first language to thelr second language, whlle thé vidéo group focused on extrallngulstic eues, uslng both verbal Interaction and Visual eues for vocabulary learning. Results ylelded several parameters relevant for thé production of vidéo recordlngs and Interactive learnlng toote in FSL.

INTRODUCTION

Alors que plusieurs études, en langue maternelle (Ll) principalement, mais en langue seconde (L2) également, ont traité du problème de l'apprentissage du vocabulaire en contexte à l'écrit, très peu d'études se sont intéressées à cette question à l'oral.

Les études sur l'apprentissage du vocabulaire en contexte en Ll à l'oral examinent soit le facteur âge (Carey et Bartlett, 1978; Crais, 1987; Dickinson, 1984) ou les sortes de mots appris par rapport à la compréhension et à la production (Benedict, 1977; Doolaghan, 1985). Un nombre limité d'études examinent l'apprentissage linguistique par le biais de la télévision et celles-ci se limitent aux enfants (Rice, 1984;LemishetRice, 1986;RiceetWoodsmall, 1988).

En L2, un nombre restreint de chercheurs ont examiné le problème de l'apprentissage du vocabulaire à l'oral. Xialong Li (1988) étudie les indices adéquats dans des phrases favorisant l'inférence et le rappel du vocabulaire chez des étudiants chinois de niveau avancé en anglais, mais cette étude se limite au contexte de la phrase puisqu'elle n'examine que des phrases séparées. L'étude de Huot (1988) évalue, auprès d'adultes anglophones de niveau débutant en français L2, la compréhension orale d'éléments lexicaux et grammaticaux à partir de quatre différentes techniques d'enseignement; la contextualisation prend dans cette étude, une signification différente de ce que l'on retrouve dans la majorité des études en langues puisqu'elle est fournie en Ll.
Peu d'études ont été effectuées, auprès d'un public adulte, sur l'apprentissage du vocabulaire par le biais de la vidéo ou de la télévision — ce qui fournit à la fois un contexte linguistique et extralinguistique — en Ll et en L2.

Pourtant, les enseignants et les enseignantes utilisent abondamment la vidéo mais il existe peu de données sur ses effets au niveau de l'apprentissage de la langue. En d'autres mots, les élèves sont-ils en mesure d'apprendre de nouveaux mots en écoutant la télé par exemple? Si oui, dans quelles conditions?

La présente recherche a pour objectif de vérifier si l'écoute d'un dialogue scénarisé avec ou sans support visuel peut favoriser l'inférence du sens de mots inconnus au départ par les sujets. De plus, cette recherche vise à vérifier la rétention des mots nouveaux appris avec ou sans support visuel.

D'abord, il est opportun de définir le sens que l'on attribue au contexte en Ll et en L2. Ensuite, suivrons les hypothèses, le plan d'expérimentation, les résultats et quelques applications pour la production de matériel didactique en français L2, principalement dans le cadre d'un enseignement individualisé ou interactif.

Le contexte

Les variations de sens du mot contexte sont à la fois inter et intradisciplinaires; elles dépendent à la fois de la discipline (par exemple, la psychologie, *la* linguistique) et de l'orientation dans la discipline (par exemple, le contexte de la phrase, du discours en linguistique et celui des connaissances antérieures en psychologie).

Depuis plus d'une décennie, la plupart des recherches sur les fondements de l'approche du contexte en compréhension et en apprentissage du vocabulaire en Ll et en L2 reposent sur deux théories cognitives complémentaires et en interaction : la théorie des schèmes (Bartlett, 1932; Rumelhart, 1975, 1981) et celle du traitement de l'information (Gagné, 1974; Schneider et Shiffrin, 1977; Shiffrin et Schneider, 1977; Anderson, 1985). En L2, la théorie des schèmes a été étudiée, entre autres, par Carrell (1984) et Johnson (1981); la théorie du traitement de l'information a été principalement examinée par McLaughlin, Hossman etMcLeod (1983).

La théorie des schèmes et celle du traitement de l'information ont permis, d'une part, d'accorder une grande importance aux connaissances antérieures et à la façon dont elles sont emmagasinées et rappelées et, d'autre part, de mettre en relief le rôle que l'activation de la catégorisation des relations inhérentes à la connaissance joue dans l'apprentissage. Par exemple, l'apprentissage d'un mot est facilité par l'établissement de passerelles entre l'inconnu et le connu; pour que de nouveaux concepts soient appris, les mots doivent nécessairement être reliés à des concepts déjà connus.

Dans la présente étude, le contexte comprend un volet linguistique et un volet extralinguistique. Le contexte linguistique est lié à la langue, au discours et aux connaissances antérieures et comprend des indices internes (racines, affixes) et externes (des définitions, des synonymes). Le contexte extralinguistique, pour sa part, est lié à la situation et aux connaissances antérieures et comprend les indices non linguistiques (par exemple, image, musique) et paralinguistiques (par exemple, geste, ton de la voix).

Le vocabulaire et le contexte

En langue maternelle, le rôle joué par la connaissance du vocabulaire dans le développement de l'habileté à lire est bien établi (Sternberg, Powell et Kaye, 1982, Sternberg et Powell, 1983, Sternberg, 1987; Nagy, Herman et Anderson, 1985; Nagy, Anderson, Herman, 1987).

Les chercheurs en Ll ont abordé le problème de l'apprentissage du vocabulaire en contexte sous divers angles. Certains ont tenté de déterminer les indices contextuels (Ames 1966; Sternberg et Powell, 1983) d'autres, les facteurs pouvant influencer l'apprentissage (Werner et Kaplan, 1950; Frey et Baron, 1982; Carnine, Kameenui et Coyle, 1984; Daneman et Green, 1986; Kaye et Sternberg, 1987) et d'autres encore ont essayé de vérifier si l'apprentissage du vocabulaire s'effectue explicitement ou implicitement, c'est-à-dire principalement selon la méthode directe ou en contexte (Gipe, 1980; Stahl, 1983; Nagy, Herman et Anderson, 1985; Nagy, Anderson et Herman, 1987).

Ces diverses études montrent qu'en plus des indices contextuels externes et internes et de certaines variables, telles la proximité du contexte (Carnine, Kameenui et Coyle, 1984), le nombre de présentations (Jenkins, Stem et Wysocki, 1984) et la redondance (Schatz et Baldwin, 1986; Carnine, Kameenui et Coyle, 1984), certains facteurs individuels, tels l'âge et l'intelligence (Frey et Baron, 1982; Daneman et Green, 1986) sont à prendre en compte dans l'apprentissage du vocabulaire en contexte en Ll.

En ce qui concerne l'inférence du vocabulaire, les études sur le contexte en 1$ se fondent sur celles en Ll et tiennent compte des facteurs individuels. Le niveau de connaissance de la Ll est un facteur important — souvent lié à la scolarité — et déterminant dans l'habileté à inférer à partir de la morphologie du mot. De prime abord, l'adulte possède déjà des acquis langagiers lors de l'apprentissage d'une deuxième langue; cette variable prend alors une autre dimension et est souvent liée à l'expérience socioculturelle (Johnson, 1981). Cependant, forcenous est de constater que les lecteurs et les lectrices ont souvent du mal à inférer le vocabulaire à partir d'un contexte en Ll, même si ce sont des personnes scolarisées (Ames, 1966). Le problème est plus aigu en L2, particulièrement chez les élèves qui n'ont pas encore atteint un certain niveau en langue cible. Les contextes n'étant pas tous riches et ne facilitant pas toujours l'inférence, la majorité des élèves ont besoin d'un entraînement spécifique.

Les recherches en Ll n'ont jusqu'ici pu montrer laquelle des approches — l'apprentissage explicite par l'enseignement direct ou l'apprentissage implicite par le contexte — est préférable pour l'accroissement du vocabulaire. L'enseignement explicite est lent et nécessite plusieurs présentations des mots et, malgré un certain succès, il doit s'accompagner d'un apprentissage implicite (par exemple, par le biais de la lecture, de la conversation, de la télévision). En L2, on retrouve également les tenants de la démarche globaliste ou implicite et les tenants de la démarche analytique ou explicite. Comme les résultats des études ne permettent pas actuellement d'en arriver à un consensus, il semble se dégager une certaine tendance pour une méthode mixte comme moyen d'accroître le vocabulaire.

La présente étude s'inscrit dans le paradigme de la théorie de Sternberg et Powell (1983) et Sternberg (1987) qui situe l'apprentissage du vocabulaire dans une théorie de la compréhension verbale et qui utilise les indices contextuels comme moyen de prédire l'inférence lexicale.

L'objectif et l'hypothèse

La recherche a pour objectif de comparer deux conditions d'écoute d'un dialogue scénarisé pour l'apprentissage et la rétention de mots de vocabulaire.

Nous énonçons l'hypothèse que la présentation visuelle d'une situation langagière familière — soit apprendre à conduire une voiture — a pour effet d'améliorer davantage l'apprentissage du vocabulaire en L2. En d'autres termes, le groupe expérimental vidéo — qui bénéficie de plus d'indices contextuels extralinguistiques—inférera plus de mots nouveaux que le groupe expérimental audio.

La méthodologie

Les conditions expérimentales

Un premier groupe a reçu un traitement vidéo, c'est-à-dire que les sujets (n=29) - anglophones universitaires de niveau élémentaire en français - ont écouté un dialogue avec support visuel. Il s'agissait d'un vidéoclip mettant en scène deux personnages au cours d'une leçon de conduite automobile. La bande vidéo de 8 minutes intitulée «Permis de conduire» provient de la série *Pour tout dire* et a été réalisée par l'Office national du film (ONF). Cette série a été conçue à l'intention des élèves des écoles secondaires comme matériel complémentaire pour l'apprentissage du français L2. Ce document, conçu par des professionnels et des professionnelles du cinéma possède toutes les caractéristiques de l'authenticité.

Dans le cadre d'une deuxième condition expérimentale - traitement audio, les sujets (n=32) ont écouté le même dialogue sans le support visuel. Il faut signaler que l'activation des connaissances antérieures des sujets s'est effectuée différemment selon le traitement; à l'aide du titre et des images dans le cas du traitement vidéo et à l'aide d'une mise en situation orale précédant le dialogue scénarisé dans le cas du traitement audio.

L'épreuve de vocabulaire

L'évaluation du vocabulaire que comprend le dialogue scénarisé a nécessité l'élaboration d'une épreuve.

Une liste de tous les mots qui figurent dans le script a été établie. Ces mots ont d'abord été catégorisés en verbe, nom, adjectif et adverbe et ensuite classés en mots supposés connus par les sujets, appelés mots familiers - faisant partie de la liste du *Français fondamental*[1] - et ceux qui ne font pas partie du répertoire des sujets, appelés les mots non familiers.

Pour respecter les proportions d'occurrences dans le texte, 20 mots familiers (12 noms et 8 verbes) et 20 mots non familiers (12 noms et 8 verbes) ont été choisis pour un total de 40 items dans l'épreuve.

Chacun de ces mots a été inséré dans une phrase dont la structure syntaxique est identique à celle du texte. Les sujets devaient traduire, par écrit, le mot cible en anglais, après deux écoutes de chacune des 40 phrases en français[2].

L'épreuve de vocabulaire a été utilisée à trois moments: avant le traitement — comme prétest — pour évaluer les connaissances antérieures des sujets, immédiatement après le traitement - comme post-test 1 - pour évaluer le gain d'apprentissage et dix jours plus tard - comme post-test 2 - pour évaluer la rétention.

