CANADIAN JOURNAL OF EDUCATIONAL COMMUNICATION

Volume 20, Number 3, Winter 1991
ISSN 0710-4340

An AMTEC Publication

Canadian Journal of Educational Communication

Volume 20, Number 3
Winter 1991

ISSN 0710 · 4340

The Canadian Journal of Educational Communication is published by the Association for Media and Technology in Education In Canada; 3-1750 The Queensway, Suite 1318, Etoblcoke, Ontario M9C 5H5; Attention: Mr. Al LeBlanc, Secretary/Treasurer. Notification of address change should be sent to the above. Back issues of C./EC are $15 Canadian and may be obtalned by contacting the Editor. CJEC Is indexed In the Canadian Education Index and ERIC.

Second Class Mail Registration No. 6956

ARTICLES

All correspondence should be addressed to:
Dr. Richard A. Schwier, Editor
Communications/Continuing & Vocational Education
College of Education
University of Saskatchewan
Saskatoon, Saskatchewan
S7N OWO

Membership Form

AMTEC c/o Dave Bieman
Co-ord., Learning Resources Centre
The Huron County Board of Education
163 Princess Street, East
Clinton, ON N0M 1L0

name _____ title _____

address _____

_____

city _____ prov/postal code _____

phone (w) _____ phone (h) _____

Fax _____ Netmail _____

☐ I am willing to have pertinent information from the above included in the next Members Handbook

ALL RENEWALS COME DUE ON EITHER JANUARY 1ST OR JUNE 1ST

If this is a renewal then please indicate your Membership Number _____

☐	**Student of Educational Technology**	**$20.00***
☐	**Individual**	**$50.00**
☐	**Institutional**	**$75.00**
☐	**Commercial**	**$125.00**

***Students must have this form signed by your Department Head:** _____

☐ **Three Issues** **$40.00**
(outside of North America - $55.00 U.S.)

Special Interest Areas:

___ Media Production
___ Media Management
___ Telecommunications
___ School Libraries
___ Distance Education
___ Media Literacy
___ Micromputer Applications
___ Instructional Development
___ Mass Communications
___ Educ. Tech. Research
___ Curriculum Implementation
___ Interactive Video
Other _____

Work Environment

___ Elementary
___ Secondary
___ College
___ University
___ Business
___ Government
___ Health Care
Other _____

Please duplicate this form.

CJEC is typeset on an Apple Macintosh Plus™ in PageMaker 3.0™. Galley proofs to authors and final camera-ready impressions are output on a Qume CrystalPrint™ *Publisher*.

Concordia University Printing Services

Acknowledgement

The *Canadian Journal of Educational Communication* is supported by a grant from the Social Sciences and Humanities Research Council of Canada.

Educational Technology in Transition: A Study of the Years 1968 - 1989

Robert M. Bernard
Karin Lundgren-Cayrol

Abstract: It is consldered that the professional field of educational technology (henceforth called ET) is comprised of three interlocking groups of individuals: scholars/professors; practltioners and graduate students In the process of enterlng the profession. For many, graduate study is the mechanism through which they develop thelr professional knowledge and skills. This article examines the interrelationshlpof the professional literature, Concordla University's curriculum in ET and the vlews of 408 of its enterlng graduate students. It looks at the similarities and dlfferences in these data sources from a hlstorlcal perspective from 1968 to 1989. These years span from the end of the audlovlsual movement to the era of computerized multi-media. A synthesls of the separate sources of lnformatlon is provided in an attempt to delineate the major trends and thelr possible effects on future developments in the field.

Résumé: Il est admis que le domaine professionnel de la technologie educatlve est constituée d'un emboitement de trols groupes d'individues: érudits/professeurs. praticiens professionnels et étudlant(e)s diplomé(e)s a la veille d'entrer dans la profession. Pour ces derniers. les études supérieures leur permettent d'affiner connaissances et competences. Cet article examlne, dans ce domalne, les connections existantes entre la littérature spéclalisée, le programme d'études de l'Universlté Concordla et les points de vue de 408 de ses étudiant(e)s diplomé(e)s. Il décrit les ressemblances et les différences entre ces sources d'lnformatlons dans un perspective historique entre 1968 et 1989. Ces années couvrent la fin du mouvement audlovlsuel pour s'étendre a l'ère des multl-média informatisés. Une synthese de ses données est présentee afin de faire ressortir les tendances majeurs et leur effet posslble sur les deéveloppements futurs du domaine.

INTRODUCTION

Some have characterized ET as having the potential to revolutionize educational practice (e.g., Beckwith, 1988), and others have said that it's best application is industrial training (e.g., Derryberry & Rossett, 1986). There is a tendency to think of ET as a subset ofeducation, but it has been argued that technology is the proper focal point for its study (Heinich, 1990). Whatever perspective one takes on these issues, it is clear that ET has changed

Canadian Journal of Educational Communication. VOL. 20. NO. 3. PAGES 153 - 170. ISSN 0710-4340

dramatically in both practice and conceptualization over its 25+ year history. It will be shown that changes to the field go far beyond the popular impression that "fascination with medium X gave way to zealous attention to medium Y", and that one of its primary struggles has been to achieve an identity other than the one just mentioned.

This paper examines the major changes that have occurred during the years 1968 to 1989 from three perspectives: a) the professional literature; b) the curriculum of Concordia University's Graduate Programs in ET; and c) the graduate student body While ET as a field existed prior to 1968, this year was chosen because it marks the beginning of Concordia's Graduate Program in ET.

This paper is organized in three main sections. The *Method* section lays out the plan that was devised and used for selecting and reporting the professional literature, the way the Concordia curriculum was examined and the means for investigating student information. The *Results* section begins with a description of the evolution of the concept of ET. It goes on to describe major events, ideas and innovations that have influenced ET in three time periods: 1968-1974; 1975-1981; and 1982-1989. Also reported in each periodarechanges that occurred to the Concordia curriculum and to the reasons expressed by graduate students for entering the program. The Discussion section is a synthesis of these data sources depicting major shifts and trends.

METHOD

Professional Literature

Coverage. Eight sources of literature were used to examine the history of the field. These were: a) articles published in refereed and non-refereed ET journals; b) articles published in journals related to the field of ET; c) related books published in or around the relevant period; d) *Aspects of Educational Technology* (British, Educational Technology International Conference) and other published proceedings from major conferences; e) unpublished conference papers; f) the *Encyclopedia of Educational Technology* and; *Educational Technolology: Definitions and Glossary of Terms* (AECT, 1977); g) reports of committees or task forces empowered by professional organizations; and h) ERIC documents. In all, approximately 120 separate documents were examined.

Selection. Documents were sorted into the three time periods and main ideas were extracted from each. Selection of primary issues for inclusion in the description that follows was based on the degree of redundancy, the circulation or coverage of the publication source (a rough measure of importance) and the occurrence or non-occurrence of these issues in the formal accounts of the history and development of the field. The selection of references for inclusion in this description, when several sources were available, was based on the importance of the publication source.

Program Data

Data source. Changes to the curriculum of the Graduate Programs in ET were taken from the calendar of the *Division of Graduate Studies* (henceforth referred to as Concordia Calendar) for each of the 21 years involved. Information was extracted concerning program and course descriptions, program and course additions and deletions, and changes to the requirements for degree completion.

Student Sample Data

Sample. Subjects for this study were 408 students who wereaccepted to the M.A. program in ET and subsequently graduated (60% of the total acceptances). The overall demographic characteristics of the subjects are shown in Table l(see page 156) along with the breakdown for each period.

Materials. Demographic data were collected from the regular graduate studies admission form that is filled by each applicant to the program. In addition to this, it has been the regular custom in the program to ask prospective students to answer the question: 'What are your reasons for entering the ET program?" (henceforth referred to as REASONS). Responses to this question and information concerning demographics were the raw data for this study

Procedure. Subject responses were classified using a keyword technique similar to that used in identifying "idea units" in verbal learning studies (Kulhavy, Schmid & Walker, 1977). First, subjects were randomly ordered. Second, keywords and phrases were extracted from the verbal transcripts and coded numerically Earlier transcripts yielded more keywords than later transcripts (i.e, 50% came from the first 50 transcripts and no new keywords were found in the last 50 transcripts). Third, these categories were scrutinized by two experts in the field who collapsed them into 22 REASONS. The collapsed categories became the basis for the statistical analyses.

Statistical analyses were performed in two steps. First, factor analysis was conducted on the REASONS data to further reduce the keywords to correlated clusters of factors. The factors were named according to the highest loading variables. The 9 highest loaded factors, and their percentage of variance accounted for are shown in Table 2 (see page 157). Factor scores were derived through this process, for each subject, and served as the input to the second step. A factor score is the sum of the weighted (multiplied by) variables (the weight is related to the strength with which each variable loads in factor analysis) for each subject. The distribution of weighted scores for each factor, has a mean of 0 and a standard deviation of 1 .O. and may be read as z-scores.

The second question involved an exploration of changes in REASONS (factors) over the three time periods: 1968 to 1974 (n = 82,20%), 1975 to 1981 (n = 120, 29%) and 1982 to 1989 (n = Discriminant functions analysis was conducted to determine which of the factors identified earlier best predicted (discriminated among) the period of student application.

Table 1
Demographic Characteristics of Students Over the Three Periods

Level	1968-1974	1975-1981	1982-1989	Total
		Sex		
Female	40%	55%	67%	57
Male	60	45	33	43
		Educational Background		
Education	10	18	17	16
Psychology	12	17	17	16
Linguistics	24	17	16	18
Business	7	9	18	8
Natural Science	7	13	7	14
Communication	20	15	13	15
Humanities	20	11	12	13
		Professional Background		
Education	70	61	53	59
Management	21	21	25	23
Technological	9	18	22	18
		Origin		
Quebec	46	47	66	53
North Amer. Europe	31	25	24	26
Developing Countries	23	28	9	23

RESULTS: CHANGES TO THE FIELD, THE PROGRAM AND THE STUDENTS

Preface

In a work such as this, it is impossible to do justice to the entire history of a field as diverse as ET. The best we can expect to do is to highlight various people, events and ideas that have helped shape the field. Like any historical account, however, the attached importance is a matter of personal perspective, that may differ with the views of other knowledgeable professionals. More comprehensive histories of the development of the field can be found in Saettler

Table 2
Results of the Factor Analysis and Discriminant Functions Analysis of REASONS Data

Factor Analysis		Discriminant Functions Analysis				
Factors (Eigenvalues > 1)	Variance (%)[a] Explained	Category Means (Factor Scores)[b]			F-Ratios	
		1968-74	1975-81	1982-89	Univariate	Multivariate
1. Interdisciplinary	8.9	-.39	-.19	.27	16.90	21.03*
2. Research-based Design and Development	8.1	-.17	-.17	.17	5.90	7.55*
3. Learning Theories (Applied and Research)	7.4	.01	.08	-.05	< 1.00	
4. Mass Communication (Educational Television)	6.3	.69	.02	-.29	32.66	37.27*
5. Developing Countries (Interest in and from)	5.6	-.21	.26	-.07	6.32	6.42*
6. Training for Profession	5.4	.01	-.01	.00	< 1.00	
7. Alternative Education	5.0	.10	.19	-.15	4.89	6.03*
8. Educational Problem Solving	4.9	.01	-.08	.04	< 1.00	
9. Improve Teaching Effectiveness	4.7	.18	.17	-.17	6.00	7.69*

[a] Total Variance Explained = 56% [b] Grand Mean = 0.0; Standard Deviation = 1.0 *$p < .05$ $n = 408$

(1968, 1990), Eraut (1989), Ely, Januszewski and Le Blanc (1988), Ely, LeBlanc and Yancey (1990) and Gagne (1987).

Period 1: 1968 to 1974

Field. One strand of modern ET evolved out of what is commonly referred to as the "audiovisual movement". Names such as James D. Finn, Edgar Dale, and F. Dean McCluskey are commonly associated with the development of audiovisual instruction during the period 1950 to 1965. This aspect of ET is reflected in Lumsdaine's definition of ET (see Table 3 page 159). Television, in particular, seemed to hold great promise as a medium of instruction and as a means for reducing the personnel costs associated with teaching (Saettler, 1968).

Concurrently, there was recognition of the need for a conceptual framework which encompassed both instructional media and other solutions to educational problems (e.g., Davies, 1971; Banathy, 1968). Tickton (1970) promoted the view that the broader conception of ET is a "...systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and non-human resources to bring about more effective instruction" (p. 5).

The primary target for early ET was the public schools and many attempts were made to integrate audiovisual teaching methods and materials into the schools. Libraries became media centres and there were attempts to examine the roles of teachers in light of the newly devised notion of media specialist and instructional designer (e.g., Kerr, 1977).

ET has always tended to import theoretical perspectives from other fields and disciplines. During this period the strongest of these influences were: communication theory, including mass communication (e.g., McLuhan, media influences; Schramm, learning from media); behavioral psychology (e.g., Skinner, teaching machines; Mager, behavioral objectives); media aesthetics and symbol systems (e.g., Arnheim, psychology of art; Goodman, semiotics); and perceptual psychology (e.g., Gibson, picture perception; Deregowski, cross-cultural perception). Systems theory (e.g., Banathy, instructional systems design; Beer, organizational management) began to emerge as a means for linking these disparate pieces into an integrated whole.

Towards the end of the period the National Society for the Study of Education devoted Part I of its 73rd annual yearbook to a study of *Media and Symbols: The Forms of Expression Communication and Education.* The yearbook set the tone for a flurry of studies of the symbolic codes embedded in media and their effects on learning and thinking. About the same time Salomon (1972) published an influential study of the hypothesized effects of one such code (i.e., zooming in on an object) on the development of general thinking skills.

Program. Concordia University's Graduate Programs in ET began in 69 when the Centre for Instructional Technology (now AV Services) and the

Table 3
Selected Conceptual and Functional Definitions of Educational Technology

Author (Date)	Quotation or Descriptive Phrase
Lumsdaine (1964)	Two aspects: "hardware or product orientation" and "software or process orientation" to solve educational problems.
Davies (1971)	A "conceptual framework able to deal with problems stemming from the needs of an education or training system to survive, grow and develop the capacity to adapt and manage change" (p.16).
Mitchell (1975)	The "discernible educational technologist" may perform as a learning consultant, an educational materials producer, a manager of learning resources or a systems developer and planner.
AECT (1977)	ET "is a complex, integrated process involving procedures, ideas, devices and organization, for analyzing problems and devising and implementing, evaluating and managing solutions to those problems involved in all aspects of human learning" (p. 1).
Davies (1978)	Added "criticism and evaluation within a problem-solving" approach.
Hawkridge (1981) & Romiszowski (1981)	Philosophical assumptions that guide research and practice must reside outside of the "hardware" and the "software" components identified by Lumsdaine.
Pals & Plomp (1989)	Three interacting dimensions: ET1, ET2 and ET3. ET1 centers around physical media developed to assist in the teaching/learning process. ET2 includes processes, used for developing, designing and evaluating instruction. ET3 is the philosophical and holistic orientation that is sometimes called the systems approach, whereby problems are analyzed and solved in their own context through a consideration of as many facets and their interrelationship as possible.
Ely (1989)	Nine ET functions: organizational management; personnel management; research; design; production; evaluation; logistics; utilization (teaching and training); and utilization/ dissemination (teaching about ET).

then newly formed Department of Education merged. In the early years the Program was a combination of traditional education courses (e.g., philosophy of education, sociology of education) and educational film and television development, production and evaluation. The entry requirement was a B.A. in education with teaching experience recommended. During this period (1968-1974) the Concordia's *Calendar* described the field as "a rapidly changing field of study"..."having a major impact upon education theory, teaching, learning, curriculum design and school organization". Emphasis was placed on teaching, instruction and communication. The early thesis requirement (1968-1971) was "Option A – Research and Development of Educational Media" and "Option B – Production of Educational Television". The title of Option A was soon (1972) changed to 'Research and Development of ET", a move towards broadening the definition of the field. Later Option B was changed to "Production and Evaluation of Educational Materials". A systems analysis and an educational cybernetics course were first offered in 1971.

Students. As shown in Table 2, the comparison of the three periods revealed two significant differences which started high in Period 1 and declined in subsequent periods. These were: a) (Factor 2) mass communication (educational television); and b) (Factor 9) improve teaching effectiveness.

Twenty percent of the sample mentioned Mass Communication (educational television) as a reason for entering the program. In addition, forty-four percent of the subjects mentioned Improving Teaching Efficiency and Effectiveness as a reason for applying to the program.

An interesting demographic shift occurred over the periods. Males dominated the first period, whereby females dominated the other two periods.

Period 2: 1975 to 1982

In 1975 the Council of Europe (Steering Group on ET) moved further away from Lumsdaine's hardware/software distinction by stating that ET involves "the optimization of human learning' using "tools, techniques and methods necessary for effectiveness" to meet the "needs and values of learners" (Fleschig, 1975). Several other definitions of the field also emerged during this period (see Table 3).

Continuous and life-long education began to appear in the vocabulary of ET (Leedham, 1975) suggesting that the field's near fixation with public schooling was beginning to soften. Access to education, as well as the technological means of achieving it, became an issue for consideration in the development of media for Third World countries (Hubbard, 1975).

A 1977 task force of the Association for Educational Communication and Technology (U.S.) adopted a definition of the field (see Table 3) that led to a wave of introspection and criticism (e.g., Morgan, 1978; Saettler, 1978; Gagne, 1980; Popham, 1980; Hawkridge, 1981). A common thread running through these analyses was concern for the roots of the field, the definition of ET and its alternative futures. Multi-disciplinarity was considered by some as a dominant feature of the field and most argued that by stressing the problem-

solving and philosophical orientations, the 'hardware stamp" that still persisted from the earlier era could be reduced.

During this period much of what is now accepted practice in instructional design was developed and formalized. Two influential instructional design books emerged. Dick and Carey (1978) provided teachers with an almost algorithmic approach to designing instruction, while Bomiszowski (1981) attempted to represent all of the complexity and subtly in designing systems for education and training. The term "needs analysis" was popularized by Kaufman (1976). More recently, this notion has been further refined into a stepwise approach called performance technology (Rossett, 1987). On the development end, "message design" became a popular euphemism for research-driven design and development (Fleming & Levie, 1978).

There was a shift away from the notion of mass communication in favor of individualization as a model for education. Individual differences became an important element of research studies. In summarizing research and theory developments up to 1977, Torkelson stated that, "...interest in communication was gradually superseded by educational/instructional technology, developing ultimately to a point in recent years where the narrower emphasis. . . was upon instructional development and aptitude-treatment interaction, logical outgrowths of refined analysis of programmed instruction and systems concepts" (p. 327).

Perceptual theory and research flourished, while the influences of the behavioral orientation began to wane. Cognitive science, and in particular information processing approaches (e.g., Anderson, Bower) to understanding learning, became popular. Mental imagery and dual coding (e.g., Paivio) were influential explanatory constructs used both to defend visual learning and to underpin the development of personalized memory techniques. The term "visual literacy" (Levie, 1978) emerged as a rallying point for researchers and teachers alike, whose interest lay in investigating or promoting the effects of visual teaching. Later, this notion was largely debunked (Cassidy & Knowlton, 1983).

In summary, this period was marked by transitions away from some of the ideas that underpinned early ET-educational innovation, mass communication theory, behaviorism and audiovisual instruction. With the decline of television as an instructional medium, came the sobering prospect that no single educational medium represents a panacea. Research questions began to change away from intra-medium questions such as "Is medium Xbetter than traditional classroom instruction?", towards more refined "inter-medium questions" like "Does a change in Y component of medium X produce better instruction?" (Solomon Clark, 1977).

Program. The move toward broadening the notion of ET continued by the introduction of 11 concentrations. In addition to the production and evaluation focus of the previous era, systems analysis and planning, information systems, educational innovation, communication theory and the management of learning resources appeared in the Calendar. For the first time, ET in Developing

Nations appeared as an optional course.

Students. An examination of Table 2 indicates that for two factors there was a higher mean in Period 2 than in the other two periods. These were: a) (Factor 5) Developing Countries, where a large increase from Period 1 and a large decrease in Period 3 was evident; and b) (Factor 7) Alternative Education, which was relatively high in Periods 1 and 2 (but higher in Period 2) and markedly lower in Period 3.

Eighteen percent of the total sample indicated an interest in ET for Developing Countries, especially in Period 2. Two demographic shifts were evident over the three periods for this factor. Not surprisingly, a large demographic shift involved geographic region. People from within North America showed interest in developing countries, while at the same time students from developing countries diminished in number.

The emphasis for Alternative Education was expressed by 34% of the sample. Alternative education includes references to adult education and continuous education, but it does not include distance education. No demographic trends were evident for this factor.

Period 3: 1982 to 1989

Nisbet (1981), in a keynote address to the Association for Education Training and Technology's annual meeting, argued that theory building and research must precede practice even though results are not immediately applicable. He distinguished between the direct and indirect impact of research. Direct effects might be observed from research on educational materials, while indirect effects could result from the "gradual but steady absorption of the ideas of ET into the fabric of educational practice . . . becoming a part of the established conceptual framework for tackling educational issues" (p. 8) (see Table 3 for other definitions of ET).

One of the key developments of this period was the introduction of the microcomputer in homes, offices and schools. A wave of enthusiasm swept through the ET community over the widespread adoption of LOGO, a computer language developed by Seymore Papert to promote mathematical and critical thinking. ET programs geared up to teach teachers to use computers in the classroom. However, the initial enthusiasm surrounding LOGO waned as research failed to confirm the original hypotheses (Tetenbaum & Mulkeen, 1984). More recent developments, which seem particularly useful in the training domain, involve the marrying of computer assisted learning with video disc to create a hybrid medium called interactive video (e.g., Schwier, 1987). The application of digitized sound and images, stored within random access hypermedia stacks or accessible to students through computer assisted learning lessons created with "authoring languages", looms as the next great advance in this area. Intelligent tutoring and expert systems have appeared on the horizon, but are still largely at the prototype stage Wenger, 1987).

Two largely new applications of ET emerged in the 1980s. Distance educators, heretofore mostly confined to the delivery of print-based

tional materials through the postal system, began to envision the use of communication technologies and computer applications to reach wider student populations. The other major application was in the world of industrial and corporate training where cost/benefit concerns led to consideration of techniques for training design and delivery. Adaptations of long-standing instructional design models began to appear as training design models and training-oriented professional associations, such as the National Society for Performance and Instruction, began to appeal to a large segment of the ET field.

This period is characterized by a shift in research focus, away from teaching improvement and towards an understanding of learning processes. This change in emphasis brought about an even greater adherence to cognitive theoretical orientations, applied both to traditional media such as print-materials (Jonassen, 1985), as well as problems of artificial intelligence and intelligent tutoring systems (e.g., Wenger, 1987). Terminology from the language of psychology, like elaboration theory, subsumption theory, assimilation-encoding theory and mathemagenics permeated the research literature and aptitude-treatment interaction research, big in Period 2, began to diminish, largely as a result of criticisms by Cronbach and Snow (1977).

In spite of Clark's (1983) revolutionary pronouncement that the media have little or no effect on learning performance outcomes, Heinich (1990) comments on a disturbing tendency of the late 1980s. Apparently there is an increasing trend in some quarters to re-equate ET with tools, and one tool in particular — the computer. The reason cited is that "doing so has the political advantage of controlling the pipeline to grant money" (p. 67). Hence, we may be witnessing a reinvention of the previous mistakes made by the television enthusiasts.

Program. This period was marked by a further decline in the emphasis placed on teaching, and public school teachers as primary consumers of the M.A. in educational technology. According to the *Calendar* (1981-1985), 'the program qualifies people for careers as learning consultants, producers and evaluators of educational media, designers of instructional materials and systems, managers of learning resources and educational planners". In 1988, "knowledge engineers (who collect human expertise and incorporate it into machine systems)" was added to the list of potential careers supported by the program.

In 1981-1982, a Ph.D. Program was added, featuring a curriculum which combined advanced-level seminars and individual tutorials. In addition to a general core of philosophy, learning theories, systems theory, research methods and statistics, five main study concentrations were listed: instructional design; distance education; research and development of educational media; systems theory and cybernetics; and human resource development.

Another new program, a Diploma in Computer Assisted Learning, was launched in 1983-1984 to support the growing demand for computer-literate teachers. This program attracted a great deal of attention for several years, but

was finally discontinued in 1989 as its clientele diminished to nearly zero.

A number of course changes were made during this period. Educational broadcasting became distance education (1982-1983). Formative Evaluation of Educational Materials (1984-1985) replaced the emphasis previously placed on summative evaluation and measurement. A second course in instructional design was added (1988-1989), while nearly all of the production courses were compressed into a 6-credit general media development course (1988-1989). Several computer-related courses were added: Knowledge Engineering and Intelligent Tutoring Systems, Modelling and Simulation, and Interactive Multi-Media Tutoring Systems.

One of the major changes was the addition of a major internship as an alternative to the thesis/thesis-equivalent requirement that had existed previously This change was largely in response to the growing demand for experienced instructional and training designers for business and industrial settings. This major shift in emphasis was accompanied by a reduction in the M.A. from 90 credits to 60 credits.

Students. Two factors, "Interdisciplinarity (Factor 1)" and "Research-Based Design and Development (Factor 2)", are significantly higher in Period three than in the other two periods. Thirty-eight percent of the sample made some mention of the advantage of the interdisciplinary nature of the field. Education as the primary work experience diminished in Period 3, while non-educational media background increased from Period 1 to Period 3. These trends suggest a movement towards students with backgrounds in a variety of disciplinary areas other than education.

Half of the sample was interested in the research orientation of the field and the program, and they expressed an overall tendency towards research in developing instructional materials.

DISCUSSION

Specific Findings and Trends

From the overall analysis it is not unreasonable to conclude that students view ET as multi-faceted and lacking one dominant central theme, besides its interdisciplinarity. This view also prevails in the literature of the field.

Three of the nine primary loading factors in the student data did not change over the three periods covered here. For Learning Theories (Factor 3), Table 1 shows that the number is divided about equally among the students responding in each of the three time periods, even though in the literature there was a change of emphasis from a behavioral to a cognitive orientation. Training for a Profession (Factor was given as a reason for entering the program by 21% of the entering students and 18% of the students see ET as a field concerned with Educational Problem Solving (Factor 8). This reflects a commonview in the early literature of the field that apparently persists to the present.

The following trends seem reasonably well justified from the literature of the field and the student data:

- There has been a shift in the field away from its roots in public school education towards applications, particularly of instructional design and systems theory, in industrial and military contexts. This conclusion is supported by a significant demographic shift in professional background over the three periods, and by the greater concern in the literature of the field for training design and development. Several authors have attempted to explain this trend. Boyd (1991) claims that lack of funds to support training and development in the public sector is partially responsible for the ineffectiveness of ET. Rossett and Garbosky (1987) point to the move towards defining ET as instructional design as a partial reason for the lack of impact, saying that ". . if we wish to be key players in the schools, we must either cleave to our media/technology roots or expand the way we are perceived in schools" (p. 41). Spitzer (1987) cites increased differentiation between education and training, increased politicization of the public schools, more money for development in the private sector and private sector leadership in educational innovation, as reasons that ET's trend away from the public schooling will continue.
- Related to this is a trend, indicated in the student data, away from an emphasis on teaching effectiveness (Factor 9). Two directions in the literature of ET suggest this. First, there was a change in emphasis from group-based teaching (i. e. audiovisual movement) towards indi vidualization (Elton, 1977), where the needs and characteristics of learners are of primary concern. Second, there is a shift in theoretical perspective from perception and behaviorism towards a consideration of learning processes and skills, meta-cognition and learning strategies.
- ET has moved away from communication theory (Factor 4), especially mass communication, and behavioral psychology and towards cognitive, and in recent years social psychology, The shift from behavioral to cognitive psychology is partially a function of this very trend in psychology itself. It may also be true that psychology provides a richer explanatory environment than communication theory and a better link with current learning technologies, including instructional design.
- There has been movement away from the language of alternative education (Factor 7) (e.g., adult education, continuous education). This may have resulted, not because these areas are no longer fashionable, but because they have developed in their own right. For instance, at Concordiaan Adult Education undergraduate program was instituted in 1980 and has flourished since.

- There has been a general move towards the view, whether correctly or incorrectly held, that research in instructional variables (Factor 2) and message design (from early work in visual design to more recent studies of computer-based learning) will result in better learning products. In part, this view may stem from the tendency over the past several decades to draw both theory and experimental methodology from educational psychology and other related fields.
- There has been a consistent move towards greater interdisciplinarity (Factor 1) in ET, as well as a general tendency away from education as the root discipline. This, Clark (1987) argues, is a step in the right direction, at least as far as training researchers is concerned. In addition to psychology and communication, areas such as management, sociology, computer science, engineering, library studies and information science have become connected with ET In fact, it is not uncommon to find ET-like activities taking place in any of these alternative disciplines, It is certainly true that the boundaries between ET and some of the other areas are becoming more indistinct, particularly when computers are involved.

Several major points can be derived from looking at program information (Concordia's Calendar) over the three periods. First, Concordia's Program led the field in offering systems theory and cybernetics courses in the early years. Except for this, however, Concordia's Program has tended to follow many of the trends that are reported in the general literature of the field. The one obvious exception is that for the most part Concordia has resisted the urge to become very specialized in instructional design, like some of its American counterparts (e.g., Syracuse, Florida State University). Concordia's faculty has chosen to define the field in a manner similar to Winn's (1989) thinking. He argues persuasively against graduate training that favors an algorithmic approach to designing instruction. Hegoeson to say that if instructional design is to become a true profession, ". . .students (must be) taught to reason about the consequences of instructional strategies for learning and not just follow prescribed steps in a design model" (p. 43).

A second point is that Concordia's program was somewhat late (1988-1989) in offering an internship option to the M.A. thesis, whereby the skills of instructional design, media production, etc. could be developed and evaluated rigorously. Many American universities have had this option since the early 70s. This indicates a hesitancy on the part of Concordia's faculty to back away from its long-standing emphasis on research and evaluation.

General Reflections

Perhaps the most interesting aspect of this characterization of the field is its struggle to define itself and particularly its attempts to define itself as something other than the application of technologies (tools view). And yet, paradoxically, the application of tools, broadly defined, is precisely where the

field has achieved a degree of success over the last twenty years. Training design, medical education and distance education (e.g., U.K. Open University), to name only a few areas, have profited greatly from their association with ET (e.g., Hannafin, 1989).

However, Mitchell's (1989) argument that ET has in large measure failed to achieve the level of potential envisioned for it is probably true, if one examines only the results of what Nisbet (1981) calls the "direct effects" of the field. These are the dramatic improvements to educational practice at all levels, that educational television, systems theory and more recently computers were predicted to evoke. The "indirect effects" of ET are more difficult to assess because they occur incrementally through the accumulation of knowledge acquired through research and the formalization and testing of development practices. More patience and a wider perspective may be required to evaluate the indirect achievements of the field.

Throughout the decades of rhetoric there is a cry consistently heard for something more; something which allows us to see the big picture, anticipate the future and make the right decisions. For many this is the systems approach, for some it is a philosophical framework and for a few it is cybernetic modeling. However, can the assiduous application of these thinking tools produce the direct effects that Nisbet describes? Probably not, but it is certainly arguable that the field would have evolved in a much different way without them.

REFERENCES

Association for Educational Communications and Technology (1977). *Educutional technology: Definitions and glossary of terms.* Washington, DC: Author.

Banathy, B. H. (1968). *Instructional systems.* Palo Alto, CA.: Fearon.

Beckwith, D. (1988). The future of educational technology. *Canadian Journal of Educational Communication, 17* (l), 3-20.

Boyd, G. M. (1991). The shaping of educational technology by cultural politics, and vice versa. *Educational and Training Technology International, 28* (3), 87-95.

Cassidy, M. F., & Knowlton, J. Q. (1983). Visual literacy: A failed metaphor? *Educational Communication and Technology Journal, 31* (2), 67-90.

Clark, R. E. (1987, October). *Media and technology: Their present and future roles in education and training.* Paper presented to the Program in Educational Technology, Concordia University, Montreal, PQ.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research, 53* (4), 445-459.

Cronbach, L. J., & Snow, R. E. (1977). *Aptitudes and instructional methods: A handbook of research on interactions.* New York: Irving-ton.

Davies, I. K. (1971). *The management of learning.* London: McGraw-Hill.

Davies, I. K. (1978). Educational technology: Archetypes, paradigms, and models. In J. A. Hartley & I. K. Davies (Eds.), *Contributing to educational technology,* (vol. 2). London, U.K.: Kogan Page.

Derryberry, A., & Rossett, A. (1986). Aspiring educational technologists: A survey of career trends. *Educational Technology, 26*(3), 9-15.

Dick, W., & Carey, L. (1978). *The systematic design of instruction.* Glenview, IL: Scott, Foresman.

Elton, L. R. B. (1977). Educational technology: Today and tomorrow. In P. Hills & J. Gilbert (Eds.) *Aspects of educational technology, XI.* London, U.K.: Kogan Page.

Ely, D. P. (1989). Personnel. In M. Eraut (Ed.) *The international encyclopedia of educational technology* (p. 27). Brighton, U.K.: Pergamon.

Ely, D. P., LeBlanc, G, & Yancey, C. (1990). *Trends and issues in educational technology* 1989. Syracuse, NY: ERIC.

Fleschig, K. H. (1976). *Towards a critical appraisal of educational technology: Theory and practice.* Strasbourg, France: Steering Group on Educational Technology, Council for Cultural Cooperation, Council of Europe.

Gagne, R. M. (1980). Is educational technology in phase? *Educational Technology, 20*(2), 7-14.

Gagne, R. M. (1987). *Instructional technology: Foundations.* Hillsdale, NJ: Lawrence Erlbaum.

Hannafin, M. J. (1989). The death of educational technology has been greatly exaggerated. *Canadian Journal of Educational Communication, 18*(2), 140-142.

Hawkridge, D. (198 1). The telesis of educational technology *British Journal of Educational Technology, 12,* 4-8.

Heinich, R. (1990). Educational technology revisited. *Educational Technology, 30*(3), 67-69.

Hubbard, G. (1975). Perspectives for life-long education. In L. Evans & J. Leedham (Eds.) *Aspects of educational technology IX.* London, U.K.: Kogan Page.

Kaufman, R. (1976). *Identifying and solving problems: A systems approach.* California: University Associates.

Kerr, S. T. (1977). Are there instructional designers in the schools? *AV Communication Review, 25*(3), 243-267.

Kulhavy, R., Schmid, R. F., & Walker, C. H. (1977). Temporal organization in prose. *American Educational Research Journal, 14*(2), 115-123.

Leedham, J. (1975). Educational technology for continuous education. In L. Evans & J. Leedham (Eds.) *Aspects of educational technology IX.* London, U.K.: Kogan Page.

Lumsdaine, A. (1964). Educational technology, programmed learning, and instructional science. In E. R. Hilgard (Ed.) *Theories of learning and instruction: The sixty-third yearbook of the National Society for Study of Education, Part 1.* Chicago: University of Chicago Press,

Mitchell, P. D. (1975). The discernible educational technologist. *Programmed Learning and Educational Technology, 12*(5), 306-325.

Mitchell, P. D. (1989). The future of educational technology is past. *Canadian Journal of Educational Communication, 18* (l), 3-27.

Morgan, R. M. (1978). Educational technology - adolescence to adulthood. *Educational Communications and Technology Journal, 26,* 142-152.

Nisbet, J. (1981). Educational technology: Its current impact. In A. J. Trott (Ed.) *Aspects of educational technology XV.* London, U.K.: Kogan Page.

Plomp, T., & Pals, N. (1989). Continental European perspectives. In M. Eraut (Ed.) *The international encyclopedia of educational technology* (pp. 51-54). Brighton, U.K.: Pergamon Press.

Popham, W. J. (1980). Two decades of educational technology Personal observations. *Educational Technology, 20* (l), 19-21.

Romiszowski, A. J. (1981). *Designing instructional systems.* London, U.K.: Kogan Page.

Rossett, A. (1987). *Training needs assessment.* Englewood Cliffs, NJ: Educational Technology Publications.

Rossett, A., & Garbosky, J. (1987). The use, misuse, and non-use of educational technology in the public schools. *Educational Technology, 27* (9), 37-42.

Saettler, P. (1968). *A history of instructional technology.* New York: McGraw-Hill.

Saettler, P. (1990). *The evolution of American Educational Technology.* Englewood, CO: Libraries Unlimited.

Saettler, P. (1978). The roots of educational technology. *Programmed Learning and Educational Technology, 15*(1),7-15.

Schwier, R. A. (1987). *Interactive video.* Englewood Cliffs, NJ: Educational Technology.

Salomon, G. (1972). Can we affect cognitive skills through visual media? *AV Communication Review, 20,* 401-423.

Salomon, G., & Clark, R. E. (1977). Reexamining the methodology of research on media and technology in education. *Review of Educational Research, 47*(l), 99-120.

Spitzer, D. R. (1987). "Megatrends" in educational technology, *Educational Technology, 27* (9), 45-47.

Tetenbaum, T., & Mulkeen, T. A. (1984). LOGO and the teaching of problem solving: A call for a moratorium. *Educational Technology, 24*(11), 16-19.

Tickton, S. G. (1970). *To improve learning: An evaluation of instructional technology.* New York: Bowker.

Torkelson, G. M. (1977). AVCR- One quarter century: Evolution of theory and research. *AV Communication Review, 25*(4), 317-358.

Wenger, E. (1987). *Artificial intelligence and tutoring systems: Computational and cognitive approaches to the communication of knowledge.* California: Morgan Kaufmann.

Winn, W. (1989). Toward a rationale and theoretical basis for educational technology. *Educational Technology Research & Development, 37*(l), 35-*45.*

AUTHORS

Robert M. Bernard is a Professor in the Department of Education and Director of the Ph.D. Program in Educational Technology at Concordia University, 1455 de Maisonneuve Blvd. West, Montreal, Quebec H4V

Karin Lundgren-Caryol is a doctoral student in Educational Technology at Concordia University.

Toward a Desktop System for Effective Computer-Aided Language Learning

Zopito A. Marini
John O. Mitterer
Alan R. Powell

Abstract: To be an effective instructional option. Computer Aided Language Learning (CALL) environments must offer the learner more realistic instructional experiences. To do so, these environments must involve more than dynamic interactivity, a well-known capability of computer-based technologies; they must also offer multiple media, including text, graphics, and sound, as well as more natural interactions, to allow the learner easier and more intuitive access to the environment. In addition, the CALL systems used to design these environments must themselves become easier for language instructors to acquire and master. Such systems must include hypermedia capabilities, direct manipulation interfaces, and a large storage capacity, such as a Compact Disc-Read Only Memory (CD-ROM). A "desktop" system with these capabilities can now be constructed from inexpensive "off-the-shelf" components. The use of such a desktop system is illustrated by describing the development of Around the House, a CALL environment designed at the Brock University Hypermedia Laboratory.

Résumé: Pour être une option d'enseignement efficace les environnements de *Computer Aided Language Learning (CALL)* doivent offrir au débutant des situations d'enseignement plus réalisties. Pour cela, environements doivent proposer plus qu'une interactivité dynamique; ils doivent aussi offrir un média multiple, comprennant les textes, les graphiques, le son, et les interactions naturelles pour permettre ainsi au débutant un accès plus facile et plus intuitif à l'environnement. En plus, les systèmes CALL devraient faciliter la connaissance et l'acquisition pour les professeurs de langues. Ces systèmes devraient inclure les capacités des hypermedia, les interfaces de manoeuvre directe, et une très vaste capacité de rangement, tel que le *compact disc-Read Only Memory CD-ROM).* Avec ces moyens, un système en éditique peut être construit a partir d'une composante "off the shelf." L'utilisation d'un système en éditique est illustrée par la description du développement de *Around the House*, un environnement de CALL conçu au laboratoire hypermedia a l'Université de Brock.

Total immersion, preferably in a living linguistic community, is the best way to learn a language (e.g., Apelt, 1981; Ng & Olivier, 1987; Jones, 1983). Although this ideal is not always achievable, it nevertheless defines the goal for language instruction. Thus, an "effective" technology-based language learning environment must offer some degree of useful approximation to "real-life" situations (Mitterer, Marini, MacRae & Joe, 1989; Mitterer, MacRae & Marini, 1988). At the same time technology must reduce the instructional burden on the language teacher (Higgins, 1985, 1986). There will be no revolution in CALL unless technology is grounded in the broader context of understanding how to construct effective language learning environments and is made easier to use.

Canadian Journal of Educational Communication, VOL. 20. NO. 3, PAGES 171 - 187. ISSN 0710-4340

One obvious dimension of the real-life situation is interactivity; effective language learning does not involve a mere passive reaction to presented material. The difficulty of creating fluid real-time interaction prevented older technologies, such as the tape-recorder, from gaining wide acceptance (Hannafin, 1989; Schwier, 1987, 1989). Similarly, the possibility of designing instruction that allows greater interactivity is what attracts language instructors to computer technology.

The first goal of this paper is to go beyond the issue of interactivity to discuss two other dimensions which CALL environments should offer the learner who *seeks* effective *language learning* experiences. The first, multiple media, involves the integration of various media, including at least text, graphics, and sound, into language learning environments. The second, natural interaction, allows for a better relation between the learner and the CALL environment.

The second goal of this paper is to describe a "desktop" system which enables the *language instructor* to create effective learning environments, and which is relatively inexpensive and easy to use as well. Such a system can be constructed from widely available, "off-the-shelf" components and defines a new minimal capability for CALL systems. This capability includes a direct manipulation interface (to make it easier and more natural for instructors to design environments), hypermedia tools (to allow the easy incorporation of multiple media in environments), and a large storage capacity such as CD-ROM (to store the large amount of information contained in the resulting environments). A desktop CALL system such as the one outlined here makes it possible for more language instructors than ever before to design effective interactive, multiple media instructional environments.

The final goal of this paper is to provide a case study report of the performance of the type of desktop CALL system outlined here by describing the production of a demonstration CD-ROM (called *Around the House)* at the Brock University Hypermedia Laboratory.

APPLYING TECHNOLOGY IN THE SERVICE OF LANGUAGE LEARNING AND LANGUAGE TEACHING

While the primary focus of this paper is not on the theoretical issues involved in designing effective language learning environments, it must be stressed that these issues can not be ignored. The broader context within which this paper can be situated is the idea that the design of effective language learning environments can be treated as a problem-solving exercise or a search through a "design space" of possibilities (Pirolli Greeno, 1988). The difficulty in creating effective language learning environments stems both from the fact that the field of language learning and teaching is very broad and complex, and the fact that the types of material which a teacher designs will depend on a large number of factors (Reigeluth, 1983; Gagne, 1987), such as the level of

language skill being learned (e.g., phonetic, lexical, or semantic), the expressive mode being used (reading, writing, listening, or speaking), and the matter of whether one is learning a first or second language (Smith, 1987).

Ideally, an appreciation for the design space of CALL environments requires a consideration of issues involving at least four different types of knowledge, or theoretical framework. First, a knowledge of instructional design (e.g., Gagne, 1987; Reigeluth, 1983) sometimes provides the broadest framework within which more detailed types of knowledge are situated. Second, knowledge of language learning must be considered in view of advances in learning and developmental theories (Anderson, 1982; Case, 1985, in press; Fischer, 1980; Pascual-Leone, 1970) have made valuable contributions to the evolution of instructional design (e.g., Case & Bereiter, 1984). Third, knowledge of language teaching must also be considered. While it has long been assumed that a good psychological theory of learning could be translated into a useful theory of teaching, it has now become evident that the two types of theory cannot be easily transposed (Strauss, 1986). At best, advances in cognitive learning theories have begun to provide an anchoring point to be considered while developing instructional designs (see Bonner, 1988) and have made modest contributions to the development of theories of teaching (e.g., Gagne, 1963, 1968). Finally, for those interested in CALL, knowledge of the applicability of computer technology must be considered (Mitterer, Marini, MacRae & Joe, 1989).

It is important to note that knowledge of instructional design, language teaching, *and* language learning provide the theoretical context within which the applicability of computer technology, the primary focus of the current paper, must be situated. In other words, it is important to integrate knowledge of the applicability of technological systems with the other sources of knowledge mentioned above. This integration is far from complete, as much more theoretical work is required in all of these areas. Because of the complexity of the issues involved, it is tempting to seek to deploy computer technology in language learning without attempting any integration. This would be a mistake; ignoring the complexity of the issues, which can only be addressed within the broader framework mentioned above, leaves the use of computer technology ungrounded and might well lead to a repetition of the audio lab situation of twenty years ago (Clark, 1983; Clark Snow, 1975; Mitterer, 1989).

Dimensions of Effective Language Learning Environments

In terms of the framework articulated above, the design space of CALL must be searched to find effective learning environments. This involves going beyond the recognition that interactivity is a key dimension of such environments; accordingly, two additional dimensions are proposed: multiple media and natural interaction.

The first, multiple media, refers to the fact that real-life language learning normally involves a total sensory experience, including hearing others speak,

reading what they have written, and seeing what it is they have described. Thus, language instruction should aim at integrating a variety of media, in order to approximate the real world in the classroom; the more effectively different media can be integrated into a single environment, the more readily instruction should be conveyed to learners. At a minimum, CALL environments should include the media of text, graphics, and sound.

The second, natural interaction, refers to the fact that another feature of real-life language learning is the naturalness or ease with which the language learner can interact with the environment. In contrast, many CALL environments present difficulties in this regard, requiring a keyboard or other awkward ways of communicating with the computer. Clearly, new technologies will be required to make input to and output from CALL environments more natural. At a minimum, CALL environments should support "real world" operations like picking up and moving objects, pushing buttons, opening file folders, and so forth.

A "DESKTOP" SYSTEM FOR CALL

"Desktop" is a computer industry term which describes once-advanced and expensive technologies that have been brought within the reach of the "average" user. For instance, "desktop publishing" has brought the capabilities once available only to professional publishers within the reach of most people with a personal computer. By extension, "desktop CALL" can bring the ability to design relatively effective language learning environments to most language instructors, A "desktop" system for CALL, offering a new minimal capability must include, 1) a direct manipulation interface; 2) hypermedia; and 3) the use of CD-ROM technology to store the large amounts of information required to design effective instruction.

1) *Direct-Manipulation Interfaces:* Direct manipulation interfaces have come into widespread use because they are easier and more natural ways to interact with computers than were earlier interfaces. While direct manipulation interfaces clearly still do not allow fully natural interactions, they represent a major step in the right direction. These interfaces are important not only because they make it easier for learners to use CALL environments; they also make it easier for instructors to design more effective environments. While instructional goals should be of paramount importance, the reality of the resource limitations which language instructors often have to deal with cannot be ignored. Unless computer technology is easy to use and makes only moderate demands on time, it will, like its predecessor, the audio lab, be ignored by a large number of language instructors (see Clark, 1983; Clark & 'Snow, 1975).

The most widespread example of a direct manipulation interface is the one used in which is based on graphical representations such as icons and pull-down menus, as well as a mouse, to manoeuvre about the

computer. The fundamental operations of this interface mimic "real world" actions like picking up and moving objects, pushing buttons, opening tile folders, and so forth. Comparable interfaces are available for IBM (e.g., OS/2) and MS-DOS (e.g., Microsoft Windows V3.0) as well.

2) Hypermedia: Hypermedia is a new model of how to store and search large volumes of information combining multiple media (e.g., Conklin, 1987). New advances in digital technology allow the integration of vastly different media, such as text, graphics (including computer-generatedstill graphicsand animated sequences, as well as digitized still photographs, video, and film), and sound (including computer-generated synthetic music and speech, as well as digitized music, and human speech). While it is beyond the scope of the current paper, the integration of analog media such as videotape and videodisc-based materials is also possible.

The point of interacting with such an environment (or "hyperdocument") is often not simply to search for one or more pieces of information. Bather, it is to develop an overall appreciation of the organizational structure of the environment. Different pieces (or "nodes") of a hyperdocument are related ("linked") together as the designer of the environment wishes. The process of following links from node to node in an environment is called navigating (Conklin, 1987). In a rich environment (one with many interlinked nodes), two different readers may navigate in very different ways, depending upon each reader's predilection. Even the same reader may navigate an environment in different ways on different "readings". By reading through such an electronic environment in a variety of ways, the reader can explore independently, move into previously unknown areas, and come to appreciate the structure of the underlying set of ideas which that environment represents.

As a hypothetical example, consider learning German through an environment concerning the life and times of the poet Schiller. The "reader" of the environment may choose to follow a link which leads to the German text of one or more of Schiller's poems. Other links might lead to cross-indexed English translations or bring up a voice reading a selected verse in German. Another link might simultaneously call up the music from Beethoven's Ninth Symphony, which incorporates an adaptation of Schiller's *Ode to Joy.* Still other links may lead to illustrations of the area of Germany where Schiller lived, to essays (in German) on the political and cultural context within which he wrote his poems, to the poetry of related poets, and so forth. In short, hypermedia allows the expression of a virtually unlimited range of instructional options.

The best-known example of a hypermedia system is Apple's HyperCard. A number of other systems are currently available, including Guide, Plus, InterMedia, and SuperCard for the Macintosh and Guide, HyperTIES, ToolBook, and Plus for the MS-DOS world. Because these hypermedia systems can be operated through direct manipulation interfaces, they make it relatively easy to create environments, and to add digitized sound and scanned graphics without requiring extensive programming experience.

3) Large Storage Capacity via CD-ROM: Unfortunately direct-manipulation interfaces and hypermedia systems can be memory intensive. Although small hypermedia environments can be produced using conventional computer memory technology, more extensive use of graphics and sound does require more computer memory. One minute of digitized sound can easily require 1.3 megabytes of storage, and one digitized colour image can require more than 1 megabyte of storage. It is no longer unusual for an environment to contain 100 or more megabytes of text, graphics, and sound, which would take about 60-120 diskettes to store.

The storage problem takes two forms. The first, the storage of an environment while it is under development, is best dealt with via conventional memory technology, especially removable cartridge drives. The second, and more important problem, the delivery of a completed environment, is currently best carried out via CD-ROM. The ROM in CD-ROM stands for Read-Only Memory, since the CD can only be "read" by the user of such a system and cannot be written to, unlike standard disk drives found on most computers (while read-write optical systems are now available, they fall beyond the scope of the current paper). Due to the "read-only' nature of CD-ROM, as well as production cost, it is most appropriate for the storage. of information which is not subject to frequent change. Currently more than 540 megabytes of data (about 1,500 PC 360K diskettes or about 200,000 printed pages of text) can be stored on one 5-inch CD-ROM. The production of a CD-ROM is no longer difficult nor too expensive, and the decreasing cost of microcomputer technology in general, and CD-ROM technology in particular, should continue to make more accessible and enhance the presentation of large educational environments (Marini & Powell, 1990).

THE BROCK UNIVERSITY HYPERMEDIA LABORATORY CD-ROM PROJECT: A CASE STUDY

Inevitably, a small number of technically inclined individuals will embrace new technology with great vigour, regardless of how difficult it is to use. However, for the majority of language instructors, the issue invariably becomes one of considering whether the time and effort invested are really worth it. The work reported here was meant primarily as a full-scale field test of the ease of use and cost-effectiveness of a desktop CALL system of the type advocated here.

The Brock University Hypermedia Laboratory was established through a grant from the Apple Canada Educational Foundation. The core group involved in the CD-ROM project, which was called *Around the House,* was multidisciplinary in nature, involving faculty and students from Psychology (J. Mitterer), Applied Human Development and Child Studies (Z. Marini), Germanic and Slavic Studies (D. and B. Joe), and Computer Science and Information Processing (A. Powell). Additional assistance was given by C.

Federici (Italian), A. Amprimoz (French), C. Garcia-Gil (Spanish), A. Leverenz (Germanic and Slavic Studies), J. Damato, T. Banwell, K. Baboudjian and G. Schankula.

The particular desktop system used to design Around the House was assembled from Macintosh equipment, including a Macintosh II computer with 5 megabytes of RAM and an 80 megabyte internal hard disk (a second system, a Macintosh IIcx networked to the first, was also used but was not essential to the project). An Apple scanner was used to digitize graphics, MacRecorder was used to digitize spoken words, a SyQuest removable cartridge drive was used for intermediate storage, and an Apple CD-ROM was used to display the final result. The software used to design Around the House included SuperCard, a hypermedia program, the scanner software supplied with the Apple scanner, and digitizing software supplied with MacRecorder. The direct manipulation capabilities of the Macintosh desktop made it easy to integrate these programs into a powerful hypermedia development environment, It is worth pointing out that it is possible to use equipment which can perform a similar function in other computer environments, such as MS-DOS.

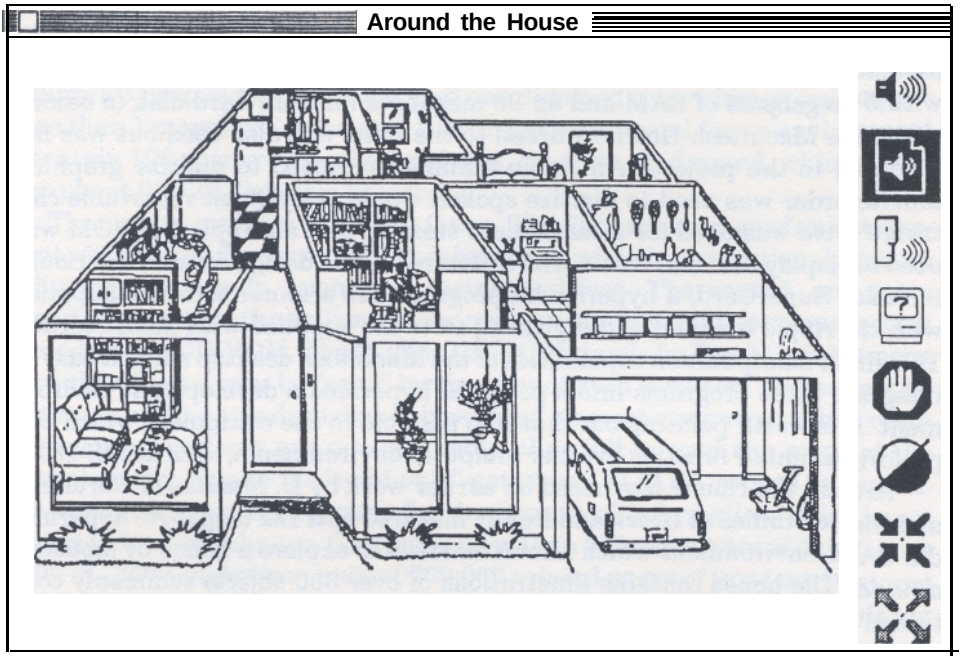
Around the House was based on earlier work by D. MacRae of Germanic and Slavic Studies at Brock and finally matured as a 122 megabyte hypermedia CALL environment which allows learners to explore a house by *mousing around*. The house contains illustrations of over 350 objects commonly contained in a *typical* house, and allows learners to discover the written and spoken word for the singular and the plural of each of those terms in five different languages: English, French, German, Italian, and Spanish. All of the graphics in Around the House were drawn freehand and were scanned using the Apple scanner. Written and spoken vocabulary was designed by team members, and spoken vocabulary was recorded with MacRecorder.

The design of Around the House was concerned primarily with presenting vocabulary information in an interesting manner that invited ongoing use. This led to a concern with a major issue in hypermedia development regarding the best way to let the language learner *navigate* through the material in a fairly natural fashion. To that end, navigational tools were designed to minimize disorientation. Another major concern was what happened when the learner encountered any particular vocabulary term. What follows is an account of how these issues were dealt with.

Problems of navigation and disorientation were addressed by relying on familiar graphical images and on navigation icons. This approach was favoured because it allows for language independence; learners need not be fluent in English to use the application. After theopeningscreens of Around the House, which allow access to instructions, the learner is presented with an overview screen which displays a cutaway illustration of a typical house, with a number of rooms visible.

Figure 1 (see page 178) forms the starting point, or anchor, for the exploration of the house and its contents. Each illustration of a room or an object includes a column of icons at the right side of the screen. These icons are used

FIGURE 1
Navigational Anchor Point Illustrating a Cutaway View of the House.



to control navigation and access vocabulary items. Such a layout provides easy access to the controls while focusing the learner's attention primarily on visual content by using most of the screen area for the illustration. The basic screen layout is used consistently, with the same column of icons appearing throughout. This consistency makes learning to use Around the House easier than it would have been had a more complex screen layout been used and provides an aesthetic integrity to the overall system.

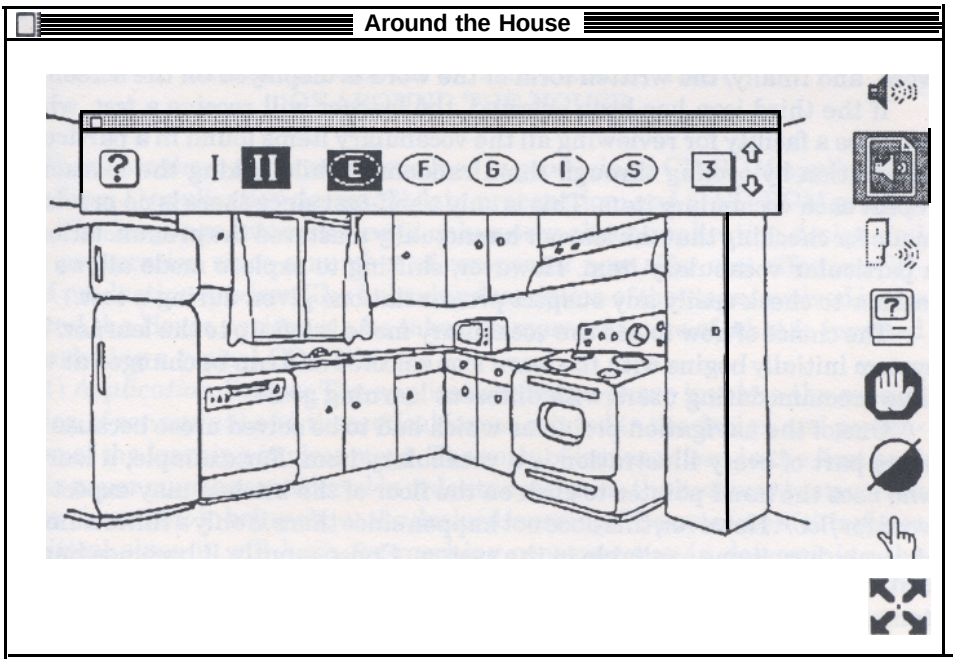
There are two fundamental modes of operation which can be selected by the learner. These two modes are toggled by clicking on the icon which is second from the bottom at the right of each illustration. The first, *navigation mode,* is accessed by clicking on the second icon when it is a hand, as seen in Figure 2; the second, *vocabulary mode,* is accessed by clicking on the second icon when it is a set of inward-pointing arrows, as seen in Figure 1.

When in the navigation mode, the learner can zoom deeper into the rooms and objects in the house. indicate that the learner is operating in this mode the cursor changes to a set of inward pointing arrows. For example, when presented with the top level cutaway illustration of the house, as in Figure 1, the learner could choose to zoom in on the kitchen simply by selecting this cursor, and then pointing and clicking on the kitchen in the house illustration, The cutaway of the house is then replaced with an illustration of the kitchen showing all the items in the kitchen, as in Figure 2 (page 1'79). Similarly, it

would be possible to zoom in on the refrigerator, and from there into the freezer compartment, and so on. In order to zoom back out to a higher level, the learner need only click on the zoom-out icon which contains a set of outward pointing arrows and is located at the bottom right of each illustration. From the freezer, for instance, clicking on this icon would return the learner to the illustration of the refrigerator. From there, clicking again would lead the learner back to the kitchen and then to the cutaway of the house.

Navigation through the house is completely under the control of the learner. The underlying conceptual structure is that of a hierarchy; at each

FIGURE 2
Control Panel for Selecting Help Menu, Plurals, Languages, and Feedback Speed.



level the learner is presented with a number of paths from which to choose. Each choice in turn leads to another set of choices, until the learner eventually reaches a terminal point where no more choices are available. What makes this conceptual structure particularly suitable is that it is difficult for the learner to become lost navigating within the house, since it is always possible to return to the anchor house illustration simply by clicking enough times on the zoom-out icon.

The actual content of Around the House can be found at all levels of the hierarchy and is accessed through a second mode of operation, the vocabulary mode. This mode is selected by clicking on the zoom-in icon, when it is second from the bottom at the right of each illustration, as it is in Figure 1. This

changes the cursor into a hand, which can then be used to point to particular items within an illustration. While in the vocabulary mode, what actually happens when an item is selected depends on which of the top three icons in the right-hand column of icons has been selected.

If the top icon has been selected, the learner can *explore*. Clicking on an item calls up a detailed illustration of it followed immediately by the spoken term for that item. For example, upon clicking on the refrigerator, which is embedded in the illustration of the kitchen, the application will show a more detailed illustration of a refrigerator and pronounce the word for *refrigerator* in whichever of the five languages is desired.

If the second icon has been selected, the learner can *learn*. Clicking on an item, such as the refrigerator in the kitchen, will initiate a sequence made up of three components: first the word for the item is presented in the context of asentence (e.g., "This is a refrigerator."), then the learner is asked to repeat the word, and finally, the written form of the word is displayed on the screen.

If the third icon has been selected, the learner will receive a *test*, which provides a facility for reviewing all the vocabulary items found in a particular illustration by cycling through them randomly while asking the learner to repeat each vocabulary item. This is only a self-test since there is no provision made for checking that the learner has actually mastered the pronunciation of a particular vocabulary item. However, shifting to explore mode allows the learner to check easily any suspect pronunciations given during a test.

The choice of how to use the vocabulary mode is left up to the learner, The system initially begins with the learn icon selected and can be changed at will, thus accommodating users with different learning goals.

One of the navigation problems which had to be solved arose because not every part of every illustration is a vocabulary item. For example, a learner who uses the hand pointer to click on the floor of the kitchen may expect the word for *floor*. However, this does not happen since there is only a finite number of vocabulary items available in the system. Consequently, it becomes important to signal which parts of each illustration represent selectable vocabulary items. This problem was addressed by providing a method for highlighting, or darkening, the available vocabulary items (typically from two to ten) in each of the illustrations. The highlight feature is activated by clicking on the sixth icon at the right side of every screen (again, refer to Figure 1).

The highlighting feature is also extremely useful in the navigation mode. Again, not every item in an illustration is decomposable into lower-level items and the learner cannot zoom-in on all the items. For instance, the refrigerator is divided into a freezer and cooler; thus it is possible to zoom in on the refrigerator. However, the ice-cube in the ice-cube tray cannot be further divided and is thus a terminal point. While in navigational mode, only those items which can be selected are highlighted.

A final important feature is the option. Clicking on the fourth icon on the right of each illustration calls up a small window (palette) which appears above the main illustration (see Figure 2). The control panel contains

a number of options. The desired language (English, French, German, Italian, and Spanish) can be selected by clicking on the appropriate icon. In addition, it is possible to choose to include plurals, to set the time allowed for repeating words, and to access the help system, which explains Around the House. The main benefit of putting these options in a palette is to allow the learner to hide them when they are not needed, thus reducing clutter on the screen. The functionality of the control panel is always available simply by clicking on the control panel icon. As well, the control panel can be left open and even "dragged" to another location on the screen which, for instance, allows the learner to click on the illustration of a chair with the language set to Italian, then switch to French with a single click in the palette window and click on the chair again.

STEPS INVOLVED IN THE PRODUCTION OF AROUND THE HOUSE

There are three major steps involved in producing a CD-ROM application, including: 1) application design; 2) data preparation; and 3) CD-ROM production. The language instructor need only worry about application design and data preparation since a number of companies now offer cost-effective ROM production services. The following description of the steps involved in the Around the House project can be taken as representative of what is involved in producing a typical CD-ROM.

1) *Application Design:* The application design phase involves the consideration of conceptual and theoretical issues related to the design and presentation of the learning environment. The sorts of issues raised in the first part of this paper must be considered in order to determine the best way to structure theenvironment tobringabout thedesired learning. Theoutcomeofthis phase is critical since it will have far-reaching consequences in determining the quality of the result. Most of the first part of the Around the House project involved planning the type of educational experience learners would encounter. Some of the issues considered at that time (e.g., navigation) are reported in the description of the project.

2) Data Preparation: The data preparation process involves the accumulation of materials and their conversion into electronic form, where required. For Around the House, this included creating and entering vocabulary lists into the computer, creating and scanning the artwork representing vocabulary items, and digitally recording the audio for the various languages. Furthermore, data preparation involves organizing the resulting body of electronic information into a particular structure, developing the software interface to allow access to these images and sounds, and possibly developing any software necessary to access the data when it is stored on the CD-ROM. The Around the House project relied on SuperCard, a HyperCard-like commercially available hypermedia program, to "glue" all of the electronic pieces together into a

coherent structure. As the project evolved, a large storage capacity was required. A number of standard hard disk drives, including a removable cartridge drive was used for storing the data. In total, approximately 280 megabytes of storage space were required (140 for the working version and 140 for a back-up).

3) CD-ROM Production: The Around the House application was stored on four removable 44 megabyte cartridge disks, which were then delivered to the manufacturer, who was responsible for completing the complex manufacturing process (see Marini & Powell, 1990, for further details). All that remained was to unpack the ten CD-ROM's which the manufacturer delivered the following week.

CONCLUDING COMMENTS

The main result of the Around the House project was that a desktop CALL system was assembled, allowing a dedicated multidisciplinary group without a high degree of technical sophistication to produce useful language learning materials while keeping development time and costs at a reasonable level. It is important not to take the development effort for this project as an absolute indicator of the effort required for comparable projects for two reasons. First, ongoing developments in the technologies underlying such desktop CALL systems will produce ongoing and dramatic improvements in the time and cost to develop future projects. Any estimates based on the Around the House project will be out-of-date very soon. Second, the effort required depends on experience. For example, experience gained in the Around the House project has resulted in a considerable reduction in the development effort required for subsequent projects (e.g., Marini & Federici, 1991). That experience has also produced several *lessons* which may be of interest to others considering the development of comparable CALL environments. These lessons include:

1) *Complete Designing the Application (as much as possible) Before Beginning to Prepare the Data:* Inexperience with the process of producing large bodies of material often results in a tendency to "plunge in" and to start preparing data before a sufficiently complete design emerges. This happened a number of times in the Around the House project and some of the time the design changes were judged to be vital and yet rendered useless some of the data preparation work under taken previously
2) *Make a Prototype:* Creating a single part of a single room in Around the House turned out to be very useful (it was the refrigerator in the kitchen). Many issues were ironed out in attempting to finish this fragment before full-scale work began. For example, it was immediately discovered that a rigid naming convention for all digitized sound files was requiredorelsecallingup thosesoundfilesat timewould

become haphazard. Since about 3500 of these files were involved (350 vocabulary items in 5 languages, in the singular and plural), it turned out to be most effective to write a single high-level procedure which searched for and played the appropriate sound file once a vocabulary item had been clicked.

3) *Do Not Trust Your Prototype to Scale up Linearly:* Moving from creating a prototype to creating the full environment can be a source of great difficulty. Once the prototype of Around the House was completed, it was assumed that the full environment would behave similarlyand so full-scale data preparation was begun; unfortunately, this assumption was not justified. For example, one important issue concerned the speed of the retrieval of sounds. Clearly, once a vocabulary item has been selected, Around the House should quickly retrieve and play the relevant sound files. Estimates of sound file retrieval times for the full environment were based on a linear extrapolation from the prototype. As it turned out, sound file retrieval times did not scale linearly, resulting in unacceptably slow times under some circumstances. Had this problem been clearly understood, the relevant section of Around the House could have redesigned to allow faster retrieval. The best solution for this sort of problem would have been to use the prototype to create a full-scale dummy model to test before actual production began. One way this could have been easily done for Around the House was by combining copies of the prototype (the refrigerator) until the size of the total dummy model approximated the size of the actual project. Testing this dummy *scale-up* would have quickly revealed the speed problem.

4) *Recognize the Paramount Importance of Navigation Issues: The* way in which the learner "moves about" in a CALL environment will determine the usefulness of that environment. If navigation is difficult, the environment will not be used, irrespective of the quality of the instructional content. Although considerable work went into designing the interface for Around the House, the result was not optimal. As outlined previously, different "modes" were used: the navigation mode was used for moving up or down the hierarchy of items in the house and the vocabulary mode was used for exploring vocabulary, Even though the appropriate mode could be selected simply by clicking on one of the bottom two icons on any illustration, this was perhaps the most difficult aspect of learning to use Around the House. Learners sometimes became confused about which mode they were in. Thus, a learner might try to navigate up or down a level while in vocabulary mode or to have a vocabulary item played while in navigation mode. In general, modeless systems are preferable because they allow the learner to access the capability of the entire system from every possible system state. Unfortunately, no simple design for a modeless interface to Around the House emerged before the project was completed.

5) *Devote Effort to the Design of Icons:* Since much of the functionality of CALL environments designed with hypermedia direct-manipulation systems is accessed by clicking on icons, it is important to design non-linguistic icons whose functions are intuitively clear and easy to remember. This was especially true for Around the House; most of the icons were useful since they were language independent and did not require the learner to be fluent in English to operate the system. If it is important to use icons which are difficult to remember, a possible enhancement would be to provide a single page quick reference help summary which should be accessed from a standard help icon available on all screens, rather than through a control panel palette. In cases where the application involves more than one language, the help screens should be translated into the other languages (this was not done for Around the House).
6) *Provide Alternative Ways of Accessing the Material:* As much as possible, alternate structures for accessing the information in the environment should be provided. Around the House currently allows only one access method: a traversal of the hierarchy is necessary in order to find a particular vocabulary item. A very useful alternate access method would be to allow dictionary-like lookups by providing a selectable list of words in each language.
7) *Help the Learner Keep Track of Exploration:* The original design of Around the House does not allow the learner to keep track of which vocabulary items have been covered. Although it is possible for a learner to systematically traverse all the items at a particular level and then proceed to the next level, the more usual approach is to explore only particular items of immediate interest. Although this is a strength, in that it provides for the optimum in learner control, it would be useful to indicate to a learner which items had been covered, without any sort of requirement that all items he covered in any particular order.

In closing, it is worth repeating that one of the major goals of this paper was to describe a way of applying technology to the service of language teaching by attempting to approximate real-life in the classroom. Although this has always been a goal of the language instructor, in the past technology made this goal difficult, if not impossible, to achieve. This paper provides some suggestions on ways of using the available technology to prepare better language instruction, where the needs of the language learner and the language instructor are met. The off-the-shelf desktop CALL system described here should be considered a minimal configuration for the design of language learning environments.

The strengths of the system described make it generally superior to many other approaches to CALL. In particular it is superior to many dedicated programs and to other authoring systems as well. The desktop system proposed in this paper offers a broad range of new alternatives to the design of

language learning environments by virtue of the fact that it is made up from the most effective tools currently available for recreating our relationship to the world around us. That they are relatively simple to use and inexpensive to acquire are added bonuses which cannot be overlooked. Through such virtues, these systems present language instructors with an opportunity to write their own finely-tuned applications. Such a system permits the design of dynamically interactive environments in which the needs of individual learners can be met: a fundamental prerequisite for good language learning.

REFERENCES

Apelt, W. (1981). Principles of foreign language teaching. *System, 9,* 1-3.

Anderson, J. R. (1982). Acquisition of a cognitive skill. *Psychological Review, 89,* 369-406.

Bonner, J. (1988). Implications of cognitive theory for instructional design: Revisited. *Educational Communication and Technology Journal, 33,* 113-123.

Case, R. (1985). *Intellectual development: A systematic reinterpretation. New* York: Academic Press.

Case, R. (Ed.), (in press). *Exploring the structural underpinnings of human though and knowledge.* New York, NY: Earlbaum and Associates.

Case, R., & Bereiter, C. (1984). From behaviorism to cognitive development: Steps in the evolution of instructional design. *Instructional Science, 13,* 141-158.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research, 53,* 445-459.

Clark, R.E., & Snow, R.E. (1975). Alternative designs for instructional technology research. *AV Communication Review, 23,* 373-394.

Conklin, J. (1987). Hypertext: An introduction and survey, *Computer, 21,* 17-41.

Fischer, K. W. (1980). A theory of cognitive development: The control and construction of hierarchical skills. *Psychological Review, 87,* 477-531.

Gagne, R. M. (1963). Military training and principles of learning. *American Psychologist, 17,* 83-91.

Gagne, R. M. (1968). *The conditions of learning* (2nd ed.). New York: Holt, Rinehar, Winston.

Gagne, R. M. (Ed.), (1987). *Instructional technology: Foundations.* Hillsdale, NJ: Erlbaum and Associates.

Hannafin, M. J. (1989). Interaction strategies and emerging instructional technologies: Psychological perspectives. *Canadian Journal of Educational Communication, 18,* 167-179.

Higgins, J. (1985). Grammarland: A non-directive use of the computer in language learning. *ELT Journal, 39,* 167-173.

Higgins, J. (1986). Smart learners and dumb machines. *System, 14,* 147-50.

Jones, C. (1983). Computer assisted language learning: Testing or teaching? *ELT Journal, 37,* 247-250.

Marini, Z. A., & Powell, A. (1990, April). *An introduction to CD-ROM technology: Technical standards, production, and instructional applications* (pp. 45). Final Report for the Instructional Development Committee, Brock University.

Marini, Z. A., & Federici, C. (1991, February). *Hypermedia based phonetics: A case study in software development* (pp. 30). Final Report for the Instructional Development Committee, Brock University

Mitterer, J., McRae, D., & Marini, *Z.* A. (1988, November). *The future of computer assisted language learning software: Hypermedia and direct manipulation interfaces.* Invited paper presented to the second annual Computer Assisted Language Learning Symposium, Brock University, St. Catharines, Ontario.

Mitterer, J., Marini, Z. A., MacRae, D., Joe, B. (1989). Computer-aided language learning, hypermedia and direct-manipulation interfaces (pp. 247-258). In J. LaFollette & R. Schmidt (Eds.), *Transitions: Proceedings of the AMTEC '89 Conference.* A publication of the Association for Media and Technology Education in Canada, Sherwood Park, Alberta.

Mitterer, J. (1989). Hypermedia and education: Just another pretty medium? *Technology and Learning, 3,* 6-8.

Ng, E., & Olivier, W. (1987). Computer assisted language learning: An investigation on some design and implementation issues. *System, 15,* 1-17.

Pascual-Leone, J. (1970). A mathematical model for the transition rule in Piaget's developmental stages. *Acta Psychologia, 63,* 301-345.

Pirolli, P. L., & Greeno, J. G. (1988). The problem space of instructional design, In J. Psotka, L. D. Massey & S. A. Mutter (Eds.), *Intelligent tutoring systems: Lessons learned.* Hillsdale, NJ: Erlbaum and Associates.

Reigeluth, *C.* M. (Ed.), (1983). *Instructional-design: Theories and models.* Hillsdale, NJ: Erlbaum and Associates.

Schwier, R. A. (1987). *Interactive video.* Englewood Cliffs, NJ: Educational Technology Publication.

Schwier, R. A. (1989). Research and development with interactive learning technologies: Introduction to the special issue of *CJEC. Canadian Journal of Educational Communication, 18,* 163-165.

Smith, W. F. (Ed.), (1987). *Modern media in foreign language education: Theory and implementation.* ACTFL Foreign Language Education Series.

Strauss, S. (1986). Three sources of differences between educational and developmental psychology: Resolution through educational-developmental psychology. *Instructional Science, 15,* 275-286.

AUTHORS

Zopito A. Marini is an Associate Professor of Applied Human Development and Child Studies at Brock University, St. Catherines, Ontario.

John Mitterer is an Associate Professor of Psychology and Computer Science and Information Processing at Brock University.
Alan R. Powell is a Research Assistant at Brock University.

Authos' Notes
Part of this manuscript is based on a paper presented at the Annual Meeting of the Association for Media and Technology in Education in Canada, in June, 1989, held in Edmonton, Alberta. The CD-ROM project was made possible though grants from The Apple Canada Education Foundation, The Ministry of Immigration and Employment of Canada, the Instructional Development Committee of Brock University, and the Departments of Psychology, Germanic and Slavic Studies, Child Studies, and Computer Science and Information Processing. The authors wish to thank the other participants in this project for their assistance, in particular Corrado Federici for providing valuable comments on an earlier draft of this paper. In addition, Discovery Systems of Dublin, Ohio provided invaluable assistance in servingas the manufacturer for this project. Correspondence can be addressed to Zopito Marini, Institute of Applied Human Development, Brock University, St. Catharines, Ontario, CANADA L2S 3Al.

Call for Applications

Editor of the
Canadian Journal of Educational Communication

The AMTEC Board invites applications for the position of Editor of the *Canadian Journal of Educational Communication* commencing with Volume 22 (1992). Previous experience in academic publishing is preferable, as is affiliation with an institution that values and supports academic publication and the goals of *CJEC*.

The editor of *CJEC* is responsible for all aspects of publication including receiving, processing and reviewing manuscripts, maintaining a staff of expert reviewers, advertising the journal and overseeing the quality of production. Preparation of grant applications in co-operation with the AMTEC Board is also required. Actual printing and distribution is handled by an independent contractor.

Interested persons should send a curriculum vitae to:

John Godfreyson
Communications Chairperson - AMTEC
c/o Curriculum Resources Centre
420 Selby Street
Nanaimo, B.C. V9R 2B7

Applying Principles of Collaboration to Videodisc Design: Profile of a Successful Project

Katy Campbell-Bonar
Louise Grisdale

Abstract: Although teachers and administrators in Edmonton Public Schools were satisfied with their approach to continuing professlonal development, there was a desire to work more closely with the Faculty of Education to develop high quality Instructlonal materials that would meet both inservlce and preservice needs whlle contributing to the collaborative relatlonship evolving between the two institutions. For some time the Faculty of Education has explored innovatlve approaches to preservice teacher education, one of which has been the development and implementation of two interactive videodiscs for use in preparing third-year students for a practicum experience. A collaborative design project resulted in a third videodisc that would meet both preservice and inservice needs of the participating institutions. The authors maintain that their project was successful because the team members consciously attended to and utilized highly complex group process skills. Conflict resolutlon was routinely achleved through adherence to a model of cooperative group process as delineated by Johnson and Johnson and others (1980, 1982, 1986).

Résumé: Quoique les professeurs et les administrateurs dans les écoles publiques onton sont satisfaitse leur développement professionnel, il y avait un dir de travailler directement avec la Faculteé d'éducation enfin de développer du matériel éducatif d'une qualité supérieur qui réponderait aux besoins des futurs enseignants et de ceux qui enseignent déjà et ainsi contribuer à créer une collaboration entre les deux instituions. Depuls un certain temps la Faculté d'éducation a explors approches innovatrlces dans l'enselgnement des futurs enseignants. Un de ces approches fut le développement et l'implantation de deux vidéodisques interactifs pour mieux préparer les étudiants en troisième année à leur futur travail. Un projet de collaboration fut le résultat d'un troisième vidéodisque répondantux besoins des futurs enselgnants et de ceux qui enseignent déjà dans les institutions participantes. Les auteurs concluent à une réussite du projet car les membres de l'quipe travaillaient consciencieusement et ils utillsaient des techniques méthodiquesistiquées. La résolution des conflits se réalisait à l'aide d'un modele d'un gorupe coopératif méthodologlque tel que dcrlt par Johnson et Johnson et ais (1980, 1982, 1986).

INTRODUCTION

Faculties of Education have become increasingly aware of the need to forge inter-organizational arrangements with local school systems in an effort to improve the quality of services (preservice teacher education) that the institu-

Canadian Journal of Educational Communication, VOL. 20, NO. 3. PAGES 189 203. ISSN **07104340**

tion delivers. In such an arrangement, participating organizations define themselves as interdependent; collaborating, with a common goal, in a shared decision-making process that is qualitatively different from more traditional interactions (Intriligator, 1982).

The Faculty of Education at the University of Alberta and Edmonton Public Schools had been engaged in a number of collaborative activities focusing on the teacher in the classroom. The design and production of teacher education materials, however, had largely taken place in the Faculty without the instructional input of practitioners, whose participation was limited to providing the setting, the teaching, and the actors (students).

Although teachers and administrators at Edmonton Public Schools were satisfied with their collegial coaching inservice approach (Joyce & Showers, 1986) to continuing professional development, there was a desire to work more closely with the Faculty of Education to develop high quality instructional materials that would meet both inservice and preservice needs while contributing to the collaborative relationship evolving between the two institutions.

Concomitantly, the Faculty of Education had been interested in the use of interactive videodisc technology for some time and had designed and produced two Level II videodiscs for use in an undergraduate pre- practicum course (Engel & Campbell-Bonar, 1989). As the skill of questioning was one major focus of this course the Faculty agreed to undertake a third videodisc project in collaboration with Consulting Services at Edmonton Public Schools. One goal of this project was to design and produce one interactive videodisc that would meet a multiplicity of needs at both the preservice and inservice levels; although the outcome of the collaborative process itself was a major focus for the design team members.

THE COLLABORATIVE TEAM APPROACH TO INSTRUCTIONAL DESIGN

The collaborative process has been described from a number of perspectives including the action research paradigm (Oja & Smulyan, 1989), from the cooperative group process perspective (Johnson and Johnson, 1982), and from special education's multidisciplinary team approach (Idol, Paolucci-Whitcomb, & Nevin, 1986).

Generally, the process involves teams of people with diverse expertise in an interactive process in which all members work with parity to mutually define a problem. Collaboration is characterized by mutual understanding and consensual decision-making resulting in creative solutions, that are enhanced and altered from those that any team member would produce independently, and common action (Tikunoff, Ward & Griffen, 1979; Idol, Paolucci-Whitcomb & Nevin, 1986; Oja & Smulyan, 1989).

Advantages of the process which are particularly applicable to collaborative videodisc design projects include increased sharing of material and human

resources across professional disciplines, facilitation of liaison activities among institutions, and cost effectiveness (Idol, Paolucci-Whitcomb & Nevin, 1986); the generation of unique solutions (Falk & Johnson, 1977); and better decision-making resulting from the pooling and recombination of resources (Laughlin, Branch & Johnson, 1969).

DeBloois (1982) describes an interactive videodisc system as an entirely new medium with unique characteristics that are unlike each of its video and computer components. He argues that a videodisc design effort must be "interdisciplinary in nature, capable of a full range of activity, crossing professional specialties, and involving personnel from disparate fields" (p 48).

In discussing the course team approach to the design of Distance Education materials, Naidu (1988) suggests that for the majority of team members the experience is an innovation which, if inexpertly managed, is the source of great conflict within the team. Naidu suggests that as institutions become more and more aware of the complexity of instructional design, the greater the tendency to adopt concerns-based collaborative models.

At the center of both of these "models" is the instructional designer, often, as in this case, the project manger, who must be sensitive to the entry-level behaviours and changing needs and aspirations of all the team members while at the same time moving the project towards successful completion. DeBloois suggests "organic" organizational structures contribute best to this environment because they allow for situational leadership, encourage a better climate for developing interactive systems, allow for consensual decision-making, participative management, and peer critique and evaluation.

It is our contention that adopting many of the attributes of the collaborative process will provide an excellent model for team-based instructional design projects.

THE PROGRAM DESIGN AND RATIONALE

In this article, the resulting videodisc is of interest only as the *by-product* of a successful collaborative process, but it is described briefly here to provide a basis for the discussion of the collaborative nature of the design process.

The Faculty had been exploring the use of simulation materials in teacher education for some time, but this Level II videodisc emerged early in the design process as a tool for direct instruction. The design of *Do I Ask Effective Questions? or, I Can Hardly Wait to Hear What I'll Ask Next!,* reflects this approach by its organization into discrete modules of instruction, each dealing with one topic of "questioning". Module topics include those addressed by Edmonton Public Schools' T.E.P. (Teacher Effectiveness Program) as well as topics of specific interest to preservice teachers such as the role of questions in a power struggle. Questioning strategies are modelled by Edmonton Public Schools teachers in grades K-12, in all core subjects and in several optional curriculum areas. Segments involving trainable mentally handicapped

adults and Grade l/2 students in the Academic Challenge (gifted) program are included. A second side provides a database of eight unmediated teaching sequences for further practice in identifying questioning strategies.

As with the previous two titles in the *Effective Teaching* series, thedecision to produce a Level II videodisc was taken before the design process was initiated. The reason for breaking this instructional design "rule" was threefold:

Edmonton Public's Consulting Services team was interested in exploring the use of newer technologies in their inservice programs, and was willing to provide both release time for one consultant and share equally in the actual production costs of a videodisc. The commitment to this instructional approach was evident in the Consulting Services' purchase of one videodisc player ta support the disc before the project was completed.

In the Faculty of Education, the course for which this series had been conceived indicated a continuing interest in providing alternatives to whole group instruction in teaching strategies. The course coordinator, a senior professor in the department, suggested that personal involvement in the design of a third videodisc would enhance his professional experience: the Chairman of his department also provided release time for this purpose.

Preliminary discussions with both client groups revealed a shared need for a resource that would: provide examples of many different teaching strategies, model reflective teaching practices and self-monitoring techniques, and sup port opportunities for both mediated and independent practice with new concepts. Random access, high-quality still-frame graphics, two audio tracks, and learner interactivity capabilities were better accomplished by videodisc than other, more conventional media formats.

COLLABORATING ON VIDEODISC DESIGN

The collaborative model of instructional design typically involves a large number of people who are all responsible for their specific areas of expertise (Naidu, 1988). In this case, a core team consisting of four was expanded at various points in the design process to include bath technical and content experts, and end users. This multi-level approach to team design has been adopted and refined by the Instructional Technology Centre in the course of many instructional design projects for the Faculty of Education (Mappin & Campbell-Bonar, 1990), but this complex strategy can be problematic in the hands of inexperienced ID teams. The field abounds with horror stories of failed collaborative efforts, many of which have been revealed at professional meetings or in private conversation with the authors.

Johnson, Johnson, and Holubec (1986) make a clear distinction between groups and cooperative groups, focusing on such aspects as positive interdependence, heterogeneity, shared leadership, shared and individual accounta-

bility, and the development of pro-social skills (p10). We believe that many team-bawd ID projects fail because team members are competitive, inexperienced in group process, and task-oriented to the exclusion of conscious attention to group process. Although the raison d'etre for many traditional ID teams is the end product, for us the collaborative group process was the priority.

As Naidu (1988) points out, collaborative team approaches to instructional design have been "quite notorious for their inability to coexist without serious difficulties" (p. 169). Familiarity with factors traditionally responsible for unsuccessful collaborative efforts (Johnson and Johnson, 1982) may contribute to more effective management of the administrative and affective domains involved in such a process:

1) *Lack of group maturity and lack of time:* members need time and experience together to develop into an effective decision-makingteam. The project manager must be honest about the time requirements for a collaborative videodisc design project at the outset in order to negotiate a reasonable project timeline. External time pressures may detrimentally influence this process.
   For example, underestimating the time requirements, in an attempt to downplay the commitment that was required, would have severely impaired the feelings of trustworthiness of the project manager. Her honesty and integrity at the outset of the project caused the group members to ally themselves with the project. Later, when external forces inevitably caused havoc with timelines (Johnson and Johnson's "outside enemy"), the group remained relatively calm in the eye of the storm, having been well-prepared by the project manager.
2) *Conflicting goals of group members:* members may not be aware of their motives. Even genuinely work-oriented members may be too self-oriented or competitive. Destructive conflict was avoided by constant perception checking. Group members held frequent and frank discussions about their reasons, both personal and career-based, for needing the project to be a success. Having these goals created interdependence.
3) *Failure to communicate and utilize information:* participation is never completely equal. Group members may fail to participate fully for any number of reasons: when this happened the group became very maintenance-oriented until the miscommunication was resolved.
   The life of the project had its natural rhythms that the group consciously attended to and discussed. Awareness of individual members' external career commitments and pressures was critical. When a member was unable to participate fully, the group made a conscious decision to accept it or to change a task's timeline.
4) *Egocentrism of group members:* effective decision-making depends on the ability to take other perspectives. Groups in which members are

committed to their own paint of view and evaluate all information on that basis make low-quality decisions. Involvement in a design project of this nature in the Faculty is increasingly seen as a privilege: team members approach the task determined to contribute to its success. For example, because of the release-time designated for team members to participate in this project, there was a high degree of sustained accountability to see this project through to a successful conclusion. The accountability was internally applied by group members with each other, as well as externally applied by group members' supervisors.

5) *Concurrence seeking and premature closure within the group:* occurs when group members inhibit discussions in order to avoid conflict and disagreements. The team chose negotiation over compromise at all design and production stages.

This point cannot be overemphasized. Group members did not operate on a model of compromise: compromise was seen to achieve the lowest common standard. Instead, negotiation through lively and often time-consuming discussion was determined to be the better model.

6) *Lack of sufficient heterogenity:* the more homogeneous the group, the leas each member contributes in the way of information, skills and viewpoints. Inter-institutional collaboration is a major advantage in this regard, although all team members possessed teaching backgrounds, which helped.

Johnson, Johnson, and Holubec (1986) suggest that the more sophisticated the material, the smaller the group size should be, and the more heterogenous the group should be.

The heterogeneity of expertise and professional experiences enhanced the fresh approach of the group. Group members were genuinely interested in each other as professionals from the outset. Individually, group members recognised early that the project would be a valuable professional development opportunity for all concerned: characterised by Kanter (1989) as the "individual potency" achieved through involvement in "newstream" work.

7) *Inappropriate group size:* groups of eight or more tend to be ineffective. But, decision-making groups need to be large enough so that needed resources and diversity of opinion and experience are optimised. Four core team members seemed to be an ideal size in this project.

Interestingly, the major crises that developed during the project all occurred when the core group needed to expand for external resources. Bringing in more people caused temporary dysfunction at times, possibly because the knowledge, skills and attitudes of others seemed misaligned with the vision of the group.

8) *Power differences and distrust:* power structures can be so well-understood by all group members that a critical insight or piece of information from a low-power member is ignored. Although the graduate student "intern" initially and deliberately took a low-power profile, an

atmosphere of trust and honesty enabled other team members to insist that he contribute his unique skills on an equal basis.
Indeed, somemembers preferred a lower profile at various times in the project. When it was perceived as occurring for a good mason, this was allowed. During classroom videotaping for example, one group member frequently was absent because he did not feel that he could contribute a great deal to that process. Because his expertise was not required on site, this was not problematic. On the other hand, the aforementioned graduate student who began the project downplaying his considerable creativity and acumen, was not allowed to continue this stance for long.

COLLABORATIVE PRINCIPLES

A number of generic collaborative principles described by Idol, Paolucci-Whitcomb & Nevin (1986) closely parallel the instructional design approach adopted by the Instructional Technology Centre:

Collaboration requires team ownership of the identified problem.

Within the core team all members must share accountability for the success or failure of the project. Effective team performance depends an the ability and willingness of each person to express opinions, to share perspectives, to encourage contributions from all team members, and to work towards a team consensus. Recognition and appreciation of each person's expertise is essential.

Although the design project had not yet been officially established, the core team of two content experts, one from each institution, and the project manager/instructional designer met several times over the preceding summer to discuss possible team focus and roles. A consensus model was adopted early in which all team members would be responsible for all aspects of the process. In this way, an informal (and later, formal) commitment was achieved to share and blend skills and knowledge in both design and content areas.

Each design effort undertaken by the Instructional Technology Centre involves a team approach. Convinced of the importance of this approach by experience, a structure was organized whereby each core design team includes a faculty member/sponsor, an instructional designer, and a project manager, who may also be the designer. Each team is a subset of a larger group of stakeholders: faculty members, Department Chairs, and course instructon. From time to time the core team "reports" progress to the stakeholders in an effort to involve them on one level of decision-making. In this way, each project depends on and includes feedback from those who will eventually use the product in their teaching. In this project, the core team sought input on several occasions from appropriate faculty members, board consultants, and

administrators.

Implementing change involves recognition of individual differences in developmental progress.

Naidu (1988) suggests that participation in a collaborative design project is a new experience, or innovation, for most team members that requires changes through multiple levels or stages of planning, learning new behaviours, and adapting to new routines. Since change is such a personal experience, all team members must be sensitive to the wide range of individual differences in feelings, opinions, readiness, etc.

It is the contention of the Instructional Technology Centre that the project manager, who is also one of the instructional designers, should be familiar with and attentive to the process of developmental change as a design issue. The developmental change model developed by Hall and Loucks (1978) at the Univenity of Texas is representative of other innovation-adoption models in describing seven individual "stages of concern": team members are ready to expedite instructional design goals at the stage associated with personal impact of the innovation (videodisc).

In this project the core design team was enriched by the addition of one instructional design "intern" who was a graduate student in the Educational Technology program. The team felt that it was important, although timelines were relatively inflexible, to participate in a number of initial familiarization activities with videodisc technology and vocabulary; and instructional design models, issues, and jargon. Maintaining a personal team journal, a task undertaken by the "intern", enabled team members to share and check perceptions throughout the process: in this way "uneasiness, disillusionment, hostility and withdrawal" (Naidu, 1988) were identified early and resolved before the collaborative process could be undermined.

Group norms must be negotiated at the outset and maintained throughout the collaborative process.

Group members will take ownership of group norms if they have helped identify them, see that the others are willing to accept and follow them, and recognize that they will help accomplish group goals (Johnson, 1980).

Initial group norms were negotiated over coffee in the summer. In pairs, or as a group of three and later four, the team identified initial roles and responsibilities, methods of communication, preferred working styles and sites, boundaries of trust and so on. For example, since the two SME's had not been involved extensively with instructional design teams, the project manager made readings on the subject available, which were discussed at subsequent meetings. After the first few meetings, a consensus model was adopted in which all team members would be responsible for all team activities. As well, since two institutions were involved, it became necessary at the outset to

identify a neutral, convenient meeting ground for the team. Meeting in a private, designated project room on campus was facilitated by arranging free parking passes for the off-campus team member, restricting access to team members and invited guests, providing "desk space" for team members, and personalizing the environment by installing a thermal carafe and personal coffee cups.

Having a personal space also helped define boundaries of trust. Early on it was agreed that any comment made by any team member, whether design-related or personal, would not be repeated outside the room. Since the project was seen as a high-risk professional activity for some individuals, the privacy and loyalty of the team to each member was pivotal in establishing an atmosphere of openness and creativity.

Situational leadership guides the implementation of collaborative consultation.

The leadership process in a collaborative project is defined as an influencing relationship among mutually dependent team members (Johnson & Johnson, 1975). Generally, team roles consist of either task functions, which lead to project goal achievement; or maintenance functions, which include the affective tasks of encouraging, arbitrating disputes, increasing interdependence among members, etc (Thibault & Kelly, 1986).

Although all instructional design projects in the Faculty have a designated leader, or project manager, all team members took responsibility for the project goals and for maintaining positive relationships among team members: both leadership and maintenance functions were thus operationally distributed. For example, content development for the disc was based on a brainstorming approach, culminating in a mind - map which contained all the concepts related to "questioning" it was possible for the group to generate. These brain-storming sessions were led by one of the content experts who had employed this technique during inservice sessions. Advantages of this consensus model include maximizing the unique abilities and perspectives of each participant, effective utilization of technical resources, and ensuring group commitment to the team's decisions.

Cooperative goal structures underlie conflict resolution during the collaborative process.

Within a cooperative framework, the inevitable disagreements and arguments are viewed as positive opportunities for constructive interaction. As participants learn to feel comfortable with controversy and learn specific skills in negotiating, rather than avoiding, design and goal conflicts, the resolution process can improve problem-solving strategies, reduce cognitive egocentrism, stimulate creativity, clarify values, increase group motivation and encourage change (Johnson, 1980; Johnson & Johnson, 1982).

Because this project was, in one sense, an attempt to bridge theoretical and practical differences between programs of teacher preparation and continuing professional development, a significant outcome of constructive controversy was increased perspective-taking between the representatives of the Faculty and Edmonton Public Schools.

Conflict appears to be an unavoidable aspect of group dynamics (Schutz, 1958; Schein, 1969; Srivastva, Overt & Neilsen, 1977; Tuckman & Jensen, 1977; Johnson &Johnson, 1982; Oja & Smulyan, 1989) and this project was no exception. But the most serious threat occurred from a team level outside the core and was a turning point in establishing a quality of group cohesiveness and commitment that endured to the project's completion and beyond.

Attention to communicative quality facilitates meaningful interactions among all group members.

Since it is essential to minimize misunderstandings and distortions so common in interpersonal communications, an effective feedback system has to be developed to ensure that messages are. being accurately received. Techniques include inviting others to talk, requisite to the design process; knowing when to keep quiet; and using non-verbal responses effectively (Gordon, 1980). It is worth noting here that all team members, by virtue of professional education and experience, were highly skilled at interpersonal interactions: all are or had been classroom teachers; all performed consultative roles. Even areas of expertise revealed this interpersonal orientation: the team included experts in drama, modern languages, course coordination, consulting, communication arts; and instructional design.

An important aspect of non-verbal language is the ability to perceive its subtleties. Perception checking is essential because all team members are given the opportunity to deal with the perception: so perception checks are descriptive rather than judgmental. Starting each team meeting by sharing the previous meeting's journal entry was one strategy the group employed successfully in this regard: another was to "stakeout" a project room which was inaccessible to others for the duration of the process. This room was critical in establishing belongingness.

Oral and written communications (should, ideally) rely on commonly understood language.

Although jargon terms are intended to make communication more efficient, to the uninitiated they make the conversation both more exclusive and distancing. This may be particularly true of a design project involving newer technologies such as videodisc.

Since jargon terms were unavoidable, they were taught at the outset to team members in several sessions devoted to orientations to both the technology and relevant instructional design terms. Once again, perception checking

at all design stages was employed to ensure that every one understood and were correctly using the technical and design vocabulary. For example, new terms such as memory (which soon became the "M" word), still frame, freeze frame, data dump, Level I/II/III, CAV/CLV, visual database, SMPTE time code, and so on, soon became familiar working vocabulary.

The collaborative design process tends to progress through a cycle of phases reflecting both personal and task needs.

A number of cyclical models of collaboration have been explicated (Schutz, 1958; Tuckman & Jensen, 197'7; Idol, Paolucci-Whitcomb & Nevin, 1986; Collis & Gore, 1987; Oja & Smulyan, 1989): commonly the group moves through a period of conflict through an interpersonal to a task orientation. Often, the performance- oriented phase leads to a renewal stage allowing the group to reform and refocus, perhaps expanding to admit new members (Oja & Smulyan, 1989). Our team described this process as moving From Initiation to Integration (see Figure 1 on page 200).

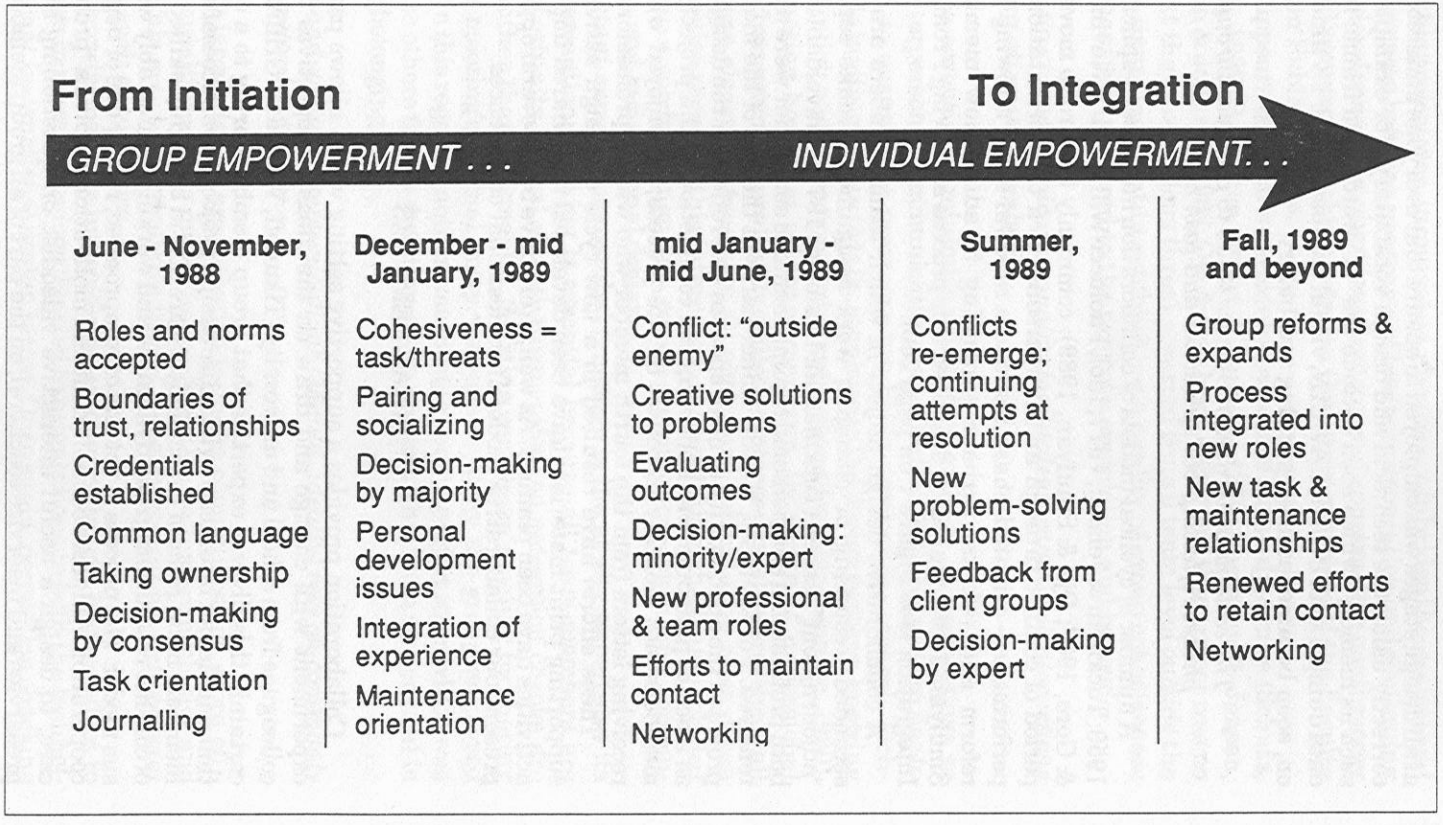
A collaborative design project in which team members are temporarily seconded, resuming or changing work assignments make separation and "adjournment" issues (Tuckman and Jensen, 1977) unavoidable: in our case both professional and personal commitments to each other were maintained or renewed. For example, a team dinner party at the one of the members' home provided the opportunity to meet spouses and reflect on the design experience as a social phenomenon. Following the completion of the project, three team members met monthly to reflect on the process; all enjoyed writing to and receiving letters from the fourth member who was on professional leave.

These efforts have resulted in a new cycle of design activity in which supporting print materials have been developed and shared implementation activities have been planned. As well, there have been several opportunities to present our collaborative model at professional conferences

FINAL REMARKS

Collaboration provides a supportive setting which allows participants to experiment with change and draw on the ideas, perspectives and skills of colleagues from school and university (Tikunoff, Ward and Griffin, 1979). It is certainly this diverse expertise that group members bring to a collaboration that enables an interactive videodisc design project to be successful. The group members must remain consciously aware of and be highly skilled in the areas ofconflict resolution, group dynamics, and working comfortably with a consensus model. The process is not one of compromise; rather one of negotiation and cooperation. A sincere commitment and motivation to solve a "problem" (in this case, to design a useful interactive videodisc on questioning strategies for preservice and inservice teachers), on the part of all group members is critical.

Figure 1.
The Group Development Process.



The time spent on a project of this magnitude will seem onerous only to members forced into a collaborative assignment with which they are uncomfortable, and will inevitably result in a crisis. To a committed team, such as this collaborative team from the University of Alberta and Edmonton Public Schools, the professional development opportunities alone will far outweigh the work load required. Avigilant and supportive team will motivate members to be as creative and positive as they are goal-oriented. The challenge in the process is as great as the reward.

REFERENCES

Collis, B. & Gore, M. (1987). The collaborative model for instructional software development. *Educational Technology, February,* 40-44.

DeBloois, Michael (1982). Principles for designing interactive videodisc instructional materials. In M. DeBloois (Ed.), *Videodisc/microcomputer courseware design,* Englewood Cliffs, New Jersey: Educational Technology Publications.

Engel, D. J. & Campbell-Bonar, K. (1989). Using videodiscs in teacher education: Preparing effective classroom managers. *Canadian Journal of Educational Communication, 18*(3), 221-228.

Falk, D. & Johnson, D.W. (1977). The effects of perspective-taking and egocentrism on problem solving in heterogeneous and homogeneous groups. *Journal of Social Psychology, 102,* 63-72.

Gordon, T. (1980). *Leadership effectiveness training (LET).* New York: Wyden Books.

Hall, G. & Loucks, S. (1978). Teacher concern as a basis for facilitating and personalizing staff development. *Teachers College Record, 80*(l), 36-53.

Idol, L., Paolucci-Whitcomb, P., & Nevin,A. (1986). *Collaborative consultation.* Maryland: Aspen Publishers, Inc.

Intriligator, B. A. (1982). *Creating conditions for successful collaboration.* Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, Houston, Texas.

Johnson, D. (1980). *Human relations and your career.* Englewood Cliffs, NJ: Prentice-Hall.

Johnson, D., & Johnson, R. (1975). *Learning together and alone.* Englewood Cliffs, NJ: Prentice-Hall.

Johnson, D. & Johnson, F. (1982). *Joining together: group skills* (2nd edition). Englewood Cliffs, NJ: Prentice-Hall.

Johnson, D., Johnson, R., & Holubec, E. (1986). *Circles of learning: Cooperation in the classroom.* Edina, Minnesota: Interaction Book Company

Joyce, B., & Showers, B. (1986). *Student achievement through staff development.* New York, NY:

Kanter, R.M. (1989). *When giants learn to dance.* New York: Simon and Shuster.

LaughlinP.R., Branch, L.G., & Johnson, H.H. (1969). Individual versus triadic performance on a unidimensional complementary task as a function of initial ability level. *Journal of Personality and Social Psychology, 12,* 144-50.

Mappin, D., & Campbell-Bonar, K. (1990, February). *Using models of planned change as a design factor in developing videodisc materials for use in teacher education.* Paper presented at the annual AECT conference, Annaheim, California.

Naidu, S. (1988). Developing instructional materials for distance education: a "concerns-based" Approach. *Canadian Journal of Educational Communication, 17*(3), 167-179

Oja, S.N. & Smulyan, L. (1989). Collaborative action research: a developmental approach. *Social Research and Educational Studies Series (7),* London, Falmer Press.

Schein, E. (1969). *Process consultation: Its roIe in organizational development.* Reading, MA, Allyn and Bacon, Inc.

Schutz, W.C. (1958). *Fino: A three-dimensional theory of interpersonal behavior.* New York, Holt Rinehart & Winston.

Srivastva, S., Obert, S., & Neilson, E. (1977). Organizational analysis through group processes: Atheoretical perspective for organization development in Cooper, C. (Ed) *Organizational development in the UK and USA.* London, Macmillan Press.

Thibaut, J., & Kelly, H.H. (1986). *The social psychology of groups.* New York, John Wiley and Sons, Inc.

Tikunoff, W.J., Ward, B.A., & Griffen, G.A. (1979). *Interactive research and development on teaching study* (Final report). San Francisco, CA, Far West Regional Laboratory for Educational Research and Development.

Tuckman, B.W. & Jensen, M.C. (1977). Stages of small group development revisited. *Group and Organizational Studies, 2*(4), 419-27.

AUTHORS

Katy Campbell-Bonar, Instructional Designer Instructional Technology Centre, Faculty of Education B-117, Education North University of Alberta Edmonton, Alberta T6G 2G5 (403) 492-3667 FAX: (403) 492-1318

Louise Grisdale, Principal Edmonton Public Schools Woodcroft Elementary School 13750 Woodcroft Avenue Edmonton, Alberta T5M 3M4 (403) 455-4690

ACKNOWLEDGEMENT: The authors wish to express their gratitude to Sue Campbell, whose suggestions and editing skills were instrumental to the final version of this paper. In addition, we are indebted to Dr. Richard Schwier for his commitment to the ideas expressed, and his efforts in guiding the paper to its fiil version.

The order of authorship for this paper is alphabeticalonly. both authors contributed equally to the finished product.

The order of authorship does not reflect the magnitude of contribution to the finished product. In keeping with our philosophy of collaboration, the authors cooperated fully at all stages of planning, writing and re-writing of this paper.

Formative Research for Cree Children's Television: A Case Study

Avishai Soudack

Abstract: This case study describes how an extensive formative evaluation was conducted in the development stage of Wachay Wachay, the first children's television series in the Cree language. The series is intended to strengthen native identity and foster language use among native children. The formative research effort examined the responses of children, parents, community elders, and native-language educators to a test tape. Interviews, questionnaires, and observation were used in screening sessions held in four Cree communities in Northern Ontario. Comparisons were made among children of different ages, between those who have Cree as a first and second language, and between speakers of different Cree dialects. The production and writing team used the findings in developlng the serles' format and characters, identifying key Issues of content and language level, and testing the appeal and comprehension of program segments among its target audience.

Résumé: l'étude de casdécrit une évaluation formative menée lors du développement de *Wachay Wachay,* la pemière série télévisée en langue Cree destinée à des enfants. La série vise à renforcer chez les enfants autochtones un sentiment d'identité et à promouvoir parmi eux l'usage de la langue Cree. La recherche formative a examiné les réactions d'enfants, de parents, de membres aînés de la communauté et d'enseignants de langues autochtones à un montage vidéo. Dans quatre communautés Cree du Nord de l'Ontario, les chercheurs ont faint des entrevues et des observations et administré des questionnaires. Des comparaisons ont été faites entre les résultats recueillis ches des enfants de différents groupes d'age, chez des enfants possédant le Cree comme langue pemière et comme langue seconde et chez des enfants parlant différents dialectes Cree. L'équipe de production et de scénarisation a utilisé les résultats de l'étude pour développer le format et les personnages de la série, pour cerner des problèmes importants de contenu et de niveau de langue et pour vérifier l'attrait et la compréhension de certains segments de la sérle avec le public cible.

An ambitious educational television project for Cree and Ojibway children has been underway in Northern Ontario. Wawatay Native Communications Society and The Ojibway and Cree Cultural Center formed a Children's Television Unit in 1989 to produce *Wachay Wachay,* a television series for

Canadian Journal of Educational Communication. VOL. 20. NO. 3. PAGES 205 - 216. ISSN 0710-4340

primary school children that promotes native language and culture[1]. As part of the series development process, formative research was conducted with children, parents, community elders, and native-language educators in four Cree communities. The findings were used by the Children's Television Unit in establishing the series' format, identifying key issues of content and language level, and in writing the first six scripts. This case study, describing the research process and some key findings, is an example of how formative evaluation can contribute to the early stages of program development[2].

The series has challenging goals and a broad target audience. Native language and culture in Northern Ontario are threatened by the extension of transportation, schooling and communications, such as the the recent growth of satellite television (Axtell, 1990). *Wachay Wachay*[3] aims to strengthen native identity and to increase language use among native children – both Native First Language and Native Second Language speaking children. Can a television series reach, entertain and ultimately promote language use among children across this continuum? And how do differences in dialect and age affect children's responses to the series? These are the questions that motivated the research project conducted in early 1990 and described in this paper.

In the series, puppets and adult performers are used as vehicles to teach authentic and accurate use of the Cree language. The program also strives to strengthen the pride and identities of native children by presenting positive role models, and to nurture aboriginal traditions, values and beliefs. The series provides native children with a culturally sensitive alternative to southern programming.*

Formative Evaluation

The Cree Children's Television series began with a strong commitment to incorporating formative evaluation at key stages in the project. The series development plan was based, in part, on the experience of the Inuit Broadcasting Corporation and their successful Inuktitut series *Takuginai,* which involved several research projects (Inuit Broadcasting Corporation, 1986, 1987). The formative evaluation of *Wachay Wachay* was in the research tradition of

[1]Funding for the development of the Cree and Ojibway Children's Television Project has been provided by the C. R. Bronfman Foundation, Ministry of Citizenship and Culture (Ontario), The National Film Board, The Ontario Film Development Corporation, and Telefilm Canada. TVOntario provided valuable assistance and encouragement to the research effort.

[2]The opinions expressed in this paper are the author's and do not necessarily reflect those of the Children's Television Unit, Wawatay Native Communications Society, or the Ojibway and Cree Cultural Center. I would like to thank Doris Linklater, John Cheechoo, Bertha Metat and Denis Austin of the Children's Television Unit in Timmins; Tom Axtell; and at TVOntario, Olga Kuplowska, Danielle Constantin, and especially, Pat Parsons. Any errors and omissions are my own.

[3]*Wachay* is a term of greeting, meaning both hello and goodbye.

*The series is being broadcast to native communities across Ontario, and videotape distribution to native language teachers is planned. In the first phase of the project, programs are being produced in Cree, for Cree communities. Ojibway pro is being addressed in the second phase.

the Children's Television Workshop and TVOntario (Axtell, 1990; Mielke, 1990; Parsons & Lemire, 1986). The research was intended to gain information from a sample of the intended audience and to *expose* the *Wachay Wachay* producers directly to their audience's reactions in a systematic manner. Several complementary research methods were used to illuminate viewers' responses to the characters, program style and language.

The writing and production staff were directly involved in conducting the formative research effort -from design to implementation. Their "hands-on" participation ensured that results and insights were shared in an ongoing, interactive manner and that the findings had real meaning and impact. Results and recommendations were reviewed in a series development workshop held at the end of the February 1990 and summarized in a final report (Children's Television Unit, 1990).*

Purpose. The evaluation was designed to contribute to the development process by examining the reactions to the series' characters and concept of three groups – children, parents and elders, and native language teachers. The primary focus of the research was on *children's* responses to the program format, series concept, and language used. The major issues the study examined were: the appeal and comprehension of each of the program's types of segments; the appeal of the puppets, their humour and how well they were understood; reactions to a scene which portrayed puppets as children and actors as adults; and feelings about two stylistically different versions of a dramatic scene. Comparisons were made between children of different ages, and between those who have Cree as a first and as a second language.

In keeping with the exploratory nature of the research and in the tradition of native communities, discussion sessions were held with *parents and elders* of the communities to hear their feelings about the suitability and appeal of the segments, about the language spoken in the program, and the Cree syllabics, or writing, that appear on screen. These adults were also expected to be an important secondary audience for the program, and to be likely co-viewers with children. Research sessions were also held with *native language educators* on their reaction to: the program format and a sample story outline; the appropriateness of the program for different ages and grade levels; their opinions on the use of Cree dialects and syllabics; their needs as language teachers; and their suggestions for the development of the series.

THE STUDY

Research Method

The test tape. Because the series was in the early stages of development, an 18 minute working tape was used in the study screening sessions. This "test tape" introduced the series' puppet characters and examples of each of the

*A subsequent formative research project was completed in 1991; it examined the first six programs in the series (Gillis, 1991).

major program styles – including puppet drama, puppet-human scene, music, story-telling, and vocabulary – in separate segments. Two versions of the dramatic scene were included, using two different narrative techniques. The vocabulary segments introduced three Cree words – their pronunciation, meaning and syllabic representation[1]. The words were *wani-ikan* (trap), *nipaw* (sleep), *shashipiw* (stretch).

Evaluation session. Interview, questionnaire, and (in the case of children) observational data were gathered at pre-arranged screening sessions. Each session lasted between one and one-and-a-half hours. The research team conducted group interviews and discussions after showing each segment of the development tape, and a questionnaire was administered after the whole tape was viewed. For the children's sessions, three researchers observed and recorded the children's attention and behaviour during the different segments. The researchers, their teachers and teaching assistants helped each of the children complete a questionnaire after viewing. Where possible, the screening sessions involved eight to ten children, but some groups were larger. Translators assisted in the discussions with adults, and the questionnaire for parents and elders was available both in Cree and in English.

The Sample

Evaluation sessions were conducted in four communities with eleven groups of children (n=118); four groups of parents and elders (n=40); and two meetings of native language teachers (n=29).

The communities, Peawanuk, Attawapiskat, Moosonee, and Moose Factory[2], were chosen to reflect differences in size and type of community and in predominant dialects[3]. The study focused on two dialects of Western Cree – Swampy Cree or "N" dialect and Moose Cree or "L" dialect. The test tape used the "N" dialect*. Peawanuk and Attawapiskat are small native communities on the west coast of James and Hudson Bays where people speak the "N dialect. Moose Factory and Moosonee are larger communities at the mouth of the Moose River on James Bay where the "L" dialect (or Moose Cree) is predominant. The latter two communities are very mixed linguistically, They have attracted people from both "L" and "N" dialect areas, as well as from eastern James Bay coastal communities, and the Cree spoken there has been influenced by this migration and, to some degree, by English.

---

[1]The writing system used for Cree (and those for other native languages) is commonly called "syallabics" as it uses geometric shapes to show consonant and vowel sounds (Burnaby, 1984, Rhodes and Todd, 1981).

[2]Fort Albany had also been selected for research, but the sessions there had to be cancelled due to bad weather. The sessions in Attawapiskat included respondents from Rashechewan.

[3]There are many Cree and Ojibway dialects which are more or less mutually intelligible. Cree is spoken in six major dialects over an enormous area stretching from Alberta to Quebec. (Burnaby, 1994; Rhodes &Todd, 1981.)

*The dialect differences between Moose ("N") and Swampy Cree ("L") include phonological variations, such as the contrastive use of /n/ and /l/, other linguistic differences have also been noted (Rhodes Todd, 1981).

In all, 118 children participated in the study[1]. Table 1 (see page 209) describes the sample by age, grade, language and type of school. The variety of school types and language backgrounds is indicative of the mixed audience a program such as *Wachay Wachay* must address in Northern Ontario. Cree was classified as the first language for approximately 40 percent of the children[2]. More boys than girls were in the sample (57 percent boys, 43 percent girls). Most of the respondents (71 percent) were six- to eight-year-olds, 26 percent were nine years and older. A small number of five-year-olds also participated[3].

The children were asked to indicate on the questionnaire if they understood Cree. They were told to say yes even if they spoke only "a little." Sixty-seven percent said they did understand it. Asked if their parents spoke Cree to them, 74 percent said they did. These figures do not give us a measure of how knowledge of Cree is distributed among these children, but they do show that a large proportion are familiar with the language and hear it in their homes.

Table 1
Children's Sample

	Number	%	Grades	Ages	Cree Language	School
Peawanuk	26	23	K-7	5-14	first	federal
Attawapiskat	9	8	K-I	5-7	first	federal
Moose Factory	37	32	2-3	7-9	second	provincial
Moosonee 1	23	20	I-6	6-12	first/second	separate
Moosonee 2	20	17	I-2	6-11	second	provincial

Note: Cree as a first or second language indicates the status of Cree for the majority of children in each group.

Table 2
Parents' and Elders' Sample

	Number	Western Cree dialect
Peawanuk	10	Swampy Cree, "N"
Attawapiskat	10	Swampy Cree, "N"
Moose Factory	5	Moose Cree, "L"
Moosonee	15	Moose Cree, "L" and some Swampy Cree, "N"

[1] Not all children completed questionnaires. The total number of children who participated in screening and discussing the test tape was 118. The number of completed questionnaires was 115, and all statistics are based on the latter number.

[2] Cree is considered a first language where it is the language most often spoken in the home, best understood by most children, and the major language of the community. It is the second language where it was not the dominant language of children at home or in their community.

[3] In many northern Ontario schools, especially in small communities and on reserves, the age grading common in large urban schools is rare. Classes often include children of different ages.

Two sessions were conducted with native language teachers, one in Moosonee with 15 participants who teach the "L" dialect of Western Cree. Fourteen teachers from Attawapiskat and Kashechewan who teach both "N" & "L" dialects participated in the other session.

FINDINGS

Overall Appeal

Response to the test tape was very enthusiastic from all audience groups, across ages and communities. It elicited lots of talking, laughter and repetition, and there was close attention paid to all segments by most screening session participants – adults and children. Even second language children who had relative difficulty in understanding the Cree, demonstrated high levels of attention to the tape. Among parents, 71 percent said their children would like the program very much and 82 percent said they would watch the program with their children. As one parent said: "children relate to this kind of programming." Discussions revealed adults were happy to see a program for children in their language. And most of the children tookdelight in hearing and recognizing the language they heard at home.

The most positive response among children was in grades two and three. These children were deeply engaged by the test tape – they laughed at many parts, repeated Cree words that they recognized or that were emphasized, and spontaneously guessed at what was happening in the story segment. Although still positive, the response was slightly weaker among younger (kindergarten and grade one) children. They paid less attention and were less involved. Surprisingly, the tape was well received among most older children – those in grades four and up.

Program Attributes

The research looked at responses to the characters, specific program techniques and styles and the language used throughout. Strengths and weaknesses were identified and the producers were provided with suggestions for change.

Puppets. The puppets were very successful among the children in the sample -they laughed at them, pointed to ones they liked and talked excitedly about them among themselves. Seventy-nine percent said they liked the puppets, only five percent did not (16 percent gave no answer). Further indication of their attraction to the puppets was that in most groups, children spontaneously picked favourite puppets among themselves. Some variations in liking were observed -boys liked them less than girls and seven-year-olds like them most. Older children (nine and over) liked the puppets, not finding them too "childish".

Nine separate puppet characters are introduced in the puppet cameo segment of the tape and the researchers recorded differences in children's

responses to each of them. Based on interviews with the children and their questionnaire responses, the production unit was given an indication of how well, and why, the different puppets were liked by subgroups of children. For instance, one puppet character received less attention and interest during viewing. Interviews pointed to children's difficulties in understanding some of what the character was saying as contributing to lower attention. Another finding was that the children tended to have difficulty remembering or identifying the names of puppets when answering the questionnaire. Interviews confirmed this, revealing that the puppets' names were not clearly established and that some children confused the names with Cree words. For instance, one well-liked character character was called *Goochich,* a name which means "little boy"

Puppet voices and language. The humorous nature of the puppets, and just the fact that they were speaking in Cree, delighted children and adults, Respondents gave feedback on the intonation and expressiveness of the puppet characters' voices and on the correctness of the language used in the puppet dialogues. There was some concern that certain voices sounded "too old" or "too adult." Both adults and children mentioned this and, though it did not detract markedly from the appeal of the puppets, it indicated to the Children's Television Unit an area in need of refinement.

Vocabulary segments. These segments were very successful with children five to eight years old. The segments stimulated them to repeat the sounds and words, to guess what the word was, to mimic the actions used to convey the meanings, and to engage in word play Older children, nine and over, were less enthusiastic about these segments, but the pieces still held their attention. Parents and native language teachers were happy with the choice of words.

The group interviews with elders, parents, and native language teachers served to identify several potential problems with vocabulary segments. For instance, in the segment on *shashipiw* (stretch), native language teachers and some parents pointed out that the presentation did not maintain the Cree distinction between animate and inanimate words. The segment included a shot of a piece of elastic being stretched to demonstrate the word. Parents, elders and Native Language Teacher respondents pointed out that *shashipiw* would not be used to refer to this action, the stretching of an inanimate object. Rather it is used for animate things and their actions, such as a child stretching his arms in waking up (which was the other visual demonstration in the segment). A sizeable minority of the children, especially among second language learners, understood the word to refer to both animate and inanimate types of stretching, blurring the Cree semantic distinction. This alerted the production team to the need to design visuals that convey words and linguistic concepts accurately.

segments. Viewers' responses to the narrative elements of the program format were examined and two approaches to dramatic scenes were compared by showing two versions of the same scene. In one version, a character turns to the camera and addresses the audience directly; in the other,

the two characters play the scene "naturally" without addressing the audience. Overall, the narrative segments were successful, holding the attention of all the children, except the youngest ones. Many children, first and second language learners, tried to guess what was happening, and called out while they were watching. Quite a few second language learners in grades two and three had difficulty understanding the dialogue - but many were able to figure out what was happening by following the visuals. There was a strong preference for the second version of the drama which had no direct address to the audience. Adults found it more "natural," "the way people really talk." Some kids found it easier to understand and more lively

In the final segment on the demonstration tape a puppet character is shown with an actor portraying his mother who speaks to him about trapping and relates a story about her father. The segment avoided showing the human actor fully on the screen, taking a "child's eye view" and showing adults from shoulder to waist only. The style was generally well received, but the section tended to have lower attention levels among the children than the other segments. Attention and interest in this scene were related to comprehension -those children who understood Cree better watched more closely and talked about it more. Parents and elders thought it was a very good idea to include an adult figure who could be a source of traditional knowledge.

Attention to program segments. The children's level of attention to the development tape was not equal for all segments or parts of segments. Rather, attention increased during the following events: interaction between puppet characters, music, "surprises", funny or silly events, and the introduction of props or unusual objects (like a marten pelt). A sense of anticipation, such as in the vocabulary segment ***wani-ikan,*** also stimulated attention. Attention dropped when puppets talked to the camera for extended periods of time. This may be due in part to the low comprehension levels of some children attention did not drop noticeably among older children during such periods.

Language: Use, Comprehension, and Dialect

The sample audience's response to the language in the test tape was very important to the production team, given the series' goals to promote language use. Because the series was in the early stages of development, formal testing of language acquisition was not undertaken. But interviews and observation addressed reactions to the language in the segments and self-reported measures of comprehension were used.

Language use. Observations of the children during viewing indicated that the test tape stimulated language use and word play and engaged the children both verbally and visually (with syllabics). The segments sparked spontaneous language use among children in all of the sessions. This was a critical finding because it indicated that the series for native children could succeed in using and drawing attention to native language. In fact, even some members of the adult sample were observed repeating words from the dialogue and guessing the words in the vocabulary segments.

The study was not intended to measure children's language acquisition, but it did demonstrate that the test segments encouraged children to recognize, think about and, to some extent, use the Cree language. Children of all ages repeated words they heard – words they already knew and new ones. In one segment, when one puppet said to his friend ***astam*** ("come here"), one of the children in a grade two screening session responded by moving toward the television. This anecdote is indicative of the high levels of attention and involvement, even among second language learners. Children responded to questions from the puppets – those directed at the audience and those that were part of the dialogue between puppets.

Comprehension. The research revealed the expected range in comprehension among children. Language comprehension was gauged by an item on the questionnaire and by comprehension questions posed during the interview. Overall, 64 percent of the children indicated on the questionnaire that they understood the Cree in the tape, which corresponds with the researchers' estimates from the discussions. Not surprisingly, the language on the test tape was understood best by more respondents in the communities where Cree was the dominant language (Attawapiskat and Peawanuk) and in other communities among those groups of children for whom Cree was a first language (in some of the groups in Moosonee).

Comprehension was related to age – younger children had a hard time understanding some dialogue and grasping parts of the story segments, and comprehension increased with age (See Table 3). Interestingly, understanding the Cree in the show was not related to grade, reflecting the wide variation in children's ages within grades. Comprehension difficulties were usually reported by children as speech that was "too fast". The puppets' speaking too fast for children was also noted by the parents and elders and by native language teachers.

Table 3
Comprehension of Cree Spoken in the Program

	percentage of all children (n-115)	percentage of children 5/6 years	7 years	8 years	9+ years
Understood	64%*	44%"	56%	62%*	87%
Did not understand	28	44	34	27	10
No answer	9	11	10	12	3

* Percentages do not total 100 due to rounding.

Dialect. Generally, the development tape, which used the "N" dialect, crossed the boundary between "L" and "N" dialects fairly well. Native language teachers who taught "L" dialect praised the tape, and said they would probably use a puppet program based on what they saw. However, they felt that the "L" dialect spoken in their area would be preferable – realizing that it was impossible to make both available at the same time. Few adults in the "L" dialect communities complained of dialect differences, other than to point out that they would like to see other versions when possible. There were no marked differences in comprehension among children from different dialect backgrounds (as revealed on self-reported comprehension questions and in interviews), but this issue remains to be studied in detail.

Native Children: TV Viewing and Other Characteristics

Interviews and questionnaires with the children revealed some interesting background information on their TV viewing habits, familiarity with native television broadcasting, Cree language competencies, and attitudes to learning Cree. This information gave the series producers a picture of their intended audience. For instance, the research revealed that despite the relatively isolated nature of their communities, the children in this study are intimately familiar with television from the south. Virtually all of the children watch television, and satellite and cable TV distribution gives most of them a wide selection of television channels to view: 31 percent reported receiving between one and five channels in their homes; 57 percent receive ten or more.

Suggestions for the Series

Parents, elders and native language teachers had suggestions of words and topics for inclusion and were interested in having input into the language aspect of the series. Native language teachers gave suggestions on the type of grammatical and lexical items to cover. Teachers recommended incorporating the vocabulary words in sentences in other parts of the program – anticipating the intended format of the series in which featured vocabulary is used in the basic story line. The language teachers also recommended using more repetition in dialogue, and some said simpler words should be used. Elders and parents suggested that the program deal with animal characters, landscapes and weather, traditional cooking, legends, sports, wisdom and lore, Cree songs and music. Many referred to traditional native ways of life, crafts, and the history of native people. The comments and suggestions from adult teacher participants in the study provided the Children's Television Unit with useful guidelines and resources for further development of the series.

CONCLUSION

The formative evaluation effort made several important contributions to the development of the series. First, it indicated that the basic concept for the

series was on the right track. Both children and adults enjoyed the test tape and were enthusiastic about a program intended explicitly for children. The research indicated the program styles could amuse and hold the attention of children – even among groups for whom Cree was a second language, and for segments explicitly devoted to language teaching. Adults also responded warmly, indicating that the program would receive their support. And native language teachers in the sample said that they would probably use the show and that it was right for primary level children.

The second important contribution of the research was the identification of strengths and weaknesses in the program segments and styles. It provided positive and negative feedback on the developing ideas of the Children's Television Unit. The research also pointed out that there is some latitude in the use of dialects. The "N" dialect used in the test tape was acceptable to adult and children "L" dialect speakers-though parents, elders, and teachers urged that the program be made available in their dialect. But perhaps the most important contribution of the research to program development was in exposing the production team directly to their audience, and at a time when what they heard and saw could be incorporated into the creative process.

REFERENCES

Axtell, T. (1990). *Research, development and utilization plans for a Cree and Ojibway children's television series* (Unpublished planning document). Timmins: Ojibway and Cree Cultural Center and Wawatay Native Communications Society.

Burnaby, Barbara J. (1984). *Aboriginal Languages in Ontario.* Toronto: Ministry of Education and Ministry of Colleges and Universities.

Children's Television Unit. (1990). *Formative Research on the Cree Children's Television Series: Audience Response to a Test Tape* (Research report, 1990). Timmins, Ontario: Ojibway and Cree Cultural Center.

Gillis, L. (1991). *A formative evaluation of the series Wachay Wachay.* Timmins, ON: Ojibway and Cree Cultural Center.

Inuit Broadcasting Corporation. (1987). *Formative evaluation of Tahuginai* series (Research report). Ottawa.

Inuit Broadcasting Corporation. (1986). *Formative evaluation of three pilot television programs for Inuit children: A description of the process and results. Final report* (Research report, November 1986). Ottawa.

Mielke, K.W. (1990). Research and Development at the Children's Television Workshop. *Educational Technology Research and Development, 38*(4), 7-16.

Parsons, P., & Lemire, A.-M. (1986). Formative evaluation: The TVOntario perspective. *Canadian Journal of Educational Communication,* 15(l), 45-52.

Rhodes, R. & Todd, E. M. (1981) Subarctic Algonquian languages. In W. C. Sturtevant (Ed.) *Handbook of North American Indians.* Vol. 6, Subarctic (edited by June Helm, pp. 52-66). Washington D.C.: Smithsonian Institution.

AUTHOR

Avi Soudack is an independent research consultant working in education and training, educational media, and second language learning. He can be reached at: 7 Fuller Avenue, Toronto, ON M6R

Book Reviews

Mary Kennedy, Editor

The New Communications Technologies by M. Mirabito and B. Morgenstern. Boston: Focal Press, 1990. ISBN O-240-80012-5 (CDN $34.00)

Reviewed by D. Hlynka

What might the technological classroom of the year 2000 look like? Educators need to ponder the look and feel of the classroom in light of information technologies. After all, the year 2000 is only nine years away Do we perceive any significant change in what we do in the classroom? Will chalkboards and textbooks still be the primary medium of communication? Will the new technologies liberate the classroom at last? Or, contrarily, might the technologies destroy the last vestiges of a classical curriculum? There have been many predictions, delphi studies, scenarios, and warnings. But only one thing is certain. As educators we need to know what new information technologies are going to be available to us. As educational technologists, we need even more explicitly to know the potential tools of our profession.

It is at this juncture that ***The New Communications Technologies*** becomes important. It is not a book for educational technologists, but educational technologists can benefit. It is not a book for educators, but it is essential that educators grasp the essentials of the new educational technologists which might impact on education.

The New Communications Technologies is intended as a beginner's guide to introduce readers to contemporary developments in communication technology. "In essence, this book serves as a guide to the communication revolution. It introduces the new technologies that have had an impact upon the communications field in addition to those technologies that promise to influence it in the not so distant future."

Overview

The book is divided into eleven chapters. The first three are introductory and intended to provide preliminary information. Chapter 1, "Communication in the ModernAge" introduces the key concepts of information, communication systems, and the information society. A final section of Chapter 1 is curiously devoted to the concept of EMP, the electromagnetic pulse. This by-product of a nuclear explosion would disrupt and destroy integrated circuits and therefore, modern communication as we know it. Nevertheless, while one understands the authors' desire to point out the vulnerability and fragility of our communications infrastructure, one is nevertheless inclined to feel that there are even more significant intended and unintended consequences of the information society The section on EMP appears curiously out of place in this opening chapter. Chapter 2, sets out the technical foundations for modern communications, and deals with concepts such as the transducer, analog and digital signals, multiplexing and standards. Chapter 3 titled "Computer Technology Primer" provides an overview of important concepts dealing with hardware and software, printers and local area networks, the microcomputer, and concludes with a section on artificial intelligence.

Desktop publishing is the focus of Chapter 4. A section within this deals technically with the democratization of information and ethics. These two sections are straight forward, but however, totally devoid of any philosophic analysis which would seem appropriate at this juncture. Chapter 5 deals with the new technology in television and radio. Chapter 6 focuses on teletext, covering European teletext, American teletext as well as the WST and NABTS services. Videotex is covered in the seventh chapter. Chapters 8, 9, and 10 deal with teleconferencing, satellite communication, and optical discs respectively The final chapter, titled "Future Visions" focuses on four futuristic technologies: high definition television, solid state sensors, high speed videography, and holography

Strengths:

The strengths of the book are: 1) a conversational, not overly technical writing style; 2) an excellent glossary of key terms accompanying each chapter, (3) a brief "Additional Reading" section accompanying each chapter; and 4) visuals are appropriate and relevant to the text.

Weaknesses:

While it has just been noted above that visuals are "appropriate and relevant", a stylistic objection must nevertheless be voiced, namely that the authors do not integrate the visuals into the flow of the text. There seems to be in vogue a rather sloppy policy in which authors throw in apparently relevant graphics wherever they fit, and allow the reader to find a way to integrate them into the content of the narrative. This reviewer, however, prefers the more formal model of explicit reference to figures and tables within the body of the text. In other words, a reference to "See figure 10-3" would direct the reader to exactly the right visual at exactly the right time.

Another understandable omission is the lack of any philosophic view of the communication technologies. Some sections seem to promise such an analysis: "Ethics", "The Paperless Society", "Implications of the Communication Revolution", "The Democratization of Information" are some of the titles which provide such a promise, but fall short. Thus, no reference whatsoever is made to Bowers' concept of the non-neutrality of technology, of Lyotard's postmodern society caused by the mercantilization of knowledge, or of Beaudrillard's precession of the simulacrum. Of course, one can simply argue that such was not the focus of the book, nevertheless, some brief indication that there is more than a technical view of communication technology would have been appropriate.

Since this review is aimed at ***educutional*** technologists, it is appropriate to note some of the explicit references to the field of education. The lack of such focus is not really a criticism of the text, since no such "educational technology" focus was planned nor intended. Still, educators will want to know how their field is handled. In general, the text omits any focus on education. Only two sections receive any such concentration. The chapter on teleconferencing notes a slow scan system for telecourses developed and used by the University of Wisconsin extension. The chapter on teletext explains how "a teletext service can be a powerful and active educational force in the school system and the community at large." A project at KCET-TV, Los Angeles is noted briefly in reference to teletext use. Chapter 10, dealing with videodisc also notes educational applications "create a sophisticated interactive environment." Finally, a brief mention is made of educational applications within HDTV It must be stressed that the text is not expected to focus on educational issues, so cannot be criticized for missing them. But, educators interested in the book need to know that their field is only minimally included.

Again, since this review appears in a Canadian journal, it is appropriate to note how Canada fares in this discussion of new communication technologies. Canada prides itself in being a leader in this field, so Canadian readers might be disappointed in the only passing references. 'Iblidon is noted but misplaced within a section dealing with teletext in Europe. A CBC series "Chasing Rainbows" is identified as an experiment in HDTV programming. Two pages are devoted to 'Iblidon in the videotext chapter. In short, this is essentially an American book, dealing with an American focus on the new communications technologies.

Finally, it needs to be re-iterated that what we have identified as weaknesses are not weaknesses at all. On the one hand, the text does not deal with philosophic issues, is not aimed at educators, and is not a Canadian text. On the other hand, it is important to be aware of those omissions.

In summary, educational technologists can benefit from this book which will provide them with a useful introduction to the new communications technologies. To that end, this book is recommended.

REVIEWER

Dr. Denis Hlynka is in the Department of Curriculum: Mathematics and Natural Sciences at the University of Manitoba. He is co-author of ***The Videotex*** and ***Teletext Handbook*** (1985) and the just published ***Paradigms Regained.***

The Design of Computer-Based Instruction by Eleanor L. Criswell, New York, NY: Macmillan Publishing Company, 1989. ISBN o-02-325603-6 (CDN $35.95)

Reviewed by John O. Mitterer

The first-time reader of a book like The ***Design of Computer-Based Instruction*** by Eleanor L. Criswell might be tempted to believe that it will constitute a general overview of the applications of computers in education. Indeed, Criswell herself contributes to this impression when she opens Chapter 1 with this definition: "The term computer-based instruction (CBI) refers to any use of a computer to present instructional material, provide for active participation of the student, and respond to student action." Another suggestion that this book might be very general derives from the liberal sprinkling throughout of references to cognitive psychology, human-computer interface design, cognitive science, artificial intelligence, knowledge engineering, and even cognitive development.

A closer examination will reveal, however, that this book has a much narrower focus. The term "CBI" (and "CBT", a synonymous term meaning "Computer-Based Training") turns out to be a code acronym for software derived from a behaviorist, or Skinnerian, perspective on learning. The producers of CBI software tend to work for the military or for large companies and to place emphasis on the precise definition and efficient mastery of objectives and on a comparison of costs with other methods. It is because of this narrow focus that this book is weak and yet is still worthwhile.

The major weakness is that there is so much that is left out. For example, although more cognitive approaches to designing instruction, including older approaches such as that of Gagne, are mentioned throughout the text, and while the second chapter does discuss a "structural" perspective in ways which make it sound like a cognitive approach, in the end the book does not make much use of the cognitive psychology perspective on the design of computer applications in education. The same can be said for developmental psychology, artificial intelligence, human-computer interface design, and expert systems. All are mentioned but are, in the end, not really discussed; at best they can be said to be given a behaviorist interpretation.

Another, perhaps related, weakness is the peculiarly dated feel of the

book, which is already two years old and refers mainly to work from the early 1980's. Very little is said about recent advances in hardware and software technology. Direct-manipulation interfaces, mouse-selectable icons, pull-down menus, multiple windows, and bit-mapped graphics are scarcely discussed. Nor is much said about multimedia or the educational applications of such current multimedia technologies like digitized sound, interactive animation, synthesized speech, LaserDiscs, or CD-ROMS.

The evolution of newer approaches to creating education applications, such as the use of hypertext or hypermedia authoring environments is also not discussed. Alternative educational theories, especially the discovery-oriented approaches of Bruner and Piaget are similarly neglected. So is Papert and the educational applications of LOGO. Leading-edge topics like the application of artificial reality work in education are, of course, totally absent. In short, one is left with an image of the "good old days" when text-based mainframes were the standard, when bit-mapped graphic microcomputers were still just gleams in hacker's eyes and when Skinnerian programmed learning and PLATO were king.

In spite of such weaknesses, however, this book ought not to be neglected For all of its limitations, CBI is a well-understood and theoretically well-grounded approach. Anyone interested in the applications of computer technology in education should aspire to master CBI, if only to serve as a solid core around which to organize an understanding of the more recent advances in the general area. It is in this way that the endemic problem of rampant faddism can be avoided. Unfortunately, it is all too easy to be carried away by the promise (or hype) of new technologies without appreciating the deep educational issues involved. This is what "The Design of Computer-Based Instruction" by Eleanor L. Criswell does offer: a solid, fairly standard, step-by-step approach to designing, creating, and evaluating computer-based instruction. CBI produced by following the advice offered in this book will likely do what it was designed to do, and this is more than can be said for some of the more recent approaches to applying computers in education. As such, this book is a useful addition to the library of everyone interested in applying computer technology in education.

REVIEWER

John 0. Mitterer is an Associate Professor of Psychology and of Computer Science and Information Processing at Brock University, St. Catharines, Ontario. He is also an Adjunct Professor of Computer Science in the Department of Computing and Information Science at the University of Guelph .

Index to Volume 20, 199l

Articles and Critiques (by Title)

Articles and Critiques *(by Author)*

Columns (by Title)

Book Reviews (by Title)

Human Learning, by T.H. Leahey and R.J. Harris. Reviewed by R. Dias, 20(l), 61-64.

Instructional Design: Implications from Cognitive Science, by Charles K. West, James A. Farmer and Phillip M. Wolff. Reviewed by B. Park, 20(2), 149-150.

Managing Interactive Video/Multimedia Projects, by R.E. Bergman and T.V. Moore. Reviewed by R. Schwier, 20(l), 64-67.

The Design of Computer-Based Instruction, by Eleanor L. Criswell. Reviewed by J.O. Mitterer, 20(3), 220-221.

The New Communications Technologies, by M. Mirabito and B. Morgenstern. Reviewed by D. Hlynka, 20(3), 217-220.

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, simulation, gaming 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.

Manuscript Categories

Manuscripts may fall into one of two classes: General, dealing with a topic or issue at a general level (although reference to specific instances or examples may be included), and ***Profiles,*** dealing with or describing only a specific instance of an approach, technique, program, project, etc. A Profile may be thought of as a descriptive case study.

Most manuscripts dealing with a topic in general should include reference to supportive literature, while manuscripts submitted to the Profile category may or may not. The Editor reserves the right to change the designation of a manuscript or to make a designation, if none has been made previously by the author. Authors interested in determining the suitability of materials should consult past issues of CJEC or contact the Editor.

All manuscripts received by the Editor (either general or profile) will be judged for suitability, contribution, accuracy, etc. by a panel of anonymous reviewers designated at the time of submission. Normally, the review process requires about eight weeks. There are no deadlines for the submission of manuscripts,

Manuscript Preparation

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, figuresand references should be prepared according to the ***Publication Manual of the American Psychological Association, 3rd Edition,*** 1983. Figures must be camera-ready.

Submission of Manuscripts

Send fourcopies 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: Richard A. Schwier, ***Canadian Journal of Educational Communication,*** Communications, Continuing & Vocational Education, College of Education, University of Saskatchewan, Saskatoon, Saskatchewan, S7N OWO.