CANADIAN JOURNAL OF EDUCATIONAL COMMUNICATION

Volume 25, Number 3, Winter 1996
ISSN 0710 - 4340

Media Technology Perspectives and Their Curriculum Implications for Media Education
Alice Yuet Lin Lee

Toulmin's Moral Reasoning Model Applied to Ethical Internet Choices: A Means for Exercising Ethical Technology Leadership
Eugene Kowch **Dr. Keith Walker**

An AMTEC Publication

25th ANNIVERSARY

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Canadian Journal of Educational Communication

Volume 25, Number 3
25TH Anniversary Issue
Winter, 1996

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This journal is published with the assistance of a grant from the Social Sciences and Humanities Research Council of Canada.

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CJEC is typeset in PageMaker 6.
Printed by: Jasper Printing Inc
Edmonton, AB

1996-97

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Editorial

David Mappin, Editor

In this the final issue of our silver anniversary volume we once again republish a number of CJEC articles. This time the three which have been chosen reflect either how our concerns in the field persist, or how far seeing our authors are, depending on your point of view. For the first of the retrospectives we have returned to 1987 and the special issue on computer-mediated communication. Given how ubiquitous these systems have become in our distance education and alternative delivery programs it is interesting to consider some of the perspectives from a decade ago. In his paper *Emancipative Educational Technology* Gary Boyd tries to "demonstrate why I believe that computer conferencing, in particular, is best suited to provide emancipative educational learning situations" (p. 179). It reminds us that the potential instructional uses of this type of learning experience are greater than are conventionally assumed and may prompt us to extend our own uses of it.

With the approval of a new standard of high definition television by the FCC in the United States and the beginnings of trials, and with the high quality images being beamed to us from satellites and promised through DVD, it seemed relevant to revisit the 1991 paper by Nikos Metallinos on the perceptual, cognitive, and aesthetic challenges which higher definition images and changes in image format may provide to the viewer and producer alike. With all of the emphasis in our field on computers and the web it may be well not to disregard newer, more commanding forms of older technologies. After all, North Americans continue to watch more television than many media scholars, social critics, and parents think they should.

Finally, as we now work in a computing environment where the acquisition and manipulation of images is easily and routinely done, we thought it might be interesting to revisit earlier thinking on the use of computer graphics. From 1986 we have chosen a review of the literature on the effective use of computer graphics in CAI. I hope you enjoy it.

The remaining two articles in this issue address new scholarship in media education. In the first article, Alice Yuet Lin Lee takes a technnological approach to analyzing media, proposing an alternative way to undertake media education. In the second, Eugene Kowch and Keith Walker argue the importance of moral and ethical education in preparing students to deal with the Internet and the often questionnable content to be found there.

A Theoretical Perspective

Emancipative Educational Technology

Gary M. Boyd
First Published: Volume 16, Number 2, Spring 1987

Abstract: In a democracy, public education should contribute to the development of responsible. autonomous people. 'The usual communication media of schools tend to favor conformity. However, the close match between Habermas' criteria for emancipative discourse and the main characteristics of computer-mediated conferencing favor this medium for education. The skeleton of a theoretical systems model for computer-mediated conferencing is presented here.

Introduction

Almost any technology can be liberative or dominative; indeed most technologies are both, but to/for different people. What I mean by liberation or emancipation is increasing a person's abilities and opportunities to make rational choices about matters important to that person. Both advertainment and peer or colleague pressure are terribly dominating influences, the former largely mediated by technology. The main form of educational communications technology is TV/ Video in society at large, while in schools it is the paper copier. There is a vast difference between those two technologies; TV is mostly a few well endowed interest groups influencing vas numbers of people, whereas copiers usually involve many influence, or few to few many times repeated.

Emancipation or liberation is not simply freedom from involvement with other people concerning one's decisions but rather requires discussion with others where the outcome is determined by the best argument, not by promises or threats or captivating art or music. This notion of discursive emancipation is due to Jurgen Habermas (1981-1984). I find his perspectives very helpful in considering technological options, as opposed to the non-option of total rejection of technology. It seems to me that the ideal conditions for non-dominative, or liberative discourse which he puts forward can more easily be achieved through computer-telecommunications mediated communications than in any other manner. In this paper I am concerned to demonstrate why I believe computer conferencing in particular is best suited to provide emancipative educational learning situations.

Problem Area

People in our society are constrained by a double yoke: mechanical bureaucratic administrations on the one hand; and time-consumptive 'advertainment' on the other. Both seriously constrict our opportunities to make autonomous and responsible choices about the propagation of culture and the conduct of education

as cultural propagation. For example in Quebec, Law 101 and its language-police are an attempt to publicly control cultural propagation, but one which is not legitimate if all the people involved have not been able to participate in debates about the means and ends concerned. This is an unusual case, though, because there actually have been public debates about the issues. In other crucial areas such as class size, and timetable hours, decisions have been made by administrators on technical and financial grounds without any debate among those affected.

The other side of the yoke – the advertainment which gobbles up people's quality attention-time so that very little is left for debating educational questions – is all too easily exemplified by Coke(TM) commercials, and *Dallas*, etc. Concerned teachers, learners and citizens have no efficacious forum for debating key educational issues such as the relative place of fundamental intellectual skills versus peculiar vocational skills in curriculum and instruction Even at the (micro-) instructional level there is very little opportunity for rational discourse to negotiate and validate instructional objectives, criterion measurement methods, or choice of media and materials. Some teachers do hold discussions on the responsibilities and rights of both learners and teachers, but it is an uphill struggle to do so. 'Historically legitimated' bureaucratic norms prevail over the classroom, while tired learners with poor attention skills have had their best time leeched-up by advertainment to which they are addicted. Actual formal education has to make do with what little functional time and discretion is left between the pressures of the administrative, and the advertainment pincers.

Jurgen Habermas (1973/1975) envisions a possible way beyond the double impasse of modern society (which incidentally he refers to as our legitimation crisis). This way lies through the widespread practice of life-world validating discourse. So called 'practical discourse' is discussion of a fully rational kind about the validity of norms and rights, and rules, and factual propositions, where the only determinants of the outcome of the discussion are the solidity of facts and the logicality and comprehensiveness of the arguments (Habermas, 1981/1984). This contrasts with ordinary debate where rhetorical tricks, and threats or promises often determine the outcome. For discourse to provide genuine legitimation for norms and procedures it must be undominated; that is to say, threats and promises must be censored out, and so must aesthetic enticements or repulsions (Boyd, 1984). Free speech should mean freedom to state arguments and ground them in facts, not license to seduce or frighten people. If there can be some way for us to conduct liberative discussions about curriculum goals, instructional system configurations and individualization, expeditiously and freely, then we may be on our way to orienting activities toward our highest-level educational goals (such as promoting culturally rooted autonomy and potency) rather than making such a fetish out of tiny fact/skill low-level objectives.

Face-to-face discussion has two grave disadvantages when viewed in terms of Habermas' desiderata for life-world validating discourse; 1) it is difficult in ordinary meetings to arrange for each person to have a full and equal chance to contribute,

and to digest the contributions of others (especially if there are many vociferous people); and 2) unfair dominative speech acts cannot be ruled out of order until they have taken place if the actor insists on uttering them. By the time that the chair can rule a remark to be out of order it has already done its damage. "Ignore that!" is a weak command. For these reasons and some others, critics have considered Habermas' option of legitimative discourse to be merely an impractical ideal. However, it occurred to me when I came across Habermas, that perhaps computer-mediated teleconferencing is a medium through which his ideal discourse conditions can (very nearly) be met.

This is so because everyone can be given equal opportunity to enter arguments in the conference, and also because a moderator system can hide illegal entries from view. Threats and promises and rhetorical tricks can be archived, and dragged up after the main decisions have been taken if there is a challenge, but they can be kept out of immediate effect. It is crucial for liberative, life-world legitimating discourse that a centralized computer-mediating moderating conferencing system be used and not just exchanges of electronic mail. This is so, not only because illegal statements can be kept from influencing judgments, but in order that a permanent time-stamped archive of all transactions can exist and be publicly accessible. It may also be important to hold frequent anonymous discussions, with the moderator system archiving those who actually made which inputs, in case a serious *post hoc* challenge arises (or in cases like that reported by Karl Zinn (personal communication) where some participants masquerade as others, and try to play the pathological game "let's you and him fight!").

That computer-mediated conferencing can function to support and promote liberative discourse has been demonstrated by David Stodolsky's experiments at Irvine (1976) and in Sweden (18986). However, many questions remain open concerning appropriate system configurations and protocols for educational life-world building.

There are other technologies such as video-playback (Ryan, 1974) which can be liberative and should be combined with computer-mediated conferencing when possible (Boyd and Jaworski, 1985).

Theory

The relative theory for research on liberative educational computer-mediated conferencing has to be assembled from several sources. The whole system consists of participants (Paskian 'p' individuals), personal interfaces, the communications network, the mediating and archiving host computer source, software, and protocols. Another way of characterizing and modeling it is by using Helmar Frank's six dimensions of the pedagogic space (Frank, 1979). These are:

1) goal the learning objectives and meta-objectives agreed upon:
2) content – facts, skills, and their organization meshes;

3) *psychostructure* – the cognitive styles, schema and identity traits, entry level skills, etc. of participants;
4) media the communication and control media and environment;
5) sociostructure -the grouping of "p" individuals into coalitions, or dialog partners, or their separation as teacher, moderator, etc.; and
6) procedure -the algorithms, or heuristics, and rules of order etc.

These dimensions are, in order, answers to the questions: 1) To what end? 2) What? 3) Who? 4) Through what? 5) With whom? 6) How? Answers to these questions in the form of both structures and processes are required to model any learning system. Habermas' desiderata for legitimating discourse largely fall within the sixth dimensionprocedure, but they implicate aspects of all the others. Pask's conversation theory mainly relates to the first three dimensions and a little with the sixth (Pask, 1976). To tie all of the above together into a probabilistic casual model, or at least a good heuristic model which can successfully promote understanding, is a big job. All I can do here is sketch how I think it might be done.

There is one more essential piece, which falls into Frank's third dimension *psychostructure,* and that is a model of the participant's higher level aspirations and fears insofar as they are relevant to participation in the system. In any real system it is necessary to live and work together with people in order to grasp aspirations and fears, before intervening – even then the intervention becomes a conjugation with the others also intervening in the teacher's own life world. If one cares for real education there must be *reciprocity* of communicative control.