Les indices contextuels

La typologie des indices de Sternberg pour le contexte linguistique (Sternberg, Powell et Kaye, 1982; Sternberg et Powell, 1983; Sternberg 1987) a servi à identifier, pour chaque mot de l'épreuve de vocabulaire, des indices permettant d'inférer le sens de chacun des mots cibles du script.

Nous avons choisi cette typologie à cause de son exhaustivité en terme d'indices contextuels. Comme cette typologie a été expérimentée pour la lecture en Ll, le contexte linguistique—lié à la langue et au discours—est entièrement couvert alors que le contexte extralinguistique - lié à la situation—est très limité.

Aussi, pour adapter la typologie de Sternberg à l'oral en L2 où il y a utilisation d'une bande vidéo — où les indices extralinguistiques sont particulièrement importants — on a ajouté deux catégories de médias de Fanselow (1987): non linguistique et paralinguistique[3]. Également, on a ajouté comme indices internes le «congénère»[4] et r«emprunt» qui sont particuliers à la L2. Le Tableau 1 présente la typologie d'indices contextuels utilisée dans la présente recherche.

TABLEAU 1
La typologie des indices contextuels

CONTEXTE LINGUISTIQUE	
Contexte externe	*Contexte interne*
Indices contextuels:	Indices internes:
1. indices temporels*	1. préfixes*
2. indices spatiaux*	2. racines*
3. indices de valeur/avantage*	3. suffixes*
4. indices de description de l'état*	4. interactions
5. indices de description fonctionnelle*	5. congénères
6. indices de cause/possibilité*	6. emprunts
7. indices de membre d'une classe*	
8. indices d'équivalence*	
Variables médiatrices	*Variables médiatrices*
1. nombre d'occurrences pour le mot inconnu*	1. nombre d'occurrences du mot inconnu*
2. variabilité des contextes*	2. importance du mot inconnu*
3. importance du mot inconnu*	3. densité du mot inconnu*
4. aide perçue émanant du contexte*	4. densité des mots inconnus*
5. densité du mot inconnu*	5. densité du mot inconnu décomposable*
6. mot inconnu et le contexte l'entourant sont concrets*	6. utilité de la connaissance antérieure*
7. utilité des connaissances antérieures*	
CONTEXTE EXTRALINGUISTIQUE	
Non linguistique	*Paralinguistique*
1. images	1. gestes
2. signes	2. expressions du visage
3. objets	3. tons de la voix
4. musique	
5. bruits	

*Traduction libre d'après la typologie de Sternberg et al. (1982, 1983) et Sternberg (1987).

Pour l'analyse des indices contextuels du vocabulaire, on considère d'une part, le contexte linguistique externe et interne qui convient pour différents types d'information au sujet d'un mot inconnu. D'autre part, les variables médiatrices déterminent les contraintes imposées par la relation entre un mot précédemment inconnu et le contexte où il se présente.

Le Tableau 2 présente l'analyse des indices contextuels — linguistiques et extralinguistiques et des variables médiatrices pour les 40 mots cibles de l'épreuve de vocabulaire; ceci a permis d'examiner les caractéristiques des mots pour lesquels il y a eu apprentissage. Cette analyse a été effectuée par deux professeurs de langue expérimentés et ne présente que les indices et les variables qui sont apparus les plus pertinents.

Ce tableau montre que toutes les catégories de Sternberg sont représentées. La catégorie de la description fonctionnelle — correspondant aux intentions ou actions possibles d'une personne — domine puisqu'on la retrouve dans 14 mots. Au niveau des variables médiatrices, 7 mots sont répétés dans le dialogue mais un seul se présente avec des significations différentes. Au niveau des indices internes, 10 mots sont des congénères. Au niveau extralinguistique, les deux juges ont conclu que dans la majorité des cas, les indices non linguistiques ne facilitent pas autant l'inférence lexicale que les indices paralinguistiques.

Les échantillons

Les sujets sont des élèves inscrits à un programme d'étude de premier cycle à l'université d'Ottawa où ils reçoivent un enseignement en anglais. Les sujets sont anglophones de naissance et unilingues dans plus des deux tiers des cas. Les cours de français sont obligatoires lorsque le niveau de connaissance de l'élève ne correspond pas aux exigences fixées par cette université.

Sur le plan de la connaissance du français, les sujets ont tous reçu 120 heures d'enseignement en FLS ou l'équivalent.

Quatre groupes de sujets (n total=119) ont participé à l'expérimentation :

EV: groupe expérimental avec traitement vidéo (n=29) — correspond au groupe bénéficiant de la bande magnétoscopique et de l'épreuve répétée (prétest+traitement vidéo+post-testl +post-test2);

EA: groupe expérimental avec traitement audio (n=32) — correspond au groupe bénéficiant de l'audio et de l'épreuve répétée (prétest+traitement audio+post-test 1+post-test2);

TA: groupe témoin avec traitement audio (n=28) — correspond au groupe bénéficiant de l'audio sans prétest (traitement audio+post-testl+post-test2);

T: groupe témoin sans traitement (n=30) — correspond au groupe sans traitement et sans post-test 2 (prétest+post-testl).

Tableau 2
L'apprentissage du vocabulaire

			Variable médiatrice					Indice interne		Non linguistique		Para-linguistique	
No	Mot	Indice externe	Oc	V	I	A	C	Congénère	Emprunt	Oral	Visuel	Oral	Visuel
1	ralentir	équivalence	1	0	E	E	oui	non	non	F	F	E	E
2	s'énerver	valeur/avantage	1	0	F	E	non	non	non	F	F	M	E
3	surveiller	espace	1	0	E	M	oui	partiel	non	F	F	M	E
4	accélérateur	description fonctionnelle	2	0	F	F	oui	oui	non	M	F	M	M
5	couleur	description de l'état	1	0	M	M	oui	oui	non	F	F	E	M
6	début	temps/fréquence	1	0	M	E	oui	non	oui	E	E	E	E
7	savoir	description fonctionnelle	3	0	F	F	non	non	non	F	F	M	M
8	travailler	temps/fréquence	1	0	E	E	oui	non	non	F	F	F	F
9	dépasser	description fonctionnelle	1	0	E	E	oui	partiel	non	F	F	E	E
10	sortir	description fonctionnelle	1	0	M	E	oui	non	non	F	F	F	M
11	coûter	valeur/avantage	1	0	E	E	oui	non	non	F	F	M	F
12	écouteurs	description de l'état	1	0	FF	M	oui	non	non	F	F	F	F
13	plaque de glace	description fonctionnelle	1	0	E	E	oui	partiel	non	F	F	M	M
14	pédale	description fonctionnelle	1	0	E	E	oui	non	oui	F	F	M	F
15	d'accord	description de l'état	1	0	E	E	oui	oui	non	F	F	M	F
16	appuyer	espace	1	0	E	E	oui	non	non	M	E	E	E
17	jour	classe	1	0	E	E	oui	non	non	F	F	M	E
18	acheter	description fonctionnelle	2	0	E	E/M	oui	non	non	F	F	M/F	F
19	penser	cause/possibilité	1	0	M	E	oui	non	non	E	F	E	E
20	angle mort	cause/possibilité	3	0	E/F	E/F	non	non	non	F	F	E	E
21	journée	description fonctionnelle	1	0	M	F	oui	non	non	F	F	F	F
22	question	description fonctionnelle	1	0	E	F	oui	non	oui	F	F	M	F
23	soleil	description fonctionnelle	1	0	E	E	non	non	non	F	F	F	M
24	discuter	équivalence	1	0	E	E	oui	oui	non	F	F	E	E

25	plaisir	valeur/avantage	1	0	E	E	oui	partiel	non	F	F	F	F
26	vieux	valeur/avantage	1	0	E	E	non	non	non	F	F	M	F
27	se forcer	description fonctionnelle	1	0	E	M	oui	oui	non	F	F	E	F
28	moto	description fonctionnelle	2	0	E	F/E	oui	non	non	F	F	M	M
29	reprendre	temps/fréquence	1	0	E	E	oui	non	non	F	F	M	E
30	retard	cause/possibilité	1	0	E	E	oui	non	non	F	F	M	M
31	matin	description de l'état	1	0	F	F	oui	non	non	F	F	M	F
32	se concentrer	cause/possibilité	1	0	M	E	oui	oui	non	F	F	E	F
33	dire	description de l'état	3	2	M	E/F	non	non	non	F	F	F	F
34	vieillir	description fonctionnelle	1	0	M	E	oui	non	non	F	F	F	F
35	kilomètre	description de l'état	1	0	F	E	oui	non	oui	F	F	M	M
36	braquer	cause/possibilité	2	0	F	F/E	oui	non	non	F	E	M	E
37	essayer	description fonctionnelle	1	0	M	M	non	non	non	F	F	F	F
38	partir	cause/possibilité	1	0	E	E	oui	non	non	F	F	M	F
39	ami	classe	1	0	E	E	oui	non	non	F	F	M	E
40	goût	description de l'état	1	0	E	M	non	non	non	F	F	F	M

Légende : F=faible M=moyen E=élevé Oc=occurence V=variabilité I=importance A=aide C=concret

Les résultats

L'analyse statistique des résultats au test de classement — qui évalue les habiletés réceptives—n'a montré aucune différence significative entre les quatre groupes de l'expérimentation: EV, EA, TA et T.

L'épreuve de vocabulaire

Nous avons, dans un premier temps, comparé les résultats entre les deux groupes expérimentaux (EV et EA) aux trois moments de l'épreuve de vocabulaire (prétest, post-test 1 et post-test 2). Cette comparaison a été effectuée par rapport aux mots familiers et aux mots non familiers.

Les résultats de l'analyse de la variance des mots familiers et non familiers avec mesure répétée[5] sur la variable vocabulaire n'indiquent aucune différence significative entre les deux groupes expérimentaux — EV et EA—pour les deux parties de l'épreuve : mots familiers et mots non familiers. On observe cependant une différence significative intragroupes (prétest, post-test 1, post-test 2).

Les comparaisons multiples de Tukey ont permis de localiser les différences significatives sur la variable répétée, c'est-à-dire le vocabulaire.

En ce qui a trait aux mots familiers, pour les groupes expérimentaux, ces différences se situent entre le prétest et le post-test 2 au seuil de signification de 0,05. En ce qui a trait aux mots non familiers, les différences aux divers moments sont toutes significatives sur les mots non familiers, pour le groupe expérimental vidéo; elles se situent entre le prétest et le post-test 2, pour le groupe expérimental audio. Le Tableau 3 présente les résultats statistiques des groupes expérimentaux pour les mots familiers et non familiers.

Toutes les comparaisons faites avec les deux groupes témoins n'ont révélé aucune différence significative attribuable à l'administration répétée de l'épreuve de vocabulaire.

En somme, les sujets ont appris des mots nouveaux par l'écoute du dialogue scénarisé. Les différentes analyses statistiques nous permettent d'énoncer que, dans cette étude, l'écoute du dialogue scénarisé a eu un effet sur le gain d'apprentissage et le niveau de rétention observé.

Les comparaisons multiples ont permis de localiser les différences significatives, en termes de gain d'apprentissage et de niveau de rétention.

Les gains (k=le nombre de mots appris) en apprentissage rapide (post-test 1 - prétest) entre les deux groupes expérimentaux (EV et EA) sont équivalents. Par contre, le gain total (post-test 2 - prétest) est un peu moins élevé pour le groupe expérimental avec le traitement audio (k=4) que le groupe expérimental avec traitement vidéo (k=9). Le degré de rétention (post-test 2 - post-test 1) se manifeste dans le groupe expérimental vidéo (k=4) et dans le groupe témoin avec traitement audio (k=3) mais pas dans le groupe expérimental audio.

Pour mieux caractériser les mots sur lesquels il y avait eu gain en fonction du traitement, nous avons fait des analyses complémentaires où l'on a associé chacun des mots à des indices contextuels.

Tableau 3
Le gain aux trois moments de l'épreuve de vocabulaire pour les mots non familiers des groupes EV et EA

VOCABULAIRE	DESCRIPTION	GROUPE	DIFFÉRENCE
mots non familiers	(post-testl -prétest)	EV	8,63*
	(post-test2-prétest)	EV	16,38
	(post-test2-post-test1)	EV	7,75*
	(post-testl -prétest)	EA	7,50*
	(post-test2-prétest)	EA	9,52*
	(post-test2-post-test1)	EA	2,02
mots familiers	(post-testl -prétest)	EV+EA	2,07
	(post-test2-prétest)	EV+EA	3,34*
	(post-test2-post-test1)	EV+EA	1,27*

^différence significative au seuil de 0,05

Les indices contextuels

Nous avons effectué une analyse exploratoire sur les mots pour connaître ceux où il y a eu apprentissage et rétention et dans quels contextes. Cette analyse nous permet de dégager quelques pistes en termes d'indices contextuels.

Selon les résultats, dans l'ensemble, les indices extralinguistiques de type non linguistiques oraux (musique, bruit) et visuels (image, signe, objet) n'ont pu être réellement pris en compte, étant donné l'aide minime qu'ils apportent à l'inférence lexicale. Ainsi, à l'oral, le bruit de fond de la voiture et des essuie-glace en marche ainsi que la musique ont plutôt distrait les sujets. Quant aux objets réels, on ne les retrouve que dans 3 mots (sur une possibilité de 40) et ils n'ont pas facilité l'inférence lexicale. Par contre, les indices extralinguistiques de type paralinguistique oral (ton de la voix) et visuel (gestes, mouvements) semblent avoir aidé le groupe expérimental avec traitement vidéo à inférer 7 mots; dans le groupe expérimental avec traitement audio, les indices paralinguistiques oraux (le ton de la voix) ont facilité l'inférence de 4 mots.

L'interprétation des résultats

Comme les effets sont un peu plus grands pour le groupe expérimental avec le traitement vidéo et pour les mots non familiers liés directement à la situation du dialogue scénarisé, nous pouvons supposer qu'un contexte plus riche en termes d'indices linguistiques et extralinguistiques facilite l'inférence et par conséquent stimule l'apprentissage et la rétention particulièrement pour des mots non familiers au départ.

Dans le groupe expérimental avec traitement audio, le gain d'apprentissage se retrouve par rapport à des mots familiers et non familiers assez généraux c'est-à-dire moins liés à la situation du dialogue scénarisé. Or, l'indice contextuel le plus propice à l'inférence, dans ce groupe, est la parenté du mot cible à l'anglais; congénères et racines communes entre la L1 et la L2 (voir le contexte interne dans le Tableau 1).

Alors que les résultats des études de Sternberg et Powell (1983) et de Sternberg (1987) montrent que huit indices contextuels externes permettent de prédire l'inférence des mots nouveaux (voir le Tableau 1), notre étude n'en a mis en évidence qu'un seul, l'équivalence qui décrit le sens du mot, son synonyme ou son antonyme.

Selon les écrits dans le domaine de l'apprentissage du vocabulaire, le concept de la redondance est important pour l'inférence et s'associe à l'équivalence (Schatz et Baldwin, 1986). Nos résultats rejoignent aussi ceux de Carnine, Kameenui et Coyle (1984) pour qui la catégorie d'indices la plus pertinente est celle du synonyme et du contraste - associée à l'équivalence dans la typologie de Sternberg - et la variable la plus significative est la proximité de l'indice contextuel par rapport au mot cible. Dans notre étude, la majorité des mots pour lesquels il y a eu gain ont des indices linguistiques à proximité du mot cible (k=7). Il apparaît donc que l'une des conditions d'inférence dans le contexte linguistique réside dans la proximité entre les indices et les mots cibles.

Alors que Sternberg et Powell (1983) considèrent que 7 variables médiatrices permettent de prédire l'inférence (voir le Tableau 1), nos résultats montrent que le nombre de présentations du mot cible (occurrence) est la variable la plus importante.

Dans la présente étude, on peut expliquer qu'un mot comme «angle mort» a pu être inféré par le fait qu'il ait été présenté trois fois; il ne faut pourtant pas sous-estimer l'importance des indices extralinguistiques qui étaient, dans ce cas, élevés. Ces résultats rejoignent les études en Ll (Jenkins, Stein etWysocki, 1984) et en L2 (Saragi, Nation et Meister, 1978; Gabbay et Mirensky, 1984) sur l'importance d'un certain nombre de présentations pour assurer l'apprentissage.

De même, l'inférence à partir des indices internes est un processus lent qui appelle souvent un apprentissage systématique (Frey et Baron, 1982; McKeown, 1985; Kaye et Sternberg, 1987).

Alors que Sternberg (1987) considère que les indices contextuels externes sont plus importants que les indices internes, les résultats de notre étude montrent que selon la condition audio, les indices internes sont très importants

— principalement l'indice congénère — et que, selon la condition vidéo, cette catégorie d'indices s'associe à des indices extralinguistiques.

Ces résultats confirment le point de vue de Hammer et Giauque (1982) selon lequel, c'est la fréquence de contact avec les congénères qui contribue à augmenter le transfert entre les mots paires de la Ll et L2. De plus, ces derniers soulignent l'importance de la connaissance de la Ll pour l'utilisation des congénères en L2.

Dans la présente étude, les sujets sont au premier cycle universitaire et, malgré l'absence d'un entraînement spécifique à la reconnaissance des congénères, certains mots cibles ont pu être inférés.

Cependant, ces résultats ne peuvent s'interpréter qu'en considérant certaines limites.

Les limites de la recherche

De type quasi-expérimental, cette étude se borne à examiner l'apprentissage et la rétention du vocabulaire en contexte dans les conditions contrôlées—audio et vidéo, pour des classes intactes ayant 120 heures de FLS ou l'équivalent à l'université. Toutefois, il semble que les résultats peuvent s'appliquer au public anglophone universitaire ayant 120 heures de FLS ou l'équivalent dans le milieu canadien.

De plus, nous pensons que, malgré le fait que le document vidéo utilisé dans le cadre de cette étude ait été conçu pour l'enseignement de la L2, il a toutes les caractéristiques de l'authenticité en ternies de situations et de langue. Toutefois, pour des élèves de niveau élémentaire en français, la situation et les interactions verbales étaient souvent assez ambiguës — dans ces cas, il n'y avait pas de lien direct entre le verbal et le visuel — et la compréhension assez difficile, particulièrement sur le plan du vocabulaire.

Enfin, comme le court dialogue scénarisé de l'étude n'a été écouté que deux fois, nous pouvons considérer que l'apport langagier du traitement a été restreint.

En somme, le niveau des élèves en L2, l'absence d'entraînement spécifique à l'utilisation du contexte pour inférer, la durée réduite de l'apport langagier et la complexité du dialogue scénarisé expliquent en partie les faibles gains obtenus en apprentissage et en rétention dans le cadre de la présente étude. Pourtant, les résultats rejoignent la majorité des études en Ll et en L2 sur l'apprentissage du vocabulaire en contexte.

Conclusion

Bien qu'il n'y ait pas de différences significatives intergroupes, les différences significatives intragroupes permettent tout de même de conclure que les stratégies d'apprentissage des sujets semblent différer et dépendre des indices contextuels disponibles. Ainsi, quand le visuel est présent, il semble que l'attention est portée à la fois sur les indices purement linguistiques et sur la coïncidence linguistique avec le visuel, ce qui permet l'inférence pour des mots non familiers au départ. Quand seul l'auditif est disponible, certains indices linguistiques internes (par exemple, les congénères et les racines communes) facilitent l'inférence de mots plus généraux et moins liés au document.

Ainsi est infirmée notre hypothèse de recherche à savoir que l'apprentissage du vocabulaire et la rétention sont facilités en condition vidéo, laquelle offre à la fois des indices contextuels linguistiques et extralinguistiques. Toutefois, le groupe expérimental avec traitement vidéo a enregistré un gain d'apprentissage total (post-test2-prétest) un peu plus élevé par rapport au groupe expérimental audio. En outre, les mots sont appris et retenus si les indices extralinguistiques sont saillants et si les indices linguistiques internes sont associés. Par ailleurs, la richesse du contexte linguistique en mots apparentés — les congénères — et le nombre de présentations des mots cibles peuvent favoriser l'inférence lexicale.

Les résultats appuient le point de vue de Sternberg et Powell (1983) et de Sternberg (1987) dont les études sur les indices contextuels prévoient l'apprentissage lexical et indiquent que certains concepts verbaux sont plus faciles à apprendre que d'autres et que les mêmes éléments contextuels ou d'autres similaires facilitent ou nuisent à l'apprentissage, au rappel et au transfert dans de nouvelles situations.

Les résultats suggèrent donc un entraînement spécifique à l'utilisation des indices contextuels pour en arriver à effectuer de bonnes inférences lexicales. De plus, comme l'apprentissage et la rétention en condition vidéo ne concernent que des mots liés à la situation du document — ce qui facilite l'activation des connaissances antérieures—nous suggérons la création, pour les étudiants et les étudiantes de niveau élémentaire en L2, de bandes magnétoscopiques tenant compte de certaines conditions. Premièrement, les référents visuels devraient être riches et saillants, deuxièmement, les situations devraient être claires et troisièmement, il devrait y avoir redondance (par exemple, plusieurs présentations de mots nouveaux, de synonymes, de définitions, d'antonymes) et un certain nombre de mots apparentés entre les deux langues (par exemple, congénères, racines communes, emprunts).

En somme, les résultats de l'étude suggèrent que l'élaboration de textes oraux ou de bandes magnétoscopiques pour une clientèle dont la connaissance de la langue cible est élémentaire se fasse en tenant compte de certains paramètres favorisant l'inférence lexicale:

au niveau linguistique

la fréquence - présenter des mots importants plusieurs fois;
la variabilité - présenter les mêmes mots nouveaux dans des contextes facilitant l'inférence;
la proximité — fournir des contextes significatifs à proximité des mots cibles;
la redondance — présenter des mots nouveaux avec leurs définitions, leurs synonymes ou leurs antonymes;

la parenté — utiliser des congénères, des mots à racine commune à la Ll et à la L2 et des emprunts.

au niveau extralinguistique

la musique et le bruit modérés;
le ton de voix juste;
le visuel - images, gestes, mouvements — lié au verbal.

Ces paramètres peuvent être d'une grande utilité particulièrement dans le cadre d'un enseignement individualisé et interactif avec un matériel multimédia.

A l'instar des émissions de télévision pour enfants qui s'inspirent du mode d'interaction entre la mère et l'enfant (Rice, 1984), les documents conçus pour l'enseignement de la L2 au niveau élémentaire - tels les bandes magnétoscopiques, les didacticiels et les vidéodisques - pourraient tenir compte des modes d'interaction entre les élèves et les locuteurs natifs ou les locutrices natives. Sans revenir à l'époque des textes construits que l'on retrouve dans plusieurs méthodes de L2, les documents multimédias conçus à des fins d'apprentissage pour un public de niveau élémentaire en L2 peuvent respecter l'authenticité linguistique et situationnelle sans être truffés de difficultés en termes de débit, d'accent, de vocabulaire et d'interactions verbales entre les personnages.

NOTES

1) *Le Français fondamental 1er degré.* Ministère de l'éducation nationale. Direction de la Coopération avec la Communauté et l'Étranger (1970). Paris, Publ. de l'Institut pédagogique national.
2) La traduction est une technique très utilisée en L2 pour évaluer l'apprentissage (Gabbay et al., 1984; Bensoussan *et al.,* 1984).
3) Pour Fanselow, le non linguistique fait appel à l'oeil (par exemple, les images, les signes et les objets) ou à l'oreille (par exemple, la musique et le bruit), alors que le paralin guistique inclut ce qui n'est ni son ni mot (par exemple, les gestes, les expressions du visage et le ton de la voix).
4) Le congénère peut se définir comme un mot ayant le même sens d'une langue à l'autre dans son utilisation courante. Au niveau de la forme, c'est un mot où seulement une lettre ou un phonème qui varie d'une langue à l'autre - par exemple, oncle - uncle, avantage - advantage (voir Browne, 1982; Hammer *et al.,* 1982).
5) L'épreuve répétée correspond à l'épreuve de vocabulaire qui a été répétée à trois moments: au prétest pour évaluer les connaissances antérieures, au post-test 1 pour évaluer le gain d'apprentissage et au post-test 2 pour évaluer le niveau de rétention.

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AUTHORS

Lise Duquette, professeure de langue, Institut des langues secondes, Universite d'Ottawa, Ottawa, ON, KIN 6N5.

Jean-Paul Dionne, professeur agrege, Faculte d'education, Universite d'Ottawa, Ottawa, ON, KIN 6N5.

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The Nedut'en Talking Dictionary Project: A QuickTime Approach to Preserving and Teaching Native Languages

Jim Wilson

Abstract: The Nedut'en Talking Dictionary Project used Apple's QuickTime digital television to create a series of computer programs to supplement and expand Native language Instruction in local elementary schools. The project field tested QuickTime as an appropriate technology to preserve and promote Native languages. The results have been promising. QuickTime is technically limited for such applications but the project contributed to the instruction and motivation of students. It also resulted in a heightened awareness of Native language programs In the local community.

Resume: Le projet du *Nedut'en Talking Dictionary a* utillse la television numerlque *QuickTime,* con^cue par Apple, pour creer une serie de loglciels pour accompagner et etendte la portee de l'enseignement des langues autochtones dans les ecoles elementalres reglonales. *QuIckTimea* ete utilise sur le terrain en tant qu'outile prtvllegle pour preserver et promouvolr les langues autochtones. Les resultats ont ete encourageants. Du point de vue technique, Qufckr/meest plutdt Unite pour ce genre d'application, mals le projet a apporte un contribution valable a l'enseignement et a la motivation des etudiants. Les communautes autochtones bcales ont pris conscience de ('existence de tels programmes d'apprentissage des langues autochtones.

> When a language dies, the world it described is dismantled too — place name by place name, custom by custom, saga by saga. (Wright, 1988, p.38)

In 1982, a government survey detailed the predicament of aboriginal languages in Canada:

> ...of the 53 distinct aboriginal languages still spoken in Canada, only three are predicted to survive (Cree, Ojibway, Inuktituk). The remaining 50 languages are moderately endangered, with several verging on extinction. (Foster, 1982, p. 12)

That forecast may have been premature. Fueled by a resurgent pride, many of Canada's First Nations are displaying a new interest in their cultures and are attempting to rescue their languages before they disappear. The government survey did recognize one B.C. First Nation that may have the numbers to reverse the trend.

> . . .the estimated number of speakers of First Nations Languages in B.C. is fewer than five thousand per language. Only the Carrier have 5,000 speakers, which gives that language a chance for survival. (Foster, 1982, p. 5)

The goal of the *Nedut'en Talking Dictionary Project* was to develop a series of computer aided language learning (CALL) programs to supplement the Carrier language instruction program in the elementary schools of Burns Lake, B.C. Native people in this area speak the Nedut'en dialect of the Carrier language. The objective was to provide an environment in which students could hear and practice speaking the Nedut'en dialect without the direct involvement of a language instructor.

The basic program produced by the *Nedut'en Talking Dictionary Project* was the talking dictionary. Running on a Macintosh Ilsi computer, the dictionary combines digitized voice recordings, still photographs, and motion video. Students look up words in English or Nedut'en, listen to the correct pronunciation of Nedut'en words and sentences, read and hear translations, and record and listen to their attempts at speech. All this is carried out in a highly visual environment that uses digitized photographs of cultural objects, activities, and ceremonies.

A second program, the Nedut'en Phonetic Library, was developed to teach Nedut'en pronunciation. Students can select, listen to and practice the correct pronunciation of the 41 phonemes in the Nedut'en dialect. A "talking head" video shows a language instructor correctly pronouncing the phoneme.

Plans are now being made to develop a third component of the programs, computerized language games that will encourage students to practice the Nedut'en dialect in a variety of interesting ways. These games and exercises will use the language database created for the talking dictionary and provide a motivational context for using it.

The three program components were designed as "shells" that can be modified to incorporate any language.

BACKGROUND

The Carrier People

The Carrier are the aboriginal inhabitants of central British Columbia. Their traditional territory covers several thousand square kilometers, extending from the Skeena River on the west to the Alberta border on the east, north to Babine and Takla Lakes, and south to the town of Quesnel, B.C. Linguistically, the

Carrier are related to the other Athapascan speaking peoples of northwestern Canada and Alaska. The Carrier language has several distinct dialects of which Nedut'en is one. Nedut'en speakers, sometimes called the Babines, originally lived on the shores of Babine Lake, the largest natural lake in British Columbia. In 1822, the Hudson Bay Company established Fort Kilmers near the north end of Babine Lake to trade with the Nedut'en (Morice, 1906). Since the 1950s a large portion of the Nedut'en People, now called the Lake Babine Band, has moved to the town of Burns Lake, B.C. The availability of jobs, schools, and medical facilities has been the main motivator behind this migration.

Language Instruction Program

The Lake Babine Band has about 3000 members. Most elders and middle-aged band members still speak or understand the Nedut'en language. Among school aged children, however, the number of Nedut'en speakers is low. The goals of the Native language instruction program in the Burns Lake School District are two-fold. One goal of the program is to strengthen the language skills of Native children by exposing them to the Nedut'en language at school. For non-Native students, the goal is language familiarization and cultural awareness.

Computer Assisted Language Instruction

The field of computer assisted instruction (CAI) has existed almost as long as computers themselves. In the area of second language instruction, a subdivision of CAI known as CALL (computer assisted language learning) has developed. CALL programs are designed to enhance language instruction. Three approaches are discussed here: drill and practice, artificial intelligence and multimedia microworlds.

Fjarly CAI was based on Skinnerian operant conditioning principles and often followed a drill and practice format. This approach to CALL has some merit as memorization of vocabulary is an unavoidable requirement of learning any second language. Modern drill and practice CALL programs can incorporate a full range of multimedia and videodisc features (Alien & Eckols, 1989).

An artificial intelligence (AI) approach to CALL relies on the computer's potential to "understand" natural language. Farghaly (1989) describes a program in which student and computer communicate in a dialogue. The computer can "understand" the student's inquiries and respond to them. Such a system is dependent on the computer's ability to process natural language, a goal that has been achieved in only very restricted knowledge domains. A simpler AI program is described by Nyns (1990). He describes a reading tutor that uses an on-line dictionary and a phrase parser to help students understand the meaning of reading passages. While the AI approach to CALL has promise for the future, it is too complex and too experimental for teachers wishing to use computers for second language instruction now.

Seymour Papert (1980) advocated the creation of computerized "microworlds" that would help students with the task of assimilating new material into existing mental structures. Papert's microworld was that of

Newtonian physics, a world in which the student could explore the laws of motion. Some CALL programs seek to create a similar microworld of language, a world in which a language can be explored in a "real-life" situation. Such programs often make extensive use of multimedia to create a realistic language environment.

Gay and Mazur (1989) describe a multimedia program in which the student takes an airplane flight. Along the way the student can interact with other passengers, watch typical air travel scenarios, eavesdrop on conversations, examine databases, and create stories about the characters. All this time the student is using and learning Spanish.

Marini et al (1991) created a multimedia environment called "Around the House" to teach vocabulary. Using it, students can explore a house and its contents in five different languages. Zooming graphics, text, andaudio recordings add to the realism of the experience.

Teaching phonics has also received a multimedia treatment (Marini & Federici, in press). The "CALL Phonetics Project" helps the student acquire pronunciation skills with the help of graphics and voice recordings.

The last two articles provided a starting point for the *Nedut'en Talking Dictionary Project.* Native language content and QuickTime digital video was added to the basic idea of a multimedia microworld in which students can explore vocabulary and pronunciation.

Computers and Native Languages

Little evidence was found that computers have been used to teach Native languages, but some work has been done using computers for language preservation. A recent account in Canadian Geographic (1992) relates the attempts of one linguist to computerize 20,000 words of the Halq'emeylem language spoken by the Sto:lo people of southern B.C. Given the availability of microcomputers it is likely that computerized language preservation projects, of varying degrees of sophistication, are under way in other localities.

QuickTime and Multimedia

The term multimedia has been used to describe the data handling capabilities of current computers. As computers became more sophisticated, the kinds of data they could process and store changed dramatically. Originally, computers processed only numbers. When characters became a common type of data, word processing was born. Later, graphics and sound were added to the computer's repertoire. The latest type of data to be processed by computers is digital video.

The implementation of digital video has taken two directions (Yager, 1991). I.B.M. and Intel have developed special digital video interactive (DVI) hardware. Apple has taken the software route. QuickTime is system software that incorporates digital video into applications running on any Macintosh computer. Digital video is available to all Macintosh users in a standardized, easy to use, and cheap form.

A Macintosh II computer is needed to capture and play QuickTime movies. The computer must be running System 7.1 that includes special QuickTime extensions. To input video signals, a video-digitizing card must be installed in a computer expansion slot. The computer can then be connected, via the video-digitizing card, to a video source like a camcorder, VCR, videodisc player, or antenna. To capture, compress, and edit the movie, the computer must be running video processing software. Video still frames can be captured using the same hardware/software configuration. The addition of a flatbed scanner makes digitized photographs accessible. Image enhancement software can be used to retouch digitized photographs and video stills. After capturing and saving the compressed movie or still picture to a hard drive, it can be played back within compatible application software like *HyperCard*.

HyperCard is Apple's multimedia software. Structurally, the basic unit of a *HyperCard* program is called a card. A card is analogous to a 3x5 index card on which information can be recorded. A collection of cards is known as a stack. Simple linear or complex branching systems can be devised to lead the user from one card of information to another within a stack. The multimedia aspect of *HyperCard* lies in the information on a card. It can be text, diagrams, maps, sound recordings or, using QuickTime, digitized video and still pictures. *HyperCard* gives the instructional designer control over the sequence of instruction and medium of instructional delivery, two vital aspects of instruction that are critical to the success of the student.

METHOD

Hardware and software used in project

* computer *Macintosh Ilsi 5/80 with math coprocessor*	(Apple Computer Inc.)
* video-digitizing card: *VideoSpigot card*	(Supermac)
* video capture/processing software: *Premier*	(Adobe Systems)
ScreenPlay	(SuperMac)
* image enhancement software: *Photoshop 2.0*	(Adobe Systems)
* flat-bed scanner: *600ZS ScanMaker*	(Microtech)
* photo compression software: *PICTCompressor*	(Apple Computer Inc.)
* multimedia software: *HyperCard 2.1*	(Claris Corporation)

Creating the Dictionary Stack

The purpose of the dictionary was to provide an environment in which students could hear and practice speaking words in the Nedut'en dialect.

Step 1: Selecting words: Seventy-five Nedut'en words were selected for use in the dictionary. These words were selected because they form the basic vocabulary of the Nedut'en language program in Burns Lake elementary schools. The words fall into broad categories like colours, numbers, animals, weather, time, food, and clothing. Each word, its English equivalent, a Nedut'en sentence using the word, and an English translation of the Nedut'en sentence were written on special forms developed for the project.

Step 2: Selecting pictures: A picture was selected to match each of the seventy-five Nedut'en sentences. Most of the pictures were family photographs and some were still frames taken from home videos. An effort was made to keep the pictures culturally relevant by selecting those depicting traditional activities like salmon fishing and moose hide preparation. An attempt was made to use local, recognizable people. In reality, the picture selection and sentence construction process was reciprocal. Often a sentence was constructed to match an exceptional picture. Occasionally a photo was taken to match a critical sentence.

Step 3: Recording audio: Two Nedut'en language instructors read the words and sentences of the seventy-five dictionary entries onto audio tape. For each entry they would read the Nedut'en word, the English word, the Nedut'en sentence, and the English sentence.

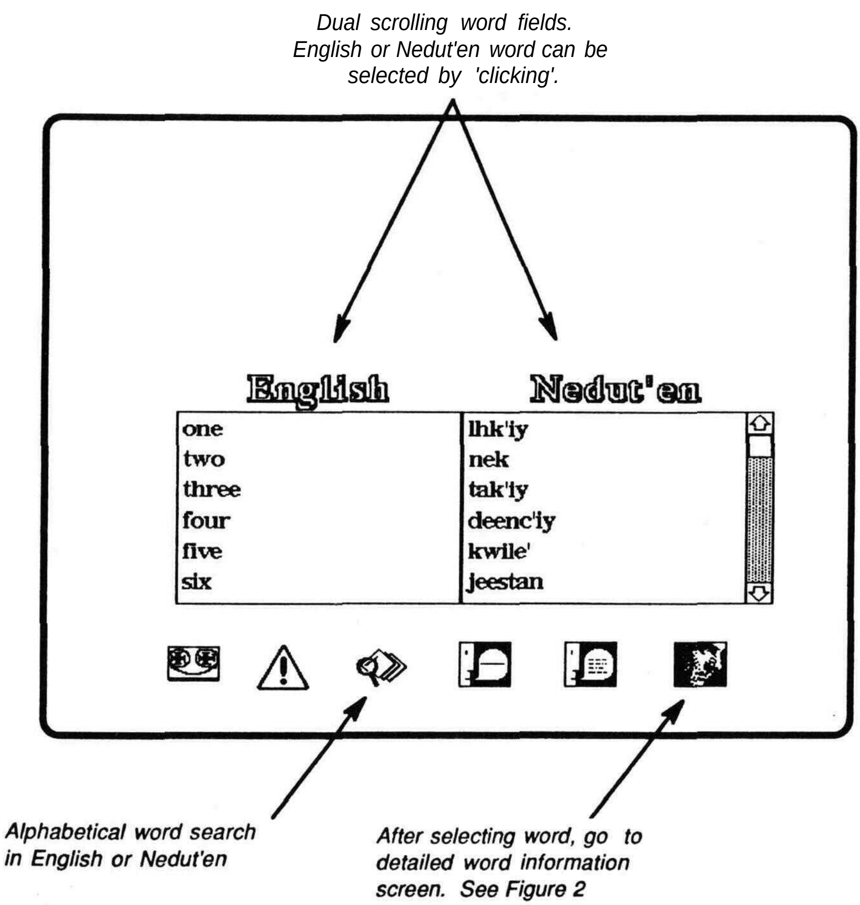
Step 4: Digitizing audio: The recorded audio tape was played into the microphone jack of a Macintosh Ilsi computer running *HyperCard.* The audio palette of *HyperCard* was used to digitize and edit the four sound components of each dictionary entry. The four components were saved as sound resources to the main dictionary stack. Average size of the four audio resources for one word was 120 K. Steps 3 and 4 could have been combined if the built-in computer microphone had been used.

Step *5: Digitizing photographs:* Each photograph was scanned into the Macintosh Ilsi computer using a *Microtec 600ZS ScanMaker* flatbed color scanner connected directly to the computer's SCSI port. The file was then loaded into *Photoshop* for touch-up and resizing. The resulting PICT file was then compressed *nsingPICTCompressor* and saved to the folder containing the main dictionary stack. Each picture file was 50-60 K in size.

Step 6: Digitizing still video: Still video frames were captured from videotape and digitized using the frame-grabbing capabilities of the *ScreenPlay* program. The hardware configuration consisted of a Macintosh Ilsi computer with a *VideoSpigot* card installed, connected to a VCR. As with the digitized photographs, the digitized still frames were touched-up and resized using *Photoshop.* The resulting PICT files were 60-70K in size and were saved to the folder containing the main dictionary stack without further compression.

Step 7: Writing the Talking Dictionary stack: The dictionary stack that tied these audio and visual resources together was written with *HyperCard 2.1.* The user sees the screen in Figure 1 first. By scrolling the word lists, the user can select a word in either English or Nedut'en. An alphabetical search option is also available. Part words can be used. Once a word has been selected, the face icon in the lower right corner of the screen calls up the word screen in Figure 2. This screen shows the words, text of the two sentences, and their corresponding picture. Clicking on the "talking stick" or speaker icons plays the text in Nedut'en or English respectively. The recorder icon activates a floating pallet with which the user can record his/her pronunciation attempts and play them back. Several teacher controls are hidden on both screens. These features allow the teacher to change visual aspects of the screens and add new words to the dictionary.

Figure 1.
Nedut'en Talking Dictionary: Main Menu

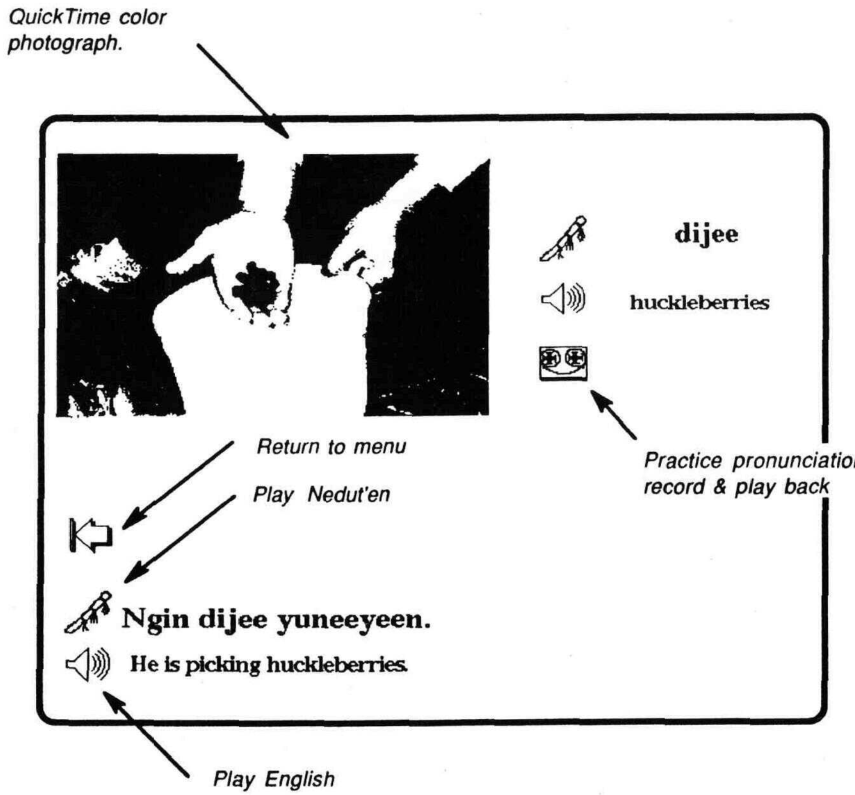


Creating the Phonetic Library Stack

The purpose of the phonetic library was to provide an environment in which students could hear and practice the individual sounds of the Nedut'en dialect.

Step 1: Selecting phonemes and words. The Nedut'en dialect has the 41 phonemes (Patrick & Tress, 1991). A reference word was selected for each phoneme. Most reference words contained the target phoneme in the initial

Figure 2.
Nedut'en Talking Dictionary: Typical Word Screen



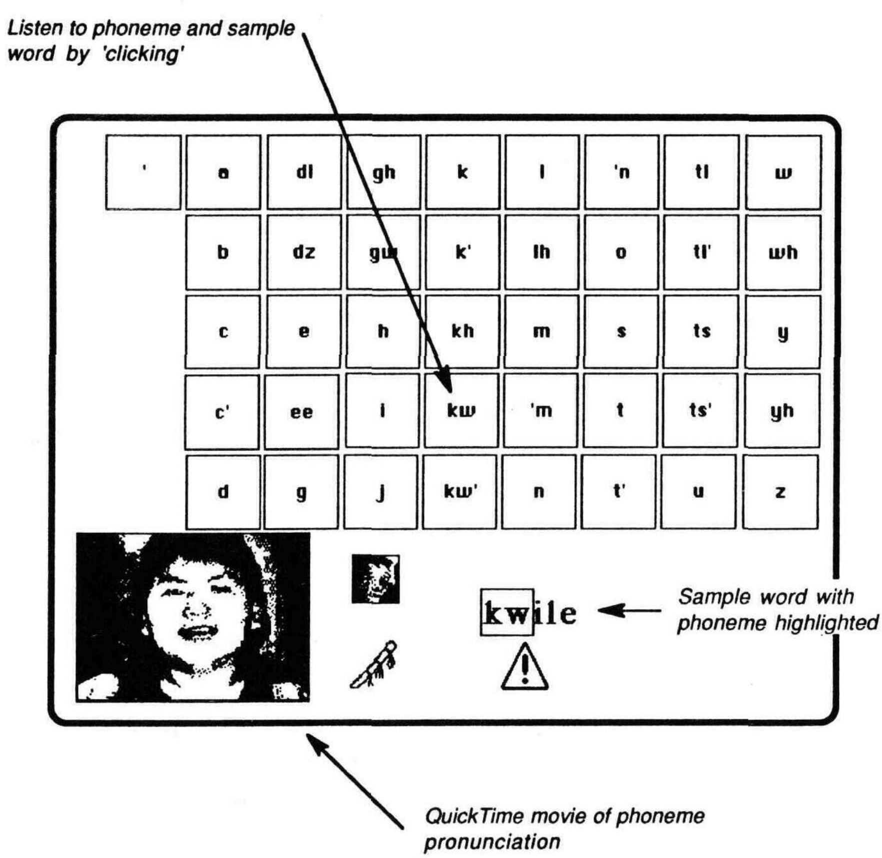
position. Some Nedut'en phonemes never occur in the initial position and words with the target phoneme in the medial or terminal positions had to be used.

Step 2: Recording and digitizing audio. The pronunciation of each phoneme and its reference word was recorded and digitized in the same way as the dictionary words and sentences described in Steps 3 & 4 of the previous section.

Step 3: Digitizing video. A camcorder was used to videotape the head and shoulders of a Nedut'en speaker while she pronounced 40 of the 41 Nedut'en phonemes. (The glottal stop (') makes no sound by itself.) The videotape was played into the computer via the video-digitizing card. Adobe Premier was used to edit this video segment into 40 QuickTime movies, one for each phoneme. These movies were compressed to 100-150 K each and saved to the folder containing the phonetic library stack.

Step 4: Writing the phonetic library stack. The phonetic library stack has one card (see Figure 3) that ties together the sound recording and QuickTime movies described above. The card is a grid with a Nedut'en phoneme in each cell. The user simply clicks directly on the phoneme. The reference word with the target phoneme highlighted in a box appears at the bottom of the screen and the computer plays the audio for the phoneme and the reference word. Clicking on the face icon plays the movie of the phoneme being pronounced by a language instructor.

Figure 3.
Nedut'en Phonetic Library



Classroom Implementation

Once completed, the talking dictionary and the phonetic library were transferred to two Macintosh LC II computers. The computers were placed in a primary school (grades K-3) and an intermediate school (grades 4-7) under the direction of a language instructor. A variety of strategies was used to introduce students to the computer and provide time for use. Group demonstrations and individual instruction were provided. Students were assigned specific times to use the computer and were allowed to use it in their free time. Computer access was also used as a reward. Individuals and small groups had access to the computer.

RESULTS

Pedagogically, the talking dictionary achieved its goal. It provided students with an alternate way of hearing and practicing the Nedut'en language. The most interesting aspect of the dictionary was the motivation it provided. Students were very interested in using it. This was partly due to the novelty of using a computer and partly due to the local nature of the program contents. Native students saw and heard people they knew, doing things with which they were familiar. One Kindergartner wanted to know, "How did Aunty Susie get inside the computer?"

One surprising aspect of the project was the way in which it increased awareness of the Native language program in local schools. The talking dictionary has been displayed at several school functions resulting in a newspaper article, letters to the editor, a 30% enrollment increase in Native language classes, and interest from several regional Native groups.

Technically, QuickTime was a disappointment. It provided excellent still pictures for the dictionary but the movies proved to be inadequate. A complete discussion of the technical limitations of QuickTime follows.

DISCUSSION

Technical Limitations of QuickTime

> "... QuickTime movies more closely resemble jerky postage stamps than fluid full-screen video." Frost, 1992, p. 158.

The video digitization process converts the analogue signal of television to a digital format that is compatible with computer processing. In North America, television signals conform to the NTSC (National Television Standards Committee) standards. Among other things this means a frame rate of 30 frames per second. This frame rate is high enough to make motion on a TV screen appear smooth and continuous. To digitize this analogue TV signal, the computer must code the location and color of each of the 640 x 480 pixels in a single frame. Thus, a single frame of full screen video can contain almost one megabyte of data and each second of video can be 30 megabytes in size! Capturing full screen video at 30 frames per second is a prohibitive task for QuickTime and cannot be done even on high-end Macintoshes like the Quadra.

To effectively digitize video, file sizes must be reduced, therefore some compromises must be made. Smaller screen sizes dramatically lower the size of QuickTime movies. QuickTime supports screens as small as 160x120 pixels (I/16 of a full screen). A single frame of this size is only 57 K. The cost of smaller screens is small movies that are difficult to see.

Lower frame rates also can be used to reduce the size of QuickTime movies. Capture rates of 10-12 frames per second are more typical than 30 frames per second, thus reducing movie size 50-70%. The cost of lower frame rates is a jerky movie that doesn't flow smoothly.

Finally, movie compression can significantly reduce the size of movie files. QuickTime performs both spatial and temporal compression. Spatial compressors examine the pattern of colors in a frame and reduce the amount of space required to store this information. For example, if a frame has a large area of a single color it can be stored more compactly if only the location of the edges is stored rather than a pixel by pixel record of the entire colored area. Temporal compressors examine sequential movie frames for areas like backgrounds that are not changing and then record only the changes rather than a complete pixel by pixel record of each frame. While compression savings are unpredictable because they depend on the content of the movie, reductions of 90% were not uncommon in this project.

Compression can cause problems because data density is not consistent throughout a movie. In parts of a movie where frames consist of large areas of one color and little change is occurring from frame to frame, the computer has little difficulty displaying at a high frame rate. But, when the frames become more complex and considerable change is happening from frame to frame then QuickTime will skip frames. The cost of data compression is a movie that may flow smoothly in some spots and jerk dramatically in others.

One final problem: Sound and pictures are not necessarily synchronized in a QuickTime movie. This can be a critical problem when using a "talking head" movie to show proper word pronunciation as was done in this project.

So why use QuickTime at all? Is it really worth all this trouble to get small jerky movies without sound synchronization? The answer is yes, if certain limitations are observed.

- Use small screens, and keep movies short. Both measures will reduce the processing load and result in better quality movies.
- Use still pictures when possible. Don't forget that QuickTime supports still pictures and movies. The color and resolution of a still frame can be excellent and often a still picture can convey the message as well as a movie.
- Lower frame rates are perceived differently depending on the subject. For example, lower frame rates have less "apparent" effect on movies of machinery than on movies of people talking. This is probably because much more information is being conveyed by the face of the speaker and any information loss is critical to understanding. Experimentation is

needed to find what will work.

- Computers with fast CPUs and large amounts of RAM work best for QuickTime video. Remember, they are also the most expensive. Watch for new hardware and software to improve digital video dramatically in the next few years.

Given all its limitations, QuickTime is adequate for present use and promises to be even better in the future.

Pedagogical Aspects of QuickTime Talking Dictionaries

The talking dictionary approach to supplementing Native language instruction has several immediate benefits and has the potential for many more.

- Supplementation and expansion of instruction
  The dictionary was originally developed to supplement and expand Native language instruction. With only two qualified teachers, language instruction was spread thin. The talking dictionary provides a stand-alone teachingunit that can be used independently giving students more access to language instruction.
- Non-Native teacher support
  The talking dictionary gives non-Native teachers the option of incorporating Native language instruction in their classrooms. There is no substitute for live instruction but many, if not most, schools in Canada that enroll Native students do not have a Native language program. In some extreme cases there may not be any Native speakers left or those that do speak the language may be unwilling or unable to teach it. Programs like the talking dictionary can be used to fill the gap.
- Non-teacher support
  The dictionary can support non-teachers attempting to teach a Native language. In many places, Native language instruction is carried out by elders or other speakers who do not have teacher training. The talking dictionary can provide one source of instruction based on sound pedagogy-
- Learning styles
  Much has been written about learning style and its influence on Native learners (Journal of American Indian Education, Special Issue on Learning Styles, 1989). Because of its audio/visual, self-paced nature the talking dictionary may be a better "fit" with Native learning styles than traditional classroom approaches. Such a suggestion is speculative at this point but may be worth further investigation.
- Audio-visual language archives
  If Native languages in Canada are on the verge of extinction then simply archiving them is a reasonable goal. Multimedia is ideal for such projects because it combines the search and retrieval capabilities of a computer with the audio-visual impact of TV.

- Cultural promotion
  Native culture is inextricably woven into the words and pictures used in the dictionary. Students, especially non-Native students, are exposed to Native culture as a by-product of using the dictionary.
- Motivation
  The talking dictionary motivates students to learn. Native students do not normally see their culture and language showcased in local schools, especially on a computer. This heightened interest may be a short-term novelty effect, but it would not be difficult to develop computerized language games that maintain the motivation. The third component of the *Nedut'en Talking Dictionary Project* will develop some of these activities.

Technology and the Larger Cultural Context

The *Nedut'en Talking Dictionary Project* attempted to apply modern multimedia technology to preserve and promote something very ancient - the language of one of Canada's First Nations. From this project and others (Wilson, 1992) several guidelines for the successful application of technology to Native language and culture have become obvious.

- Native people must be involved in production. It is their culture. They are the experts.
- Costs must be kept low. This is possible because multimedia is based on microcomputers and home video equipment, both of which are relatively inexpensive.
- The level of technical expertise required must be kept low. Multimedia on a Macintosh computer is easy to create. QuickTime has complicated the situation but promises to get easier.
- As an educational tool, the multimedia database must be interesting to use. It has the advantage of combining the best features of every medium.

In summary, QuickTime was found to be adequate for creating computer assisted Native language learning programs since its limitations can be avoided. It is one of several technological tools that can be used to preserve and promote Native language and culture.

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AUTHOR

Jim Wilson is a teacher-librarian at Lakes District Secondary School, Burns Lake, B.C.

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Mediaware Review

Creating Digital Video with VideoSpigot

Richard A. Schwier

General Information: VideoSpigot™, SuperMac Technology, 485 Potrero Avenue, Synnyvale, California 94086 • Phone: 408-245-2202 • Fax: 408-735-7250. System Requirements: • Any Macintosh computer with an available Nubus slot • A colour monitor with 8-bit or greater graphics card • 4 MB of RAM memory (although 8 or more is recommended) • At least 40MB hard disk drive (although larger drives are recommended) • System 6.0.7 or later system software • 32-Bit QuickDraw™, version 1.2 or later • QuickTime™ , version 1.0 or later

VideoSpigot System. Description

Multimedia developers face the challenge of converting analog video and audio segments into digital files so that they can be incorporated into multimedia instructional programs. VideoSpigot is a hardware and software system for the Macintosh which does precisely half of the work—the video half. The hardware component of the system is the VideoSpigot Nubus Digital-Video Frame Grabber. The software components of the system are the QuickTime™ system software extension, the VideoSpigot System Extension, and ScreenPlay, an application that records video as QuickTime movies.

Frame Grabber

The VideoSpigot Nubus Digital Video Frame Grabber is a piece of hardware for capturing video; it is a circuit board which plugs into any available Macintosh nubus slot. When in place, it exposes an RCA plug for connecting the Macintosh to external video sources, such as videodisc and videocassette players, and camcorders. The Frame Grabber can successfully deal with video recorded in either NTSC or PAL formats.[1] It is capable of receiving analog video input from any of these sources and digitizing the signals. It is not capable of video output—transmitting video to an external monitor or receiver.

QuickTime Extension

The QuickTime Extension is an invisible program which is stored in your system folder. It is a standard protocol for managing time-based information, so in multimedia terms, it synchronizes video and sound, and allows them to be played back together on the Macintosh. The QuickTime Extension must be loaded into the system in order to use motion/audio data, but once it is loaded, it operates in the background, so the user can forget about it.

One particularly nice feature of the QuickTime protocol is that it has been adopted as the standard approach to handling multimedia data on the Macintosh platform. It is used in many newer versions of programs, including PowerPoint, Persuasion, MacroMind Director, Authorware Professional, and of course, HyperCard. QuickTime uses a new transparent data type, called dynamic data, which means motion and sound can be treated just like other data types such as text and graphics. Dynamic data (QuickTime movies) can be cut, pasted, copied, saved, and moved from one application to another. For those readers who care about such things, QuickTime is a media integration architecture which acts as a transparent interpreter between applications, codecs (compression/decompression managers), and other applications and equipment. For most users, QuickTime can be ignored, as it invisibly integrates video, audio, animation and devices.

VideoSpigot System Extension

The VideoSpigot System Extension automatically compresses QuickTime movies to save space when saving them on a hard drive, and decompresses them for playback. More on compression/decompression will be mentioned later. This extension is also placed in your system folder, and like the QuickTime extension, it performs invisibly in the background.

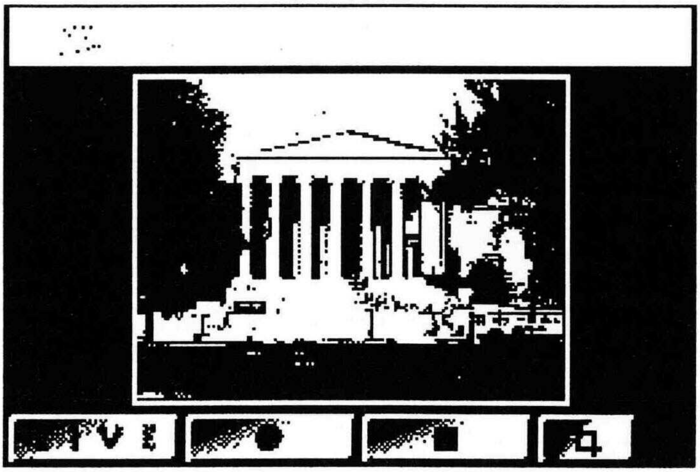
ScreenPlay

ScreenPlay is the program you receive with the VideoSpigot which allows you to produce and play QuickTime movies. When ScreenPlay is started, any video source which is playing through the video input appears in a window. For example, if you were playing a videocassette, and connected the "video-out" of the VCR to the "video-input" jack on the VideoSpigot, the motion video image would appear in the ScreenPlay Record window (see Figure 1).

ScreenPlay has four buttons which appear beneath the Record window. They allow the user to play "live" video, crop the video image, record video, and stop live video or recording. Another additional command is activated by clicking on any image appearing in the "live" video window and dragging it off the screen. This, in effect, creates a still image which can be saved as a PICT file.

Three pull-down menus also appear at the top of the screen — File, Edit and Spigot. The File and Edit menus contain the usual variety of Macintosh commands, but the file menu also contains a "Compression..." command line which allows the user to select the method of compression used when recording

Figure 1.
ScreenPlay "Record" Window.



a movie or still image. The methods include Video, Photo—JPEG, Animation, Graphics, Component Video, Compact Video, and None. With the compression method selected, the user chooses the number of colours (the video settings have no options or few), and adjusts the quality of the image with a slider bar (see Figure 2). The Spigot menu allows several adjustments to the video and still images. The colour and hue of live video can be adjusted with one set of controls (see Figure 3). A second set of controls labelled Preferences allows the user to record audio with the video (through a separate input), set the limit of the number of frames-per-second for motion segments, select the size of a still image, and whether it is captured from a still video source (see Figure 4). The number of frames-per-second is particularly important, as it will largely determine how choppy or smooth the recorded movie will appear when you play it.

Each of these settings also influences the amount of compression performed on the file, and therefore the size of a file. Theoretically, if hard disk space is at a premium, it is important for the user to select the lowest acceptable levels of quality available (i.e. lower quality compression, fewer frames per second). Figure 5 presents comparison data I generated on my own system (Macintosh Ilci, 8MB) recording the same 15-second segment at high, medium and low quality compression settings and at 20 fps, 15 fps, and 10 fps.

It is apparent from these data that adjusting frames per second has a much more dramatic effect on file size than does the quality of compression setting. In fact, at 10 frames-per-second, the file sizes are marginally larger at low quality compression settings than at high quality compression settings. This

Figure 2.
ScreenPlay "Compression. . . " Window.

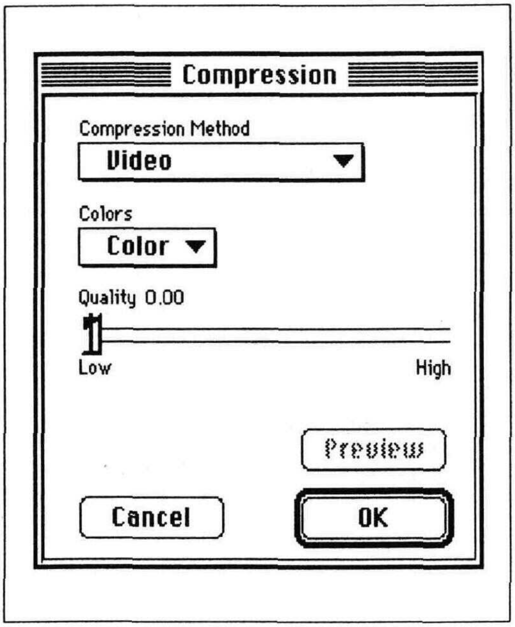


Figure 3.
ScreenPlay "Colour" Window.

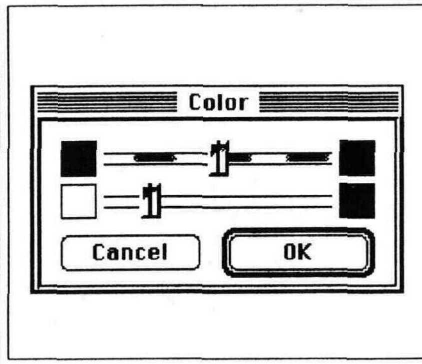


Figure 4.
ScreenPlay "Preferences" Window.

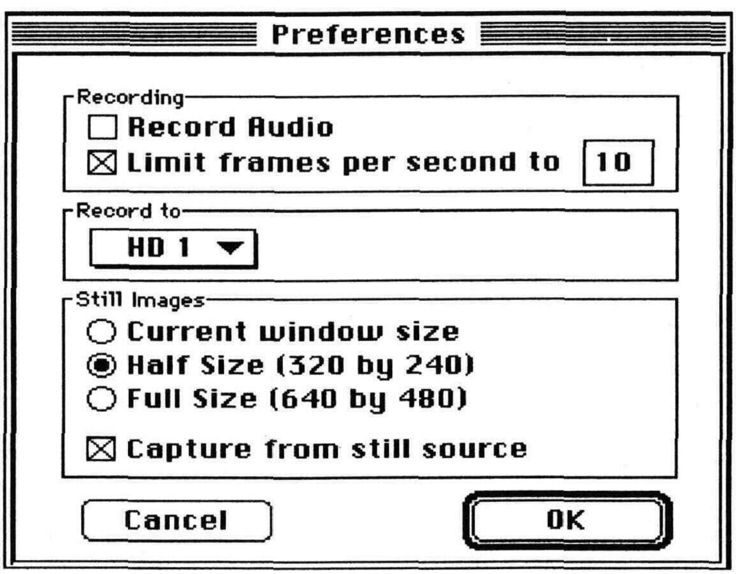
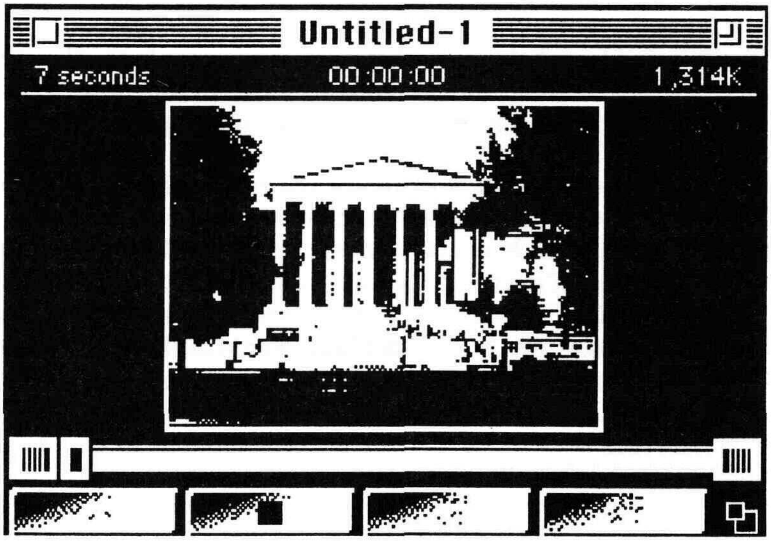


Figure 5.
File Sizes Resulting from Various Quality Settings for a 15 Second Motion Segment without Audio.



opposes logic, and I have no explanation for the results. It is possible that my reflexes were inconsistent in stopping the recording at 15 seconds, but I repeated the measures three times and obtained the same pattern of results each time. Regardless, at every speed the effect of the compression setting was small —almost negligible. These data argue for using the highest quality compression setting available, and making adjustments to the number of frames-per-second in order to conserve file space.

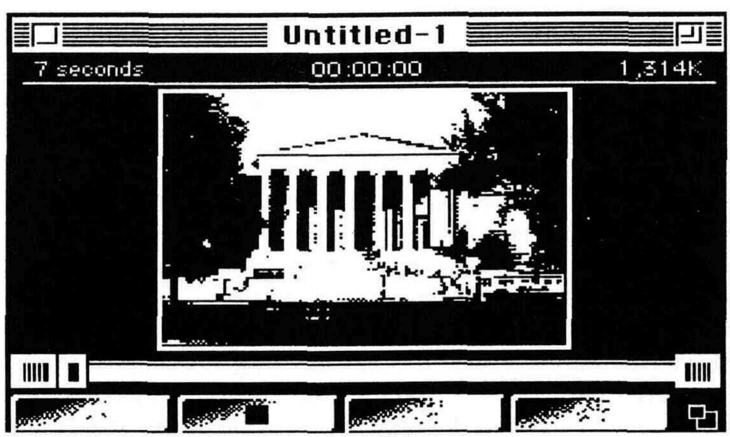
It is also important to know what type of system you are using for recording. The maximum frame rate for recording live video depends in the size of the image, the speed of the CPU, the speed of the hard disk drive and whether or not audio is being recorded. For example, the documentation for ScreenPlay reports that a Macintosh LC records 320 x 240 pixel frames at 8-10 frames-per-second (fps), and 160x 120 pixel frames at 12-15 fps. One method of improving a recording on a slower system is to record to RAM memory (Option-Record Button). Because recording to memory is faster and less variable than recording to hard drives, the movie is smoother, but each recording is limited to the amount of RAM available in the system.

Recording, Editing and Playing Video

As with most Macintosh applications, ScreenPlay is highly intuitive and uses well-established conventions for carrying out routine operations such as opening and saving files. The buttons in the Record Window mimic the controls of a VCR for the most part, so it is very likely that a new user would be able to record a segment without reference to the documentation. Of course the process doesn't stop there. Several specific operations must be carried out in order to crop images, record, edit, preview and save the exact video clip you want to create.

When "live" video is being recorded, counters appear in the Record Window which keep track of the elapsed time and the actual frame rate of the recording. Once the recording is completed, the recorded video appears in a new window called a "Movie Window" (see Figure 6). The Movie Window displays the recording you just completed, and allows you to edit clips from the segment. The complete segment, and any clips extracted from it can be saved as separate movie files. The top of the Movie window shows the total length of the segment, the position (in time) of the current image being shown, and the file size of the segment. Beneath the recorded image, the Movie Window displays a scrub bar, which can be used to mark the "in" and "out" points of clips to be extracted and saved from the original full segment.

Figure 6.
ScreenPlay "Movie" Window.



This review will not drag you through a complete procedure. There are many approaches and variations which might be taken with the same material, and these are amply described in the ScreenPlay documentation. Most procedures are so simple to use that you will be able to create and edit movies within a few minutes if you are already a seasoned Macintosh user.

But What About the Audio?

Even though the VideoSpigot hardware only records video, audio can be recorded at the same time if your Macintosh has built in audio capabilities or through an audio input board or MacRecorder system. I have used a MacRecorder successfully to add the audio tracks from the video or add my own audio to a recording.

The ScreenPlay program must be configured to record audio. This is accomplished by selecting Record Audio from the Preferences window under the Spigot pulldown menu.

CONCLUDING REMARKS AND OBSERVATIONS

The VideoSpigot documentation is beautifully laid out and easy to use. It is well-illustrated, and what impressed me the most was its economy. The entire operation of ScreenPlay is described in a few short pages—testament to both the simplicity and elegance of the program, and, I hope, the fine hand of an instructional developer in the creation of the print document. Still, the documentation is missing some key features I would have appreciated, such as comparison tables of various systems/quality settings configurations. The documentation is also missing a description of the compression methods one can select, so the user is left to experimentation to determine which of the compression methods might be best for any particular use. Of course, most users will be familiar with the Apple QuickTime documentation too, which contains brief, but very useful descriptions of these and other compression methods.

The ScreenPlay software is limited to recording segments of motion video, and clips or still images from the segments. If one wants to assemble a video production by combining clips, adding transition effects and mixing audio, then video editing software is required. At the time of this writing, VideoSpigot was being bundled with Adobe Premier, an easy-to-use and quite impressive video editing program. For many multimedia applications, one only needs to record or copy brief, intact sequences for insertion in an instructional program. For these applications, ScreenPlay is adequate. For anything more elaborate (and I suggest you will be unable to avoid the temptation) video editing software is necessary.

Word on the street has it that there are higher quality frame grabbers than the VideoSpigot on the market, and if price is any indication, this is probably true. I have had occasion to use only one other frame-grabber system (VideoVision), and I was unable to see a marked difference in quality, and I found its software to be a nightmare to use.

One personal observation: I dislike the choppy look of digital video. Digital video, at least the variety we are able to create on our desktops at the moment, is not very pleasing. The pixilated movement and out-of-synch audio makes me cringe. For high-quality video, videodisc is still unsurpassed in multimedia productions. Still, digital video is improving rapidly, and the affordability, convenience and portability of creating digital images makes the pain of watching inferior motion images bearable. I suspect that with products such as VideoSpigot and ScreenPlay, we are witnessing the beginning of an important transition in the development of multimedia instruction. I only hope that the transition is brief, and we achieve higher levels of technical quality very soon.

[1] NTSC stands for "National Television Standards Committee," and it is the standard video format used in Canada, Central America, Japan, Korea, Mexico, western parts of South America, Taiwan, and the United States.

PAL stands for "Phase Alternate Line," the video format used in most of Africa, Australia, China, New Zealand, Scandinavia, eastern parts of South America, and most of Western Europe.

Book Reviews

Diane P. Janes, Editor

Modern Video Production: Tools, Techniques, Applications by Carl Hausman with Philip J. Palombo. New York: HarperCollins College Publishers, 1993. ISBN 0-06-500045-5 (CDN $40.00)

Reviewed by Brian Cahill

The advent of a new generation of camcorders has brought an increasing number of the general public into the sphere of video production, which was formerly the domain of a relatively few television professionals.

Modern Video Production is a book which can greatly enhance any user's knowledge of and facility in video production. This book is best suited as a course textbook (a supplementary instructor's manual is available) targeted at students or practitioners of professional video production; that is not to say, the book has nothing to offer the novice or home video user. The authors state, in the preface, "Our aim is to communicate a technical subject in a simple and lively style." While they are largely successful in this endeavour, the book deals with a very technical area. However, a novice video producer could at times be inundated with the amount of material and the technical nature of the material this book encapsulates. This is not a content area that lends itself to print description alone.

The book is divided into four parts which include twenty-two chapters. At the beginning of each chapter basic objectives are laid out for that particular section. Each chapter concludes with a summary that encompasses technical terms and exercises designed to incorporate the knowledge acquired in the chapter. Still pictures are used effectively on many occasions to simulate the television screen.

Part One—The Tools provides an overview of video as a medium and deals with the hardware commonly used in video production.

Part Two — The Techniques deals with the nuts and bolts of television production (camera operation, lighting techniques, etc.). Some valuable tips gained only through actual production are provided.

Part Three — The Applications deals with different show formats, directing, editing and remote shooting.

Part Four—Specialized Operations looks at the technical aspects of video. The technical aspect is confined to knowledge which overlaps into the production area rather than electronic maintenance. The other major focus in Specialized Operations is an attempt to define where video is headed. It looks at current trends and the latest in technology (high-definition television, digital video and desktop video).

My initial response to the book was very positive. First, the book is well written and includes a thorough treatment of video production in basic and reader-friendly language, given the difficulty of the subject matter. It is well designed and progresses step-by-step through a complex, many-faceted subject area. Second, as a teacher of video skills in various settings I have seen very little that is as current and complete. This book fills a much needed void. One of the problems in describing video production in print is not what should be covered (that is relatively easy to ascertain) but to what depth should any individual subject be covered. I feel this is one of the key strengths of this book. The reader is told not all, but enough of the various production elements described in the book, and that demonstrates good organization on the part of the authors.

With relatively minor omissions in content area, the book has few shortcomings. As stated earlier the book contains a tremendous volume of information and its effectiveness would be greatly decreased if it were not used in connection with practical applications.

This book would be a welcome companion for any individual, regardless of experience, contemplating video production.

REVIEWER

Brian Cahill is a television producer and director with the Division of Educational Technology at Memorial University of Newfoundland. He has extensive experience in video production and editing, and teaches video skills in a variety of settings.

Inequity in the Classroom, Claudie Solar (Ed.). Montreal, PQ: Concordia University, Office of the Status of Women, 1992. ISBN 0-88947-042-1 (CND $40.00 manual or video)

Reviewed by Dr. Joan Whelan

Educators of adults whether in a university, college or community-based setting, are often faced with the perplexing problem of what to do about student behaviours that are grounded in inequity issues. The need to "do something" is perplexing because, very often, there is difficulty in finding time and the resources to address the problem, not to mention a possible lack of expertise in tackling difficult issues.

A solution has been found! The Women's Studies Office of Concordia University has developed a multi-media package, consisting of a video and a training manual that not only examines the inadvertent sexual and racial biases that women students encounter in a variety of learning environments, but offers strategies that can be used to address inequity encountered in these situations. Available in French and English, the package enables facilitators and learners unfamiliar with the more subtle forms of racial and sexual bias to explore these issues in a format that grounds them in the facts that need to be addressed. It is designed, as well, to increase the knowledge of those who are aware of inequity issues and are pursuing a framework to examine them further.

In addition to a video, the package contains a comprehensive manual for 'Inequity in the Classroom," divided into four parts: a training guide for a one-day workshop, fact sheets dealing with different aspects of inequity, and an annotated bibliography.

The workshop, designed for delivery using an interactive approach, is grounded in principles of adult learning. A statement of objectives, suggestions on how to set an appropriate climate for the workshop participants, and a questionnaire that provides an opportunity for reflection on knowledge and feelings about inequity in the classroom are provided. The fact sheets sensitize learners to discriminatory classroom interaction that results from bias based on sex, race, ethnicity, class, sexual orientation, age or disability, either through unconscious or deliberate behaviour or through the use of exclusive or biased learning materials or approaches that perpetuate inequity.

The video portrays women engaged in a variety of learning environments receiving inequitable treatment. As well, the video provides several in-depth discussions by well-known scholars who are familiar with inequity in learning environments and who are concerned with its effect on learners.

The training session contains detailed step-by-step directions (including points to be included in commentary throughout the session) as well as suggested activities, reference literature, and questionnaires for learner evaluation. The material and suggested approaches accommodate a range of student needs and have a delivery sequence that can fit several time frames.

Part one of the workshop focuses on defining discrimination in the classroom. In part two, learners can use small group discussion to examine personal experiences and observations, as well as situations presented in the video, and discuss consequences of discrimination. The training session concludes by suggesting approaches educators can use to counteract and deal with inequity.

The training session concludes with a review of the workshop, addresses unanswered questions, and arranges for participants to evaluate their learning.

The 26-minute video serves as the springboard for the activities of the workshop. Used early in the workshop session, the video provides examples of the subtle and inadvertent sexual and racial biases that undermines a learner's confidence.

For educators who find themselves caught in learning environments that expose the need to address inequity issues, or for those aware that inequity is an issue that needs discussion in order to prevent it, this learning package can be a valuable resource. The editor and those who assisted her in the development of this package provide a framework for increasing our sensitivity to inequity issues in learning environments and they help us become aware of the consequences for learners who are treated inequitably. While the package is comprehensive and self-contained, both the delivery format and time lines suggested can be modified to fit a variety of learners' needs and situations. In both instructional design and content, the package adheres to the principles of adult learning and seeks to remove from learning environments those behaviours that detract from the human dignity of the person.

REVIEWER

Joan Whelan, Ed.D. (Toronto), is an adult educator, consultant, and part-time instructor in Adult Education at Memorial University of Newfoundland. She is presently (1993) the women's representative to the Newfoundland and Labrador Labour Force Development Board.

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Information for Authors

CJEC welcomes papers on all aspects of educational communication and technology. Topics include, but are not limited to: media and computer applications in education, learning resource centers, communication and instructional theory, instructional design, sim ulation, gam ing and other aspects of the use of technology in the learning process. These may take the form of reviews of literature, descriptions of approaches or procedures, descriptions of new applications, theoretical discussions and reports of research.

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Manuscripts should be typed on 8 1/2 x 11-inch ordinary white paper. All materials must be double-spaced, including quotations and references. Include a title page on which appears the title of the manuscript, the full name of the author(s) along with position and institutional affiliation, mailing address and telephone number of the contact author. An abstract of 75-150 words should be placed on a separate sheet following the title page. While the title should appear at the top of the first manuscript page, no reference to the author(s) should appear there or any other place in the manuscript. Elements of style, including headings, tables, figures and references should be prepared according to the *Publication Manual of the American Psychological Association, 3rd Edition,* 1983. Figures *must* be camera-ready.

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Send four copies of the manuscript to the Editor along with a letter stating that the manuscript is original material that has not been published and is not currently being considered for publication elsewhere. If the manuscript contains copyright materials, the author should note this in the cover letter and indicate when letters of permission will be forwarded to the Editor. Manuscripts and editorial correspondence should be sent to: Mary F. Kennedy, *Canadian Journal of Educational Communication,* Faculty of Education, Memorial University of Newfoundland, St. John's, Newfoundland, AI B 3X8.