The actual goals for any educational teleconference will depend on many situational factors and the goals of each participant. My conjectural model of the functioning of 'p' individuals is that at any given time a 'p' individual (participating entity – see Pask, 1982) can operate or interact at one or more of three levels:

1) Receptive-Acquisitive level of merely attending to and capturing pattern-forms and adding some of them to one's active schema;
2) Transmissive level functioning as a conduit by repeating received forms (e.g., memes) and outputting them or imposing them upon any thing, or anybody – any other 'p' individual who seems likely to pay attention: and
3) Conjugative – Propagative level where the 'p' individual connects part of its own core identity form to some transmissible symbolic 'child' meme in such a way that some further 'p' individuals are likely to take up the form, and connect parts of their identities to it, and 'pass-it-on' indefinitely.

In short, each player at each 'play' can either: 1) accept or reject; 2) just pass-it-on; or 3) conjugate some 'self-pattern' with it and pass the changeling on.

This is a very rudimentary model, but I think it captures the most important communicative activities (actually there may be a sort of continuum between those

possibilities). The above seems to belong more to Frank's procedural dimension than to the goal dimension; they are closely linked. As I see it, human beings have a wired-in 'ought-that-is' or highest-level imperative to propagate portions of their identity. One might call them 'identimemes,' or even 'soul-memes'. This instinctual imperative is satisfied when I see some aspect of my own way of doing things being performed by others. That is the goal of the game. The highest payoff is to see such propagation when it has the appearance of being able to go on forever. The next best pay-off is to have someone copy something that you have taught them, even if it doesn't carry your own characteristic style.

Those are the desirable goals of the game in this model. They have their converse: at Level 1 a negative payoff occurs when one accepts and keeps 'garbage-forms' which are no use for helping make new messages; at Level 2 or operation one may be infected by and propagate parasitic memes which one doesn't own at all, but which use up one's attention time and communicative opportunities; at Level 3 one may be infected by a virulent parasitic meme which does couple to one's identity so that one is now a gambler, or an alcoholic, or some other kind of self-destructive contagious addict (pay-off minus infinity) (see Hofstadter [1985] for examples).

At the procedure level and also at the goal level it seems to be necessary to have a mediating variable, which is used to help allocate resources. This is 'status' or reputation (or in life off-line it may be money). In particular I have argued (Boyd, 1977) that relevant-credibility status is the most important moderator variable in knowledge development games. Normally, status increases if high-status persons pay attention to your transmissions, and that in turn draws the attention of others. A deviation-amplifying feedback loop exists so that those whose status starts to increase tend to get propelled to the top, while those who are initially ignored lose heart, do less, get fed less, get less support, and eventually drop out. Elaine McCreary's recent results (see 16(2) CJEC) tend to indicate a much more complicated role for status. There is also the difficulty that status in the computer-mediated conference may not correlate directly with status otherwise assigned.

This issue of status in the conference brings one back to Habermas (1984); for a message to be properly received and for the sender to be accorded full-participant status four essential conditions must be met: 1) truth of factual propositions; 2) rightness of collective norm assertion; 3) truthfulness of commitment; and 4) honesty of expressive parts of a communication. Failing on any of these weakens both the validity of the message, and the credibility status of the sender. These conditions seem to hold for any communicative act that has an open-ended on-going or heuristic property. This is defined in opposition to mere 'instrumental' knowledge that only allows one to extrapolate, or interpolate correctly, but has no leading-on quality (an operational test for understanding is whether the learner can *extend* the concept in an interesting and *valid* way).

The above is a gross over-simplification of the process of life-world building through message exchange. but I think it has the essential entities, goals and

procedures. Therefore, it should be possible to use it to understand computer-mediated conferencing and to situate research work, most of which lies ahead of us, notwithstanding the nice work of others in this issue, and of still others like Hiltz, Johnson and Turoff (1986) and Stefik, Foster, Bobrow, Kahn, Lannry and Suchman (1987).

Envoi

The foregoing may have given the impression that rational discourse for positing and criticizing validity claims lies at the heart of educational practice; it does, if the education has an emancipative meta-objective. But it is not all that lies at the heart of education. If we go back to Alfred North Whitehead's (1955) characterization of learning as a three phased cyclic process with an initial phase of *romance.* Followed by a phase *ofprecision* and completed by the *generalization* phase, then it would seem that text-based computer-mediated conferencing (notwithstanding Ferrarini, 1984) is best suited as a vehicle for the latter two phases.

It is fairly easy to see how precision, the clear definition of one's thoughts and procedures, can be facilitated by interaction via computer, and even clearer how multiple dialogs can aid with generalisation. Perhaps the *romance phase* needs solitude or museums, theatres and wilderness parks. It is more directly appropriate to imply aesthetic techniques (Boyd, 1984) to support the *romance phase,* and possibly also ritual (See the chapter on Mary Douglas in Wuthnow, Bergesen, & Kurzweil, 1984). Haberma's ideal discourse desiderata are to life-worrld construction what Karl Popper's *Conjectures and Refutations* desiderata are doing to science; necessary but not sufficient. What is left out in both cases are both the creative imaginative synthesis which enlarges our cultural worlds, and also the ritual observances through which we re-enact our affiliation with these worlds, through which we re-create our collective identities.

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High Definition Television. New Perceptual, Cognitive and Aesthetic Challenges

Nikos *Metallinos*

First Published Volume 20, Number 2, Summer 1991

Abstract: The perceptual, cognitive and aesthetic principles governing the medium of television are decisively challenged by the advent of high definition television (HDTV) or improved definition television (IDTV). Established rules of visual perception cognitive processes, and aesthetic apprectation of television images of the past must now change to compensate for the high quality. film-like picture produced by HDTV
This article focuses on the major adjustments that need to be made in perceiving, comprehending, and appreciating the newly emerging technology of HDTV.

Résumé: Les principes perceptuels, cognitifs et esthétiques régissant le médium de la télévision sont désormals mis au défi par l'avènoment de la télévision à haute définition (HDTV) et par celul de la télévision à définition améllorée (IDTV). Les règles et principes de perception viuelle, de processus cognitif et d'apréciation esthétique de l'image télévisuelle, établis par le passé, dolvent maintenant être revisés, s'ajustant ainsi à la haute qualité, a la ressemblance cinématoraphique, des images produites par la télévision à haute défintion (HDTV).

Cet article concentre son propos sur les ajustements majeurs et nécessaires à apporter à la perception. à la compréhension et à l'appréciaton de cette nouvelle technologie émergeante qu'est la télévision à haute définition (HDTV)

The advent of electronic cinematography, defined by Mathias and Patterson *(1985,* p. XII) as ". ..a new form of production, born of the marriage of video hardware and film techniques," was an inevitable development of communication media technology. SO confident were these authors in the development of the field of electronic cinematography, that they predicted that:

> The future of electronic cinematography lies in high definition television. When video images achieve a resolving power comparable to images recorded on 35mm film, electronic cinematography will begin to realize its full potential. (p. 220)

For the most part, the predictions of these authors proved to be right, and, according to Carbonara (1990) HDIV technology consists of:

> ... five times the visual information detail (1.125 scanning lines of pure NTSC (National Television Systems Committee, 625 scanning lineal, about ten times the color information, more than two times the horizontal and vertical resolution, great improvement in picture brighten, a wider aspect

ratio 6:3) and sound quality that is equal to compact disc. (p. 1)

Technical, political, and economic problems have delayed the mass application of HDTV technology everywhere but in Japan where it has been in use for more than a decade. This could be a welcome sign considering the preparation and the consumer adjustment needed to meet the challenges of HDTV technology. The "technical" problems imposed by HDTV touch on the *production* of HDTV, the projection of images and the means of *distribution* of HDTV programs. The "political" problems center on the issue of arranging a world-wide accepted standard for the transmission of HDTV programs. The economic problems have to do with the enormous amount of money required for the development of electronic cinematography, the production, and the distribution of HDIV programs as opposed to the limited funds required to produce regular 35 mm films (the estimated ratio is 5: 1). The bulk of the literature on HDTV technology centers on various technical, political, and economic issues. Excellent seminars on these issues are found in the proceedings of several recent world conferences, most notably, *1) High-Definition Technology: The Critical Choices* (Checco, Russell, & Behrens, 1988); 2) *Technology Update: High Definition Television Production Of Electronic Films, Strategies and Experiences* (Zwaneveld, 1987, June 4); and *3) Proceedings From the 2nd Annual Conference and Exhibition on High Definition Television and the Only one Devoted Exclusively to* HDTV(Meckler, 1990). However, very little has been done on the artistic, cognitive and perceptual issues related to HDTV technology.

In the view of some scholars and researchers, so much emphasis has been placed on these technical, political, and economic issues that the technology is already ten years behind in its proper development. Researchers at M.I.T's Media Laboratory have worked out an alternative solution to HDTV technology and claim that they ". .can deliver those gorgeous HDTV-quality images within existing TV bandwidths by clever data compression and image improvement" (Brand, 1987, p. 75). In fact, the founder and director of M.I.T.'s Media Lab, Nicholas Negroponte, prophesizes that the future of HDIV technology will be even greater if we redirect efforts towards computer generated HDTV pictures which can go beyond 1.125 scanning lines (Rice, 1988, pp. 62-71). Negroponte's associate, Andrew Lippman (1990) suggests open architecture and computational video as the most likely high definition system for the 1990's and states that:

> A change in television has already begun with so-called "intermediate digital" TVs (IDTV). IDTVs digitally translate an image onto a higher definition scanning system. So, it will not he long before the computer *qua* TV will be the receiver. whether the broadcaster is delivering NTSC, 1125, 1250, 1375, or any other type of signal. (p. 3)

Regardless of the means oftransmission (regular broadcast or computer image compression), when the outstanding technical, political, and economic problems

are resolved, the new technology image some challenges for today's producers and researchers.

Existing perceptual, cognitive, and aesthetic principles governing the medium of television are fundamentally challenged by the advent of cinematographically produced high quality, film-like images which are transmitted by television. Some well established rules and principles of visual perception (stemming from related studies in the fields of perceptual psychology and neurophysiology), certain bases which are needed in order for the viewer to easily decode and recognize television images (stemming from related studies in the field of cognitive psychology and semiotics), and some guidelines for composing television pictures which can be more readily appreciated (stemming from the related fields of the arts, communication and media aesthetics) need to be altered due to new electronic cinematography technology. This article is an overview outlining these changes and pointing out the adjustments that must be made in order to meet the challenges presented by future mass application of HDTV.

Changes in the Perception of HDTV Pictures

Such perceptual variables as 1) life-like pictures; 2) aspect ratio; 3) screen size; and 4) frame rate, are among the most significant factors found in numerous empirical research studies coming from Japan where the technology has been in full swing for more than a decade (Takahashi, 1982), from Canada (Conway, 1988; Cook, 1990; IIearty & Phillips, 1988). and from the United States (Mathias & Patterson, 1985; Meckler, 1990; and Zwaneveld, 1987, June 4).

Unquestionably, HDTV or IDTV pictures are superior to those of the NTSC (National Television System Committee), PAL (Phase Alternation Line) or SECAM (Sequential Couleur a Memoire) systems. Such picture clarity, however, has caused concern to some researchers. They contend that in HDTV pictures, detailed and unnecessary visual elements – third level visual information – can assume a prominent role – first level visual information disturbing rather than enhancing the visual communication process (Behrens, 1986; Metallinos, 1990; Winner, 1989) if the priorities of the visual information are not predetermined and the figure/ground hierarchical order is misrepresented. Empirical studies on figure/ground anomalies in commercial television have shown that picture perception of certain television commercials was decisively diminished when the background (third level visual information) took precedence over visual elements in the foreground (first level visual information) (Metallinos, 1988). Film and television directors have used the technique known as *depth axis, vertical axis,* or Z-axis staging to increase the perception of depth of field in film and television pictures. It should be noted, however, that and television cameras produce high or low resolution pictures indiscriminately. They cannot replace the human eye which perceives images in accordance with their position in the visual world. Consequently, placement of visual elements in the vertical axis alone does not guarantee normal figure/ground relationships.

Empirical studies conducted in Japan by NHK (Nippon Hoso Kyokai), the Educational Television Network, have determined that HDTV pictures are better perceived by a wider screen aspect ratio (preferably 5:3) than the conventional 4:3. This is confirmed by Mathias and Patterson (1985) who state that:

> Studies indicate that the impact of wide-screen images results from the fact that the wide format doesn't allow the viewers to take in the whole image in one glance. It requires them to scan the image with their eyes and edit it into a visual experience. The fact that the viewers must participate in their visual experience tends to involve them more fully. (p. 224)

Experimental studies on the HDTV screen size confirm that the larger the screen, the more comfortably the picture is perceived. As stated by Zwaneveld (1987):

> The advantages of HDTV cannot really be appreciated unless the display is much larger than at present. For an optimal "presence", at a ratio of 5:3 and an image diagonal size of 2 meters, observed at a distance of 2 x image height, and a 45" viewing angle, the monitor or video projected display should measure 1 meter x 1.8 meter for an 1100 line TV system. (p. 2)

Apparently this has been the experience over the years with the motion picture industry-the larger the film screen. the better the visual impact on the spectators (Mathias & Patterson, 1985, p. 224).

Another perceptual factor which challenges HDTV viewers is the rate at which the frames or pictures change to create the illusion of motion. In general, the higher and the more frequent the ratio at which frames change, the better the resolution of the picture. The adoption of HDTV requires a higher frame rate in order to avoid flickering and "promote better rendition of movement" (Mathias, 1985, p. 225) and to reduce the possibility of noise. Ordinary NTSC (a 525 line, 30 frame per second system) and PAL or SECAM (both 625 line, 25 frame per second systems) television viewers are not accustomed to this higher frame rate. The proponents of IDTV use the "frame rate" limitations of HDTV to promote the notion that the digitally created High Resolution TV picture system is completely free from flickering, reproduction of motion. noise and bandwidth requirements (Lippman, 1990).

Changes in the Cognitive Process (Comprehension) of HDTV Pictures

Recognition is another prerequisite for the study and understanding of the workings of the visual communication media, in general, and HDTV pictures in particular. Cognition here is synonymous with comprehension, recognition, interpretation, and understanding of the high quality of the pictures and sounds of HDIV technology. Scientific research on the cognitive effects of HDTV in North America and Europe are very limited – ahnost non existent. From general research

on technology imported from Japan, the emphasis is placed on such factors as 1) the overwhelming picture resolution; 2) the increased size of the TV screen; and 3) the entertainment value of the new technology.

In commenting on the cognitive impact of the picture resolution, Behrens (1986, p. 42) explains that minute details like, for example, the list of ingredient printed on a can of soup, overwhelm the viewer whose eyes capture things never before seen on television or details which were never intended to be of any visual importance. To avoid visual confusion and misunderstandings, the HDTV producer/director must pay special attention to this factor. Placement of the visual elements within the depth or vertical axes of the visual field becomes an even more necessary practice in HDTV productions.

Mark Fleischmann (1990) commenting on the issues raised by HDTV and IDTV regarding their use of bigger screens, suggests that the issue of acceptable size is related to the issue of viewer acceptance and understanding of the visual image projected by such TV set technology. It will take some time before NTSC, SECAM, or PAL TV viewers readily adjust themselves to watching larger TV screens. An image presented on a small screen does not offer the same level of comprehension or degree of understanding and is not appreciated the same as on a large screen. Epoch fihns intended for projection on large film screens are viewed differently when presented on the small TV screen. Size is a determining factor in comprehending the semantic dimension of televised images.

Several observers of the cognitive effects of HDTV have speculated that television programming which is not made solely to enhance the technology, will invariably not be recognized and appreciated by its viewers. Winner (1989) suggests that "If our society absolutely must spend billions on television during the next several decades, improving the quality of programming would seem a better place to start" (p. 276). In discussing the differences between film and HDTV or IDTV as far as future programming is concerned, Moore (1990) predicts that:

> Sitcoms, talking heads shows, most news programs and the typical intimate drama will benefit little from improved picture quality. The most significant benefits will be for sporting events, epic pictures, operas and ballets, and shows with exotic locales as backdrops. These type shows make up only a fraction of programs currently being broadcast, which again limits the attractiveness of HDTV. (p. 3)

Levy (1989) goes even a step further. He believes that HDTV will not only develop its own programming to feed the viewer's hunger for better home entertainment, but that technology will have a profound effect on the movie industry as well. He predicts that "We'll see an incredible increase in special effects, and films will more easily be able to portray fantasy" (p. 100). Improvement in the programming of the movie industry and creation of special programming for HDTV are both cognitive factors which will challenge the future viewer of electronic media.

Changes in the Aesthetics of HDTV Pictures

The greatest challenges faced by the new technology will be in such widely practiced aesthetic principles (theories, concepts, rules, and constructs) as hot (film) vs. cold (TV) media; horizontal (film) vs. vertical (TV) staging techniques; small (TV vs. large (film) visual fields, to mention only a few.

Prior to the development of HDTV, students oftelevision production, television criticism and television aesthetics full-heartedly embraced McLuhan's hypothesis of hot and cold media (1964, p. 37):

> There is a basic principle that distinguishes a hot medium like radio from a cool one like the telephone, or a hot medium like the movie from a cool one like TV. A hot medium is one that extends one single sense in "high definition." High definition is the state of being well filled with data. A photograph is, visual, "high definition." A cartoon is "low definition," simply because very little visual information is provided. (p. 37)

Partly due to the low quality (low definition) of TV pictures and partly due to the small size of its visual field (the TV screen), television adopted the practice of using extreme close-ups in dramatic television to more intensely involve the viewer. With the advent of massively applied HDTV, McLuhan's TV aesthetic hypothesis becomes outdated. As mentioned earlier, HDTV programming requires a larger TV screen. A larger TV screen with a high resolution picture requires less viewer effort for psychological closure. In short, HDTV is no longer a "cool" medium – it is a "hot" one. This implies that the aesthetic theory of "hot and cold" media in film and HDTV is inappropriate. It also implies that the production techniques for TV programs intended for HDTV presentation must follow, to a large extent, those techniques established by the film industry.

Research works stemming from various studies on film and TV production techniques have formed two distinct bodies of literature in film grammar in which Eisenstein (1942, 1949), Lindgren (1970), Bobker (1969), Mast and Cohen (1974) and Kauffmann (1979) are the most representative; and in television grammar which was created by Armer (1990), Davis (1974), Lewis (1969), Millerson (1972), WurtzeI(l983), and Zettl(1990), among others. These grammars formed the various compositional principles and production techniques in lighting, staging, editing, and audio which were unique to each of these media. The emerging electronic cinematographer and HDTV producer/ director must be knowledgeable and confident with both grammars in order to meet the challenges posed by the new techniques.

Until now, it was theorized that in order to enhance the illusion of depth of the small visual field of the low definition television picture, visual elements should be composed within the Z-axis, moving inwards or outwards, either towards or away from the center of the screen (Zettl, 1990, p. 193). It was further theorized that the small opening of the regular TV screen does not allow the composition of crowded scenes and shots of landscapes. Such scenes were deemed more

appropriate for the larger high definition film screen. These theories are now fundamentally challenged and must be adjusted with new aesthetic rules applicable to HDTV programming,

Aesthetically speaking, the composition of visual elements within the small view offered by the ordinary home television set is much different than the composition of visual elements within a larger screen area. In addition to changes in framing and shot selection, there will be environmental changes of scenery, sets, props and the like. According to some speculators, not only will the new HDTV set be larger, but the entertainment center in the home will have to change. According to Levy (1989):

> Unlike regular television, a tiny box in a room, HDTV cannot be ignored. Who can read a magazine in a movie theatre? Ultimately . . the whole experience ofwatching television is going to be different. It will be a cinema experience. (p. 100)

SUMMARY AND CONCLUSIONS

This article focuses on the major adjustments that need to be made in perceiving, comprehending, and appreciating the emerging technology of HDTV. Producers and consumers alike must be sensitive to and aware of this electronic cinematography technology. As television home viewing differs from attending a theatre or film presentation, so do the developers and producers of these two media differ in their expertise and attitudes. In this common practice, these two media are fundamentally different perceptually, cognitively, and aesthetically. The merging of film with HDTV is like asking artists to become scientists. It is possible, theoretically, but it is difficult in practice. As Blandford (1987) suggests:

> Films were born from imaging and photography. It's easy to use, that is paramount. It's right side of the brain oriented. Video is a "left side of the brain" medium, its practitioners are electronics engineers and technicians. **(P. 36)**

Although this is an extremely provocative statement, it focuses on the changes that need to be made and directs our attention to the challenges presented by the forthcoming massive application of HDTV technology.

It is, therefore, important that we *keep informed,* through systematic study and vigorous experimentation, on all aspects of this new technology, not only technically or scientifically, but practically and artistically as well. In developing and marketing HDTV technology, its artistic, cognitive and perceptual dimensions (aesthetic factors) should not be overlooked.

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Effective Use of Computer Graphics in CaI: A Review of the Literature

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First Published: Volume 15, Number 1, Spring 1986

Abstract: Computer graphics technology offering great potential for designing new types of instructional interactions is fast becoming available to the CAI designer. This paper first describes various new graphic display capabilities, then reviews relevant applications. The ability to animate both graphics and text and the ability to directly manipulate graphic elements on screen displays represent revolutionary features. Little research, however, is currently available which could help provide guidelines for the development of instructional applications for computer graphics.

It has been said that CAI's greatest potential lies in its capability to individualize instruction using interactive techniques (Moore,Nawrocki, & Simutis, 1979). With increased computer power. systems for manipulating data, including programs. text, graphics, video, voice, sound and touch are rapidly improving, providing us with powerful new tools for interaction. As these systems become increasingly accessible to the CAI designer, there will be a growing need for clarification with regard to instructional applications.

Restrictions in hardware have limited the use of images in CAI programs, and to date more emphasis has been placed on the presentation of text in an interactive mode than ob the use of graphics. As a result, CAI programs have been largely dominated by word-oriented dialogues. Current significant advances in computer graphics technology, however, are now resulting in an increasing shift in emphasis from textual to graphic presentations (Bork, 1981: O'Shea & Self, 1983) Our task here will be to examine the emerging capabilities of computer graphics as they apply to CAI and to review relevant research that may assist us in determining their effective use.

What Do We Mean By Computer Graphics

lmages of objects can now be created, stored, and/or manipulated by the computer - this is the essence of computer graphics (Lewell, 1985). Marcus (1977) provides us with general but useful definition of computer graphics: "any kind of imagery mediated or generated by computer control and most appropriately, but not exclusively, displayed on cathode ray tube screens"(p. 6). Graphics capabilities in computer systems range from the printing of simple characters to sophisticated picture drawing an image manipulation commands. Computer graphic displays have been used to fulfill a variety of functions such as in the automation of manufacturing processes and the production of engineering drawings, architectural

plans, and commercial art layouts.

Examples of computer graphic output include: low resolution paper output, high quality black/white or color pictures of real or imaginary objects for slides, films, or video, and images produced on video displays and characterized by user intervention (Foley & Van Dam, 1982). From a CAI design standpoint our focus is the output generated on a video display screen. Great differences can exist with regard to the type of screen image produced, its quality, and the extent to which it can be dynamically controlled by the viewer. This last factor of viewer control can be used a the criterion for categorizing computer graphic applications as either passive or interactive, a distinction we shall see as having significant implications for CAI design.

Current developments in microprocessor technology are resulting in the design of computer systems with a vast range of graphics capabilities. Special graphics processor chips now under development will make test-based computing systems obsolete (Lu, 1986). In addition to enabling us to create more sophisticated images on the screen, including animated programs, graphic-based systems will allow easier integration with text. New microcomputer systems with such revolutionary video capabilities will become the vehicle for the most common instructional applications of computer graphics.

Categories of Computer Screen Displays

It is helpful for our purposes to present a scheme for categorizing computer screen displays to use as a descriptive framework for discussing computer graphics applications in CAI. The widely accepted distinction between text and graphics in relation to print can also be applied to static text and static graphics in screen displays. In addition, the ability we now have to animate content to make it dynamic allows us to further distinguish between screen displays.

Text Displays: Static

Jonassen (1982, p. ix) describes text as "written discourse (aggregates of words) in printed form" that can either be displayed on paper or a CRT. Insofar as text presentation techniques on a screen have a visual element, variables such as screen resolution, size, color, and style graphics in screen displays. In addition, the ability we now have to animate content to make it dynamic allows us to further distinguish between screen displays.

Graphic Displays: Static

In reviewing the literature on graphic displays, Moore and Nawrocki (1978) suggest "pictorial," "schematic," and "symbolic" as the terms best representative of the categories used to differentiate among them. As we shall see, these classifications can be generalized to computer screen displays as well.

A pictorial display refers to a "representation of objects or events, to include their relationships, but with the representation having some degree offidelity to the physical characteristics of these objects or events" (Moore & Nawrocki, 1978, p.

33). Examples would include photographs, drawings and other realistic renderings of real-life objects.

The category of schematic displays describes "two-dimensional line drawings showing spatial or temporal relationships" (Moore & Nawrocki, 1978, p. 33), such as blueprints, circuit diagrams, and maps. Symbolic displays function as "character sets in which each character has a predesignated, but nonlinguistic, referent to a specified object or concept" (Moore & Nawrocki, 1978, p. 33). The use of symbols is part of the field of iconic communication, which focuses on communicating meaning through visual forms. The work "iconic" implies the use of basic visual imagery dependent on "the ability of people to perceive natural form, shape and motion" (Huggins & Entwisle, 1974). This is in contrast to the use of alphanumeric representations which require linear, linguistic interpretations. The elements of iconic messages can be organized non-linearly in a multidimensional space allowing numerous interelations.

This classification of graphic displays is an arbitrary one, and a closer examination of the literature reveals certain definitional problems. Twyman (1979) for example, finds it difficult to distinguish between pictorial and schematic categorizations. Merrill and Bunderson (1979) on the other hand, find the Moore and Nawrocki classification scheme to be restrictive, and suggest adding a fourth category to the three outlined above (i.e., figural displays to represent the illustration of relationships between abstract ideas). Although other categorization schemes for graphic displays exist based on other criteria, we find this one provides us with a useful starting point for discussing screen displays.

Pictorial, schematic, and symbolic graphic displays cannot be electronically represented on a CRT screen. Perhaps even more importantly, however, computer graphics technology now allows us to generate entirely new forms of displays. For example, systems are now able to scan various types of information into the computer. Two-dimensional information such as maps or three-dimensional information in the form ofdescriptions of solid objects can be drawn into the compute to produce graphic displays, vastly extending our capabilities to graphically represent information. In view of such capabilities Greenberg (1982) has expanded the definition of computer graphics to include "the communication of graphic (non-alphanumeric) data to or from the machine" (p. 7).

Foley and Van Dam (1982) refer to computer graphics technology as "the most important mechanized means of producing and reproducing pictures since the invention of photography and television; it also has the added advantage that with the computer we can make pictures of abstract, synthetic objects" (p. 5). In addition to enabling us to portray real objects and to represent abstractions, the new technology allows us to superimpose abstract and realistic representations, creating yet another new form of graphic display (Brooks, 1977).

Text Displays: Dynamic

With the advancing revolution in computer/video display technology, we will be able to manipulate text in a more creative and dynamic way. The movement of text

on the screen promises to become a powerful tool. Heines (1984) offers the following as examples of this potential of text: ". it can be displayed at various speeds, using pauses to add emphasis to key words. In addition, words and short phrases can often be effectively animated across the screen to denote a flow of information and/or materials" (p. 110).

Graphic Displays: Dynamic

All of the graphic displays described previously as being static now have the potential to be dynamic. The ability to add movement to static images represents a powerful tool for communication and information purposes. In addition, the fact that computer/video systems are now capable of creating, storing, retrieving, and manipulating new forms of dynamic images in real time (at a rate which reflects the perceived outside world) or, if desired, at a rate not consistent with real time (slower or faster), has significant implications for CAI applications. A general description of various new forms of dynamic displays follows.

Dynamic models. Dynamic models have properties built into the model description which enable them to change their characteristics within the limits determined by the designer (Glassner, 1984). The use of dynamic graphics is important in the animation of models. For example, a static mode1 of our solar system can only be moved about on the screen, or presented in different perspectives or scales. Changing this model into a dynamic representation, however, permits the movement of planets within the solar system. This ability to move or change the shape of internal elements is what distinguishes static from dynamic models.

Techniques for what are termed "update dynamics" (Foley & Van Dam, 1982) refer to changes in the physical properties of the objects being viewed (e.g., shape, color, and size). There are a large number of modes to encode information with respect to time variation in shape and color of objects. Computer graphics systems allow us to define pictures that involve a variety of transformations, including two-dimensional into three-dimensional and perspective transformations. For example, engineers use computer graphics in structural analysis to build finite-element models to determine the distribution of stress in physical structures (Lewell, 1985). Computer graphics enable us to represent dynamically varying images which portray phenomena, either real or abstract, which vary with time and position. Dynamic sequences can, therefore, be used to convey different types of metamorphosis.

Simulations: The capability of computer graphics systems to rapidly display and efficiently move visual elements in a three-dimensional field is of particular significance for simulation and testing purposes. Lewell (1985) suggest that: "Whenever an image can replace a real object, for the purposes of interaction, a graphic simulation could conceivably be devised" (p. 22). In visual flight simulation, for example, a projected display is used to portray a geographical area, with topological and geometric structure of objects and surfaces being dynamically represented (Schacter, 1983).

Dynamic icons. The use of dynamic computer graphics allows us to generate movement in iconic communication as well. In a study on iconic communication,

Huggins and Entwisle (1974) proposed that "the moving iconic symbol" is a new medium with special strengths having great applicability to instruction and requiring much additional research. They note that iconic representations characterized by motion and spatial perspective should be especially created to suit the electronic medium.

Dynamic diagrams. Most diagrams have been developed for use on the printed page, and therefore are static and closely related to the accompanying text. Marcus (1977) maintains that an increasingly important use of diagrams will be to organize vast amounts of information into a practical and readable format. He extends the meaning of the word "diagram" to encompass an array of symbols that utilizes not only two-dimensional but three-dimensional space as well. The array of symbols includes alphanumerics, points, lines, and planes, which may be characterized by texture and color.

In defining the parameters which would accommodate a more dynamic and visual approach to structuring diagrams, Marcus (1977) includes the following: "movement of symbols across and into the visual field, layering of information in actual or implied depth/literal or phenomenal transparency or translucency, color, multiple entry and exit, and figure-filed relationships" (p. 6).

By facilitating the use of these visual elements in the design of diagram, dynamic computer graphics will provide us with the mains of extending our capability to convey vast bodies of information.

Passive Versus Interactive Applications

In examining the implications of emerging computer graphics capabilities on CAI design, we need to make a critical distinction. Computer graphics applications can be categorized as either passive or interactive, depending on the involvement of the end-user of the application. Passive applications are those in which the viewer does not interact with the display, while interactive applications require an active involvement with the screen image. Sutherland (1970) provides examples of two types of interactive applications which may have instructional consequences. Once application involves solving pictorial problems (e.g., topographical mapping and design), the other involves obtaining additional understanding of complex natural phenomena through the use of simulation.

Computer graphic applications which allow the viewer to dynamically control the image on a display surface with regard to content, format, size and color are referred to as interactive. Control can be exerted by means of various interaction devices such as keyboard lever, orjoystick, each of which signals the user's intention to the computer. Interactive applications allow the system to respond to user input and therefore require two-way communication.

Interactivity thus implies a dialogue between the user and the computer. The computer responds to the signals from the input device by modifying the display. The user perceives this change in display as the response to his or her commands. Martin (1973) differentiates between four types of dialogue.

- Dialogue in which precomposed images can be selected by the user, but not otherwise modified in any way;

- Dialogue in which images can be modified, but only by alphanumeric means;

- Dialogue in which the user can draw or manipulate pictures of objects. The input devices used and the speed of the computer in changing the image give the user the impression of drawing directly on the screen.

- Dialogue in which the user is able to create and manipulate symbolic graphic images.

Interaction is achieved through a technology which allows the viewer to adjust certain aspects of the dynamic screen display speed, for example, the amount of detail shown, or the portion of the image displayed. Techniques for motion dynamics allow the user to employ two perspectives: 1) one in which he is stationary, and 2) one in which he is movie. In the first case, objects in the display can be moved with respect to the viewer. In the second case, the viewer is able to move around the stationary objects displayed on the screen. The latter technique is best exemplified in its flight simulation applications, where the viewer moves in and around various elements of the defined environment.

Techniques for otion dynamics which allow the viewer to be mobile can also be used within the context of a non-realistic screen environment. Viewers can move in and around molecules, two-, three-, or four dimensional mathematical functions or scatter diagrams of data points in two- or three- dimensional space (Foley and Van Dam, 1982). Marcus (1977) describes such a simulated space, "Cybernetic Landscape 1," in which the viewer is able to explore a language space composed of abstract visual forms and conventional textual elements. "No longer bound to the incised, written, or printed sheet," the reader travels through the text as context" (p. 10).

Sutherland (1965) who regards the display screen on an interactive graphics system as "a window onto a virtual conceptual 3-D universe," elaborates on this application of computer graphics technology: "I think of a computer display as a window on Alice's Wonderland in which a programmer can depict either objects that obey well-known natural laws or purely imaginary objects that follow laws to be written into the program." (1970, p.57).

Foley and Van Dam (1982) summarize the implications of the capabilities of this new technology:

> Interactive computer graphics allows us to achieve much higher bandwidth man-machine communication using a judicious combination of text with static and dynamic pictures than is possible with text alone. This higher bandwidth makes a significant difference in our ability to understand data, perceive trends, and visualize real or imaginary objects (p. 6).

Opportunities for instructional applications abound as we are now free to experience in a new dynamic medium concepts that have been traditionally confined to textual expression (e.g., mathematical formulas and linear print) (Adams & Fuchs, 1985).

Direct Manipulation

A key feature of interactive graphics displays is the ability to represent objects and to provide a means for manipulating them. Schneiderman (1984) reports that interactive systems exhibiting the following features seem to receive the most enthusiastic user support: visibility of the object of interest; rapid, reversible, incremental actions; and replacement of complex command language by direct manipulation of the object of interest. The best known example of direct manipulation is the video game. The commands are physical actions, including joystick motions, button presses, and know rotations. The results of actions are obvious and easily reversed.

Schneiderman refers to such interactive systems as "direct manipulation" systems. Users are said to report positive feelings in terms of: mastery of the system, competence in task performance, ease in learning the system, and confidence in their capacity to retain mastery over time.

Spatial data management systems provide another example of direct manipulation systems. Spatial data management is a technique for accessing data through their graphical representations, or "icons," which are arranged in two-dimensional information spaces known as "Ispaces". These systems are comprised of a color, raster-scan display, a touch-sensitive screen, and a joystick. The user is able to travel within an Ispace and zoom in on specific icons for additional detail (Friedell, Barnett, & Kramlich, 1982). Schneiderman (1983) proposes that the success of such systems is dependent on the designer's skill in choosing icons and developing layouts that are natural and easily understood.

Relevant Research

Instructional Graphics

Graphics in general have been assumed to contribute to the effectiveness of communication, including communication for instructional purposes (e.g., Bork, 1981). In a comprehensive review of the literature on the effects of instructional graphics, Moore and Nawrocki (1978) identified six different "theoretic predispositions" (p. 4) underlying the basic assumption that graphics serve to increase the effectiveness of instruction. Graphics are thought to be: 1) perceived more efficiently than other forms of verbal or auditory displays, 2) realistic, 3) preferred by learners, 4) capable of relieving overloaded perceptual channels by adding sensory input; 5) important because perceptual research has shown individual differences in visual ability to be a significant variable, and 6) only part of a whole instructional system. Moore and Nawrocki (1978) found, however, that the assumption that graphics increased instructional effectiveness to be unsubstantiated

by empirical research findings, although some studies were found showing positive effects.

Although each medium has its own unique characteristics, the presentation of static images on computer displays can be compared to some extent to the presentation of pictures in a text. Static graphic displays are most often visual representations displayed in support of a textual component. In this context it is useful to refer to the research relating to the instructional effectiveness of text illustrations.

In discussing how the use of pictures can improve the effectiveness of instructional textbooks, Brody (1982) notes the various functions a picture can serve: to reinforce the information presented verbally, to provide additional information, to help ensure retention of information, and to serve as an organizer. Despite the considerable amount of research conducted involving the use of pictures, an understanding of which pictorial elements affect learning from instructional texts is still lacking (Brody, 1982).

Levie and Lentz (1982) note seven different functions of text illustrations categorized as attentional, affective, cognitive, or compensatory. Although they conclude that illustrations can facilitate learning from text, the researchers observe that how they do so is not clear. In terms of the implications for future research, Levie and Lentz (1982) focus on the need to categorize the functions pictures can perform and the need to prescribe how to design for these functions. Wisely and Streeter (1985) in fact present a scheme outlining seventeen functions of static visuals in relation to supporting text. The proposed scheme, however, is based only on intuition and a literature review, and thus requires validation.

Insofar as computer graphics technology extends our ability to represent graphic information, as described earlier, the CAI designer must be prepared to call upon this resource in making design decisions. Until definitive research in this area is available, continuing research should help us identify the conditions in which graphics are a significant adjunct to the instructional process.

Computer Graphics Applications in CAI

Specific research addressing the effectiveness of computer graphics in CAI applications is scarce. A study conducted in 1979 by Moore, Nawrocki and Simutis compared the effectiveness of three types of graphics displays in a CAI lesson, namely low level graphics (schematic representations and boxed alphanumerics), medium level (line drawings), and high level (animation plus line drawings). The type of graphics display was found to have no significant effect on test scores. The researchers, however, noted that the experimental design of the study may have resulted in a masking of any potential effects of graphics during learning. They recommended as a better approach an exploration of the role of graphics during learning in terms of "When, where, how, and with whom are graphics to be used? (P. 13).

By contrast, Rigney and Lutz (1976) had found that animated graphics inserted

into one version of a CAI science unit produced higher posttest scores and more positive attitudes toward the instruction than a non-illustrated control condition, Bernard and Pineault (1984) found a similar overall effect in favor of static illustrations designed to support a computer-based instructional unit on visual anatomy. They also found that simultaneous presentations of text and illustration (i.e., both in view at the same time) promoted better memory of the verbal text, while sequential presentation of text and illustration (i.e., test presented first followed by supporting graphic) tended to produce better memory for the elements portrayed in illustrations. While these results suggest that graphics included within a computer-based instructional environment may be expected to increase learning, the literature regarding such applications has not advanced to the point that specific design guidelines may be derived. For the moment, designers of CAI materials must derive guidance from studies performed on static and/or non-interactive media.

Human Factors Research

This area of research, which combines information from the fields of psychology and engineering, is concerned with how to visually display information on computer screens and is of great potential interest to the CAI designer. Currently, however, the variables regarding dialogue design which have been researched focus more on textual than graphic aspects (Reilly & Roach, 1986)

Interactivity/Direct Manipulation

More sophisticated techniques are required to study the role of computer graphics in the learning process, and interactive application require separate exploratory study. An early study conducted by Oliver (1969) to investigate the effectiveness of interactive computer graphics to teach selected methods in numerical analysis was reported by Brooks (1977). A non-randomized pretest-posttest design was used in the study, in which the use of interactive computer graphics was found to significantly improve performance. In terms ofqualitative observations, individual manipulation of the mathematical objects was found to improve perception and understanding of the objects represented. In addition it was noted that students using the interactive graphics system showed greater class participation and showed initiative in using the system in unanticipated ways.

The role of direct manipulation in learning requires further investigation, as we have little by way of research to explain its effectiveness. Nelson (1980) has proposed a "principle of virtuality," which refers to a representation of reality that can be manipulated, to describe the phenomena. Similarly, Rutkowski (1982) refers to a principle of "transparency," describing the ability of the user to apply intellect directly to the task with the tool seeming to disappear.

Research in the area of problem-solving may assist us in understanding the effectiveness of direct manipulation. Polya (1957), for example, proposes that drawing represents a means of suitably representing mathematical problems. Bruner (1966) also uses the idea of physical representation to convey mathematical principles. Researchers Carroll, Thomas and Malhortra (1980) discovered that subjects given

a problem with spatial representation were able to solve problems more quickly and successfully than subjects who were given an isomorphic problem with temporal representation. Schneiderman (1983) maintains that physical, spatial, or visual representations are easier to retain and manipulate than others, citing the success of LOGO in teaching children mathematical concepts.

The phenomena of direct manipulation involves a high level, active response from the user to the system. Within a CAI context, this implies an active involvement of the student with the learning situation, increasing the likelihood that the student will learn. Bork (198 1) maintains that the quality of interaction in the design of the program ultimately determines the quality of the instructional program. The capability of direct manipulation made possible through computer graphics technology will greatly enhance current levels of interaction. A great deal of research in this area will be required, however. before we will be able to maximize the effectiveness of such interactions.

Conclusion

We have examined some of the emerging capabilities of computer graphics technology within the context of potential CAI applications. As well, we have reviewed the research in key relevant areas in an attempt to determine their applicability to these new graphic tools. It is a fact that we will have increasing access to presentation and response capabilities that have never before been possible. Guidelines for the use of these capabilities are not yet available, and on the basis of the current state of research in the field, we can predict that such assistance will take time in arriving. The CAI designer, however, needs to be aware it will be necessary to design new and different interactions.

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Media Technology Perspectives And Their Curriculum Implications for Media Education

Alice Yuet Lin Lee

Abstract: This article examines the mass media from a technological perspective. A typology is developed to (1) evaluate and analyze the social and cultural impact of media technologies; and (2) explore the curriculum implications of such an impact. The typology divides existing studies on communication technology into three type: technological determinism, determined technology and socially constructed technology. It is argued that different approaches of media education stem from different conceptualizations of the social impact of the mass media. The above three perspectives could result in three different curriculum developments in media education – inoculative, ideological and socially participative. The last approach is based on the philosophy of socially constructed technology and is considered more desirable for media teaching.

Résumé: Cet article etudie les mass-médias d'un angle technologique. Une typologie y est développée pour i) évaluer et analyser l'impact culturel et social des technologies des médias et ii) étudier sous tous ces aspects les implications curriculaires d'un tel impact. Cette typologie sépare les études actuelles sur les technologies des médias en trois catégories: celle mettant l'emphase sur le déterminisme technologique, la technologie établie - i. e. celle produite par une organisation sociale donnee - et la technologie socialement construite - i. e. en interaction avec l'organisation sociale -. Nous affirmons que les différentes approches en enseignement des médias ont à voir avec Ics différentcs conceptualisations dc l'impact social des mass-mtdias. Les trois pcrspcctivcs ci-dessus mèneraient donc à trois différents développements curriculaires en enseignement des médias que l'on appellerait respectivement: préventif, idéologique et participatif. La dernière approche est basée sur la philosophie d'une technologie socialement construite et est considérée comme la plus souhaitable pour l'enseignement des médias.

Towards the 21st Century, communication technologies have rapidly developed, resulting in a technologically advanced information age. Mass media have played an increasingly important role in people's daily lives. This article examines the mass media using a technological approach. Print, radio, television, film, video and multi-media are all regarded as technological devices that are used for the selection, transmission and reception of information. Based on this premise, a typology is developed to (1) analyze and evaluate the social and cultural impact of media technologies; and (2) explore the curriculum implication of such an impact.

The typology divides studies on communication technology into three types: technological determinism, determined technology and socially constructed technology. These three perspectives provide diverse views on the social impact of communication technology. Nevertheless, they all address mass communication as a significant social force demanding a new role in education.

The educational response to the advancement of communication technology

has been to introduce media education into the educational system. Media education is the study of theories, criticisms and debates about the mass media and is regarded as one of the effective alternatives to deal with the great impact mass communication imposes on modern people's lives (Lusted, 1991). An official definition was put forward by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1973 as follows:

> Media education is the study, learning and teaching of, and about, the modern media of communication and expression as a specific and autonomous area of knowledge within educational theory and practice, distinct from their use as aids for the teaching and learning of other areas of knowledge, such as mathematics, science and geography (IFTC, 1977, p. 3).

In the 1990s media education has already developed from a fringe concern to a global movement. Australia, Britain and Canada are the leading countries in media education. In Canada, media education has been introduced to many provinces including Alberta. British Columbia, Manitoba, Ontario, Quebec and Saskatchewan. Curriculum professionals and teachers in these provinces have formally or informally integrated media education programs into their school curricula. In this article, it is argued that the three media technological perspectives to be discussed below have different curriculum implications in any teaching of the mass media.

Technological Determinism

The first category in the typology outlined in Table 1 is technological dctcrminism, being the studies or theories attributing communication technology as the essential cause of social formation. According to this perspective, communication technology sets the conditions for social formation. It influences our cognition and sensorium, changes our social behaviour and shapes our culture. It not only affects our society but also alters our world. Moreover, this perspective argues that technology has its own internal logic of development. New technologies are discovered, by an essentially internal process of research and development, which then generate social transformation. Williams (1974, p. 13) calls this kind of argument "an immensely powerful and largely orthodox view of the nature of social change." Medium theorists like Harold Innis, Marshall McLuhan and Joshua Meyrowitz, techno-cultural pessimists such as Jacques Ellul, George Grant and Neil Postman, and many researchers of media effects basically subscribe to the view oftechnological determinism.

Medium Theory

McPhaiI and McPhail (1990) suggest that an examination of communication technology and culture should begin with the work of Canada's two most influential scholars in this area – Harold Innis and Marshall McLuhan. These two "medium theorists" advance the notion that the rules and patterns ofcommunication in society are major determining factors in our social, economic and political fabric. Their theoretical propositions are highly deterministic and, thus. Czitrom (1982. p. 147

Table 1: Typology of the Socio-Cultural Impact on Mass Communication Technologies

	Technological Determination	**Determined Technology**	**Socially Constructed Technology**
Argument	(Technology as the cause)	(Technology as an effect)	(Technology as both cause and an effect)
	• New communication technologies sets the conditions for social change • Technology has its internal logic of development	• Communication technologies are by. products of particular social formation • The development and use of technology are intentionally determined by a single social force	• Communication technology is both a cause and an effect; it is a part of the process of social formation • Technology has interactive relationship with the political, economic, social and intellectual systems. It is indluenced by these systems but wholy controled by neither of them
Selected Schools/ Authors	• Medium theorists: Innis, McLuhan, Meyrowitz • Techno - cultural pessimists: Ellul, Grant, Postman • Behavorial media effects model (eg., sex, violence): Winn	• Critical communication theory: Althusser, Enzensberger, Adorno & Horkeimer (Franfurt School) • Political economy model: Herman & Chomsky, Schiller	• Mumford • Williams • Franklin • Ungerleider & Kreiger • Tichi • Altheide • Fiske
Assumptions	Autonomous model: • Research and development of communication technologies are self. generating. The new technologies are invented as they are in an independent sphere, and then create new societies • The state has no important role to play • Communiction technologies have deterministic power • Mass media are evil • Media consumers are mindless and passive	• Dominant ideology mode: • Technology as a tool for social control. The determination on technologies is regarded as a single force which is wholly controlling and predicting • The state exercises hegemony through media • Communication technologies are tools of social control • Media consumers are mindless and passive	• Social construction model: • Technology has its own logic and characterics but its function and use are shaped by humans • Not possible for total manipulation on media technologies • The state can play positive role • Communication technology is powerful but not omnipotent
Concerns	• Decline of human values and civilization • Anomie • Moral degeneracy	• Ideological manipulation • Political fake • Commodity fetishism	• The interplay of communication technology and society • Social construction of media institutions • Cultural politics
Strengths	• Sophisticated analysis on individual medium • Raises attention to the threat of technology to culture	• Directs attention to the "intention" of abusing technology	• Calls attention to existing and developing communication institutions • Sees room for negotiating control and social reform
Limitations	• Abstracts technology from society • Ignores the "intention" behind the use of technology	• Fails to acknowledge the fact that the reality of determination is the setting of limits and the exertion of pressures within which variables social practice are profoundly affected but never necessarily controlled	• Vague about the process of negotiating control • Idealistic
Educational Implications	• Damage limitation approach • (Product. oriented) • "Damage limitation": resistance and discrimination to mass media, message and media format, or, • Accommodation for survival	• Ideological approach (Product oriented) • Ctirical interpretation of mass media messages for. "emancipation"	• Socially participative approach • (Process oriented) • Understanding and shaping process of media institutions (so that communication technology can develop in a healthy and democratic way)

characterizes their works as the "two wings of a body of knowledge that locates the formal characteristics ofcommunication media as the prime mover behind the historical process, social organizations, and changing sensory awareness."

Innis (1950, 1951) proposes that the rise and fall of civilization and the cultural changes within an individual civilization may be understood as functions of the dominant media of communication. Each epoch is distinguished by dominant forms of media that record and transform information into systems of knowledge which are in line with the institutional power structure of that society. The interaction between media form and social reality creates biases, which strongly affect the society's cultural orientation and values (Heyer & Crowley, 1991).

Marshall McLuhan shares Innis' idea that society is radically reshaped with the introduction of new media. McLuhan differs from Innis in that he was primarily concerned with the impact of media technology on human sensorium, not the relationship between communication and social structure (Czitrom, 1982). McLuhan argues that a change in the dominant medium influences which senses we use, thereby altering our world view. His famous phrase "the medium is the message" advocates that the form of the medium alters the environment, shapes society, and structures thought in a way that its content could never do. To McLuhan, the new electronic technology is organic and non-mechanical in tendency because it extends, not our eyes, but our central nervous system as a planetary venture. As Czitrom (1982, p. 177) puts it, McLuhan "elevated this metaphor into a psychological and biological principle at the centre of a rigid technological determinism."

Influenced by Innis, McLuhan (1964) advances the argument that each medium has unique effects and a grammar of its own. For example, print is a linear, quantitative and logical mode of communication which creates a "visual space." On the other hand, electronic media, particularly television, are holistic and qualitative modes of communication which create an "acoustic space" (McLuhan, 1964). Every medium creates an environment that is the message of that medium. However, the media environment is invisible to people in the way that water is invisible to fish. Therefore, he stresses the need for an urgent awareness of the media environment as a basic force shaping the modern sensibility (McLuhan, Hutchon, and McLuhan, 1977).

Meyrowitz (1985), who integrates McLuhan's (1962, 1964) works with Erving Goffman's (1959,1961,1963,1967, 1969,1971,1974,1981), puts forward a powerful theory of television. He suggests that television makes people have "no sense of place." It alters the balance between public and private space, blurs the difference of childhood and adulthood, lowers political heroes to our level, brings decline of authority and overlaps socialization spheres. The result includes the blurring of age, gender and authority distinctions. Like McLuhan, Meyrowitz is also medium-oriented. His analysis focuses on how the inherited characteristics of television exercise influence on people's perception and behaviour. Moreover, his arguments are also deterministic in tone.

Techno-Cultural Pessimism

In the discussion of technological determinism, one cannot exclude the work of the French sociologist Jacques Ellul who demonstrates that technology, which is continued to be conceptualized as the servant of man, will overthrow everything that prevents the internal logic of its development, including humanity itself (Ellul, 1964). He points out that technological society requires humankind to be contented with what it is required to like. For those who are not content, it provides distractions-escape into absorption with technically dominated media of popular culture and communication (Merton, 1964). To Ellul, communication technology is an essential component of the technological society.

Key elements of Ellul's conceptualization of the technological society are the "laws of development of technique." According to Ellul (1964) every part of a technical civilization responds to the social needs generated by technique itself. In a technological society, an autonomous technology is taking over the traditional human ends and values by becoming an end in itself. Ellul concludes that this is the real tragedy of our modern civilization which is increasingly dominated by technique. In his view, humans can find "no exit" from this mechanical civilization.

George Grant shares the lament with Ellul that humanity has been suppressed by the modern, technical order. As a Canadian, Grant is particularly upset about the lost of cultural heritage through absorption into the fully modern technical empire of the United States. Canada has long been flooded with American media products. Its cultural domain is largely conquered by the sophisticated American communication technologies. Kroker (1984, p. 15) remarks that Grant is "the most important representative in Canadian thought of the perspective of technological dependency." In the new electronic age, Grant reminds North Americans that their fate is to live as dying "gasping political fish," suffering an oxygen-starved morality and vision in the midst of the technological dynamo (p. 14). Grant is a determinist in his allegation that our future is fated to be hopeless due to the further advancement of modern technology.

Like Ellul and Grant, Postman adopts a cultural approach to examine the impact of technology and depicts a gloomy scenario. Postman (1985) demonstrates his worry that Huxley's "Brave New World" is coming into existence in America with television being the dominant medium of the century. Huxley predicts that in the technological new world, people would adore the very technologies that undo our capacities to think. According to Postman (1985), before the emergence oftelevision American culture was shaped by the printed media during the "Age of Exposition." With the advent of television American culture was remodelled, ushering in the Age of Show Business. In a culture dominated by print, he asserts, public discourse tends to be characterized by a coherent, orderly arrangement of facts and ideas. In the age of show business, people watch television, and discourse is conducted largely through visual imagery. The culture is overwhelmed by irrelevance, incoherence and impotence. Since television is entertaining, it has made entertaimnent itself the natural format for the representation of all experience.

Postman says the problem is not that television presents us with entertaining subject matter but that all subject matter is presented as entertaining. Now, all public discourse increasingly takes the form of entertainment. Politics, religion, news, athletics, education and commerce have been transformed into show business. This transformation is irreversible. The new technology changes everything.

Behavioural Model of Communication Studies

Research on mass communication has long been dominated by the "effects" approach adopted by psychologists and sociologists. Many studies conclude that the mass media condition all kinds of social behaviour. Some critics call this view the hypodermic theory, which emphasizes the powerful and determining consequences of modern communication technologies.

The behavioural approach to communication is usually concerned with the evil influences of media entertainment (Starker, 1989). These influences include the stimulation of violence, undermining of sexual morality, promotion of passivity, substitution of fantasy for reality, and promotion of materialism. Winn (1979) even describes television programs as a plug-in drug: "The essence of any serious addiction is a pursuit of pleasure, a search for a 'high' that normal life does not apply... Not unlike drugs or alcohol, the television experience allows the participants to blot out the real world and enter into a pleasurable and passive mental state" (p. 24). On the one hand, she highlights the deterministic character of the electronic media and laments the powerlessness of modern man in the face of "the abstract machine that modern society has become" (p. 271). On the other hand, she urges us to assert our wills in the face of the real and tangible machine (television set) in our homes to make sure it is not controlling us.

Assumptions and Concerns

Technological determinism is based on an autonomous model ofcommunication. This perspective has several assumptions. Firstly, it assumes that research and development of communication technologies are self-generating (Williams, 1974). The new technologies are invented, as it were, in an independent sphere. Ellul is the key supporter of this kind of proposition. Secondly, mass communication has deterministic power. As pointed out by Innis, McLuhan, Postman and other behavioural theorists, communication technology is the prime mover behind history and the most influential determinator of social behaviour. Thirdly, communication technology is assumed to be dangerous or even evil. Techno-cultural pessimists such as Ellul, Grant, Huxley and Postman see the dark side of technology, and even lnnis and McLuhan are conscious of the bias and destructive nature of modern communication media. The behaviourists even regard the mass media as agents of social diseases. Fourthly, this perspective assumes that the audience and readers are mindless, passive and powerless in front of the omnipotent media.

The major concern of this perspective is the decline of human values and civilization. It draws attention to the threat of technology to culture. Most authors listed above larnent the domination of humanity by communication technology. Even

McLuhan who is excited by the new electronic media warns us of the confusion brought which accompanies the new media environment. Furthermore, these authors have moral panic resulting from most of the new communication technologies.

Determined Technology

The determined technology perspective takes communication technology as an effect (Williams, 1974), a by-product of particular social formation. This perspective emphasizes other causal factors in social change. The development and use of technology are determined by other social forces such as economic production or political development. Very often, communication technologies are considered merely tools of the dominant social group. This view of determined technology (Herman & Chomsky, 1988; Schiller, 1989) is represented by the Frankfurt School (Adorno, 1990; Adorno & Horkheimer, 1977; Marcuse, 1964), dominant ideology theorists and political economists.

Critical Communication Theory

Critical communication theory views communication technology as a by-product of the capitalist economic force and social struggle. For example, according to Althusser (1971) communication (press, radio and television) is regarded as one kind of the hegemonic tools of the capitalist ruling class. Althusser divides the concept of state into Repressive State Apparatus (RSA) and Ideological State Apparatuses (ISAs). The RSA is composed of the legal system, the police, the army, the government and administration whereas the ISAs consist of communication, religious, educational and political institutions as well as trade unions and families. Since no ruling class can rule by means of force alone, the state has to exercise its hegemony through the ISAs (Blackledge & Hunt, 1985). With the sophisticated development of communication technology, mass media are considered as one of the most powerful ideological agents in modern society.

From a critical theory viewpoint, the function of the media is to produce the appropriate consciousness or ideology in the majority of people to ensure the reproduction of what is essentially an exploitative system of social relations (Jhally, 1989). Enzensberger (1974) coins the phrase "consciousness industry" to describe the media, which are theorized to produce a form of consciousness in the audience that benefits the class that controls both the media and the production industry.

A particular coherent body of thought dealing with the ideological effects of mass media is that of the Frankfurt School (Schroder & Skovmand, 1992). Mass media are labelled as "cultural industry" (Adorno, 1990; Adorno & Horkheimer, 1977). Adorno and Horkheimer, the two major figures in the Frankfurt School, argue that under capitalism the profit motive is transferred to cultural forums in that more and more artistic products are turned into a commodity, marketable and interchangeable like industrial products. Their criticism of the cultural industry (mass media) can be summarized as follows:

(1) *The promotion of commercial values.* The industrialization of culture places culture under the same laws ofeconomic production as in other commercial spheres.

Other Frankfurt School theorists have further elaborated on how the mass media encourage consumption of other products through advertising. Media programs promote values such as the lifestyles of the wealthy, matching the selling messages of the advertisements.

(2) Consciousness manipulation. Cultural products are regarded as carriers of ideology which are purely manipulative and debasing. People who consume and enjoy them either will be debased by these activities or are living in a permanent false consciousness. Hence, the Frankfurt School considers these products to be "the opium of the people" and the consumers "cultural dupes."

(3) Mindparalysis. Since the rise of the mass media as capitalistic enterprises has resulted in the standardization of cultural forms, this process has in turn atrophied the capacity of the individual to think, reflect on the world, and act in a critical and autonomous way.

Political Economy Model of Communication Studies

Although Herman and Chomsky (1988) are not orthodox Marxists, they are critical of the ideological function of the mass media. They put forward a propaganda model to accuse the American mass media of "manufacturing consent." To them, the emphasis, selection of content, premises and general agenda of news production are highly functional for established power, responsive to the needs of the government and major power groups. The powerful decide what the general public is allowed to see, hear and think about, managing public opinion through regular propaganda campaigns.

Adopting a "free market analysis," Herman and Chomsky (1988) argue that the performance of the media is largely an outcome of market forces. Most biased choices in the media arise from the pre-selection of right-thinking people, internalized preconceptions and the constraints of ownership, organization, market and political power. Censorship is basically self-censorship, by reporters and commentators who adjust to the realities of source and media organizational requirements.

Schiller (1989) follows a similar line of interpretation of the mass media. However, his accusation points directly to the business corporations. He advocates that in the last 50 years, the corporate sector in the American economy has widened its economic, political and cultural role in domestic and international activities. The major concern he raises is the corporate control of cultural activities. To Schiller, modern technology has been designed, produced and employed by the same corporations. The new communication technologies create a "market ideological atmosphere." The cultural industries become an integral component of the market economy and their sales messages invade public, private and personal space. It is important to investigate the connection between corporate power and the utilization of new communication technologies if freedom of expression and democratic politics are still goals to pursue.

Assumptions and Concerns

The view of determined technology focuses on dominant ideology in examining

communication. It argues that communication technology is used for reproducing dominant ideology, supporting the social order which favours the dominant social group. This argument is based on several assumptions, the major one being that the development and use of communication technology is determined by a single force, wholly controlling and predicting. As analyzed by Adorno and Horkheimer (1977), the determining force is industrialization. The culture industry is the product of the industrialization of culture. To Althusser (1971) and Enzensberger (1974), the determining force is the capitalist economic structure which is based on class exploitation. Communication technology is a tool for social control and state hegemony. To Schiller (1989) and Herman and Chomsky (1988), the determining factor is the market force.

New communication technologies are also assumed to be tools of oppression. The mass media provide cultural opiates and exercise consciousness manipulation while the state is theorized to have the same interests as Big Capital. Together they form the ruling class and exercise hegemony through the mass media. The audience are then assumed to be brainwashed cultural consumers. Since they are innocent and passive, ideological content is projected directly into their minds.

This perspective is primarily concerned with the manipulating power of the mass media. Political fakery and commodity fetishism are regarded as the two major negative consequences of mass communications, always giving rise to controversial debate. Scholars holding the view of determined technology wonder whether people are still capable of cultivating a critical and responsible attitude and whether independent individuals can exercise reasoned judgments in modem society.

This perspective directs our attention to the possible abuse of communication technology by particular social groups. It also illustrates that technology is not self-generating but its development is directed by social intention. However, it seems that this perspective overemphasizes the "intention" behind the social use of communication technology and falls into the trap of another form of determinism. Like technological determinism, the notion of determined technology is one sided, a singular version of the human process. Certainly, the political economy of a capitalist society and the corporate market force are important social factors. However, by no means are they the only controlling and predicting set of causes for technological development. As Williams (1974) puts it, some determining factors set limits and exert pressure on social practice (including the social use of communication technology), but they are never wholly manipulative.

Furthermore, other assumptions of this perspective are questionable. For example, on the one hand it overemphasizes the debasing function of the mass media and fails to explore the positive roles the mass media may play in modern societies. On the other hand it underestimates the autonomy of the media consumers. Recent audience research indicates that media consumers are active and selective (McQuail, 1994; O'Sullivan, Dutton, & Rayner, 1994). It is not appropriate to assume that a particular cultural product will have any one given effect, having been received and appropriated by a wide range of individuals in the course of vastly differing daily lives.

Socially Constructed Technology

In contrast to technological determinism and determined technology, the socially constructed technology perspective argues that communication technology is both a cause and effect. It is, in fact, part of the process of social formation. This perspective is against the view which alleges that technology develops autonomously. It suggests that technology develops according to human choice. It also objects to the notion that technology is wholly controlled by some particular social forces. Technology has an interactive relationship with the political, economic, social and cultural systems. Technology is affected and constrained by these systems but it also exercises influence on them. A number of scholars from the fields of social science and cultural studies, including Lewis Mumford, Raymond Williams, Ursula Franklin, David Altheide and Cecelia Tichi, hold the view of socially constructed technology.

Technological Development by Human Choice

Mumford (1934) points out that technology has affected not only our conceptions of space and time but also of human relations and institutions. For example, the telescope challenged the theological world. As the earth was known to move in relation to the sun, so the position of man in relation to God moved as well. Although Mumford sees the significant role technology plays in the development of human civilization, he rejects any deterministic analysis of technology. He stresses that "technics and civilization as a whole are the result of human choices, aptitudes and strivings... No matter how completely technics relies upon the objective procedures of the sciences, it does not form an independent system" (Mumford, 1934, p. 6). In his view, the machine itself makes no demands and holds out no promises; it is the human spirit that makes demands and keeps promises. He proposes that in order to reconquer the machine and subdue it to human purposes, one must understand and assimilate it. He is optimistic about the outcome and concludes that "nothing is impossible" (p. 435).

Like Mumford, Williams (1974) opposes technological determinism. He is particularly critical of McLuhan, saying that in McLuhan's work "all media operations are in effect desocialized; they are simply physical events in an abstracted sensorium" (Williams, 1974, p. 127). Williams calls attention to the social context within which technology develops. He argues that throughout history communication technologies have been shaped by changing political and economic forces. Famous for his idea of "long revolution" (political, economic and cultural revolutions), he points out that the development of communication technologies is a significant part of any cultural revolution and that democratic, industrial and technological revolutions cannot be separate processes (Williams, 1961). They grow together and influence one another. Furthermore, Williams (1976) highlights the importance that different societies and cultures will develop different communication systems. For example, the US broadcasting system is much more commercial-oriented than the British

one. He lists four kinds of communication systems, namely authoritarian, paternal, commercial and democratic, to illustrate different societies pursuing their technological aims in different ways.

While suggesting that technological determinism should be rejected, Williams (1974) warns not to substitute it with the notion of a determined technology. It is true that most technical development is in the hands of corporations which express the contemporary interlock of military, political and commercial intentions. The limits and pressures on the use oftechnology are real and powerful but they cannot be totally controlling. To Williams, technology is malleable and socially constructed. People should develop their capacity and power to direct their own lives by creating democratic media institutions. This goal is difficult to attain but society should engage in "a continually renewable social action and struggle" (Williams, 1974, p. 134).

In line with the view of Mumford and Williams, Franklin (1990) maintains that technology is not preordained. For her, there are choices to be made and she sees "no reason why our technologies could not be more participatory and less expert-driven" (Franklin, 1990, p. 1 15). In her view, within a very short historical period, communication technology has greatly changed the perceptions of space and time. The imaging technology has given emphasis to the far instead of the near, and to the abnormal instead of the normal. The images create pseudorealities which in turn lead to a pseudocommunity. Moreover, she is concerned that these technologies have no room for reciprocity, a response to a given situation. She worries that the production of pseudorealities and the elimination of reciprocity will diminish the sense of common humanity. In order to make "the real world oftechnology" become "a globally liveable habitat," she insists on reintroducing human justice to the technological decision making process. For her, "the crisis oftechnology is actually a crisis of governance" (p. 120). The development and use of technologies should be bound by a social contact, based on social equality, fairness and justice.

Interlocking Relationship between Technology and Other Social Systems

Similar to Williams's analysis, Ungerleider and Krieger (1985) put emphasis on the interlocking relationship between media and other social sectors. They put forward an analytical framework to illustrate how in every society the five systems (technological, political, economic, social and intellectual) are interconnected. They argue that "changes in one system of activity influence changes in the other systems" (p. 12) and point out that television led to changes in all other areas of society, but at the same time its development was impacted on the other four systems. In other words, television is both a cause and effect of the social formation of our modern world.

Tichi is also interested in the interplay between television and society. She examines the social construction of television in America and her study basically tells a story of the cultural assimilation of a technology. She argues that "no matter how strikingly new a technology (e.g., television) may be, once introduced into

society, it becomes deeply enmeshed in long term cultural traditions and conflicts" (Tichi, 1991, p. 7). Based on her study of some 40 years of advertisements, cartoon humour, art, journalism, memoir and fiction, she reveals how American social attitudes constitute the television enviromnent as well as the deep involvement of television in national values including American individualism, domesticity and patriotism.

Altheide and Snow (1979), on the other hand, are concerned with the impact of media perspectives on other domains of social life. They propose that the media, as a social force in society, are a form of communication with a particular logic their own. They call it the "media logic," which is the way media present and transmit information. They argue that mass media have risen to a dominant position in the institutional network of society primarily because various institutions follow a media logic in the definition and solution of problems. This process has resulted in the construction of a media culture which emerges from acting through specific media formats. For example, the politicians and others who are covered by the media use the same criteria the journalists do, and often more skilfully. The political campaign is then built from standard communication procedures and formats (Altheide & Snow, 1991). To Altheide and Snow, it is not a case of media dictating terms to the rest of society, but an interaction between organized institutional behaviour and media.

Active Audience Theory

As mentioned above, many authors point out that the development of communication technology, to a certain extent, is affected or constrained by other social institutions. In addition to this, active audience research in recent years has shown the power of communication technology, such as television, is also limited by its audience (Ang, 1995; Fiske, 1987). Related studies have traced differences among viewers, modes of viewing and meanings or pleasures produced. For example, television viewers are regarded as social subjects who have a history and live in a particular social formation (a mix of class, gender, age, religion, etc.). Based on its social position, the audience generates negotiated readings of the text. The media message is not solely in the text, but can be changed or worked on by the audience as they make their own interpretation of a program (Fiske, 1987).

Assumptions and Concerns

The perspective of socially constructed technology sees the use of communication technology as negotiable. It rests on several assumptions. First, technology has its own logic and characteristics but its function and use are directed by humans. Second, it is not possible for a particular social group to gain total control of media technologies. Third, communication technology is viewed as powerful but not omnipotent. In many ways communications are shaped and influenced by the social and cultural environment. People would not accept mass media misinformation directly and uncritically.

This perspective emphasizes the interplay between communication technology

and society and its major concern is the social construction of media institutions. In other words, its primary focus is how cultural politics develops to establish a desirable communication system. For example, Williams (1976, p. 133) suggests that we should develop a "democratic communication system" by reforming the present media institutions. This system should insist that all people have the right to offer and receive what they choose. It is against authoritarian control of what can be said, and against paternal control of what ought to be said. It is also against commercial control of what can profitably be said because that also can be a tyranny.

This perspective draws attention to the existing and developing communication institutions. It sees room for negotiating control and social reform. Unlike the pessimistic views oftechnological determinism and determined technology, it has faith in human capability to conquer and manage new communication technologies such as television, video and multi-media. With regard to popular culture, this perspective is not authoritative like that of the technological determinists or elitist like that of the determined technologists. It respects popular culture disseminated through the mass media. For example, Williams (1976, p. 115) opposes the distinction between high culture and low culture. However, he warns that those excessively violent programs should not be counted as "popular culture" but "synthetic culture" or "anti-culture."

The Changing Concept of Literacy

The three perspectives have different theoretical assumptions and concerns, and therefore provide diverse views on the social impact of communication technology. Nevertheless, they all address mass communication as a significant social force and have implications on the following social phenomena: (1) high rate of media consumption; (2) mediation of contemporary culture; and (3) electronic and digital mode of communication. These phenomena, in turn, demand a new look at the concept of literacy.

High Rate of Media Consumption

In the information society, a great deal of information is made available to the people through advanced communication technologies. Receiving information becomes one of the most common experiences (Jarvis, 1985) as we are bombarded by numerous mass media images every day. The new communication technologies are not only vehicles of communication but also substitutes for the family and even school in becoming a major socialization agent. For example, an average Canadian student spends 23 hours a week watching television, which means children spend more time in front of the box than they spend in classroom (O'Brien, 1989). Television, together with other mass media, becomes an "invisible curriculum" alongside the ordinary school curriculum (Lee, 1997). As mass media assume a teaching role, more and more children now learn by television.

Mediation of the Culture

Unlike the ages of oral and print societies, in modern society a lot of information

a person gets is not first hand. It is mediated by all kinds of communication technologies and the information received is thus loaded with certain values and ideologies. In this "processed world," culture is gradually shaped by these communication technologies. Thompson (1990) puts forward the idea of "mediazation of the culture" which refers to this general process of symbolic forms becoming increasingly reliant on the technical and institutional apparatuses of the communication industries. As outlined before, Innis (1950, 195 1) and McLuhan (1962, 1964) already demonstrate communication technology as a shaper of culture. Schiller (1989) and Herman and Chomsky (1988) charge the filtering function of mass media as the hindrance of public free expression which damages the democratic process. Williams (1961, 1974, 1976) is concerned about the institutional mediation of cultural production. Other authors also point out that new communication technologies have been transforming social behaviour and reshaping the cultural landscape. Therefore, the mediation of culture is one of the social phenomena of most concern in the modern world.

The traditional concept of literacy (reading and writing) has the goal of helping people make sense of their world so that they can function efficiently in it. In other words, literacy is used to interpret the world. Since the world is now being shaped by the new communication technologies, there is naturally a need to expand literacy to include technological media in order to better understand social and cultural formation. According to Agostino (1991, p. 26) "there will be a growing demand for literate people... who can fully understand and to be able to harness the impact of an ever changing technology."

Electronic and Digital Modes of Communication

Western industrial countries have already entered the information age. Print is no longer the most preferred mode of communication (Agostino, 1991). It has now been joined by the visual media (e.g., television, film, video and laser disc) as the keepers and conveyors of our culture. In fact, television and the computer are now replacing print as the most influential communication media in our everyday life. As discussed before, both Innis and McLuhan point out that every communication medium has its own unique characteristics and impact. For example, print is a linear and logical mode of communication while television is a holistic mode of communication. Since the new modes of communication (e.g., television, video and multi-media) have different grammar and logic, a literate person in a modern world naturally needs to learn not only traditional language, but also visual and digital language in order to communicate effectively.

Therefore, there is a need to redefine a literate person in today's world. The traditional view of literacy as being skilled in reading and writing is no longer sufficient for people who live in a more technologically sophisticated world-a world requiring an understanding of symbols, message carriers and nonverbal communication channels (Ely, 1984). The concept of literacy should then be broadened to include media literacy and computer literacy. In other words, education has to play a new

role in promoting media literacy or "infomedia literacy", which might be characterized as being literate in information and media technology (Lee, 1997). According to Lee (1997) media literacy is a life skill which has several components. The first component is a critical awareness of the impact of mass media. The second is an understanding of the media as to how, why and for whom the media is constructed. The third is the ability to conduct critical analysis. The fourth is proficiency in using the media for self-expression. The fifth is the ability to learn through the media by making broader analysis of the social, economic, political and media structures of society so that responsible citizenship can be developed. Media literacy also incorporates the concept of media appreciation and enjoyment.

As media censorship infringes on freedom of expression, media education may be an effective tool in moderating the impact mass media have on most people's lives. Media education here is defined as the study of the mass media with the primary aim to develop media literacy. It is either a formal or informal curriculum in the educational system.

Curriculum Implications of Media's Social Impact

As the influence of the mass media intensifies and the concept of literacy changes, the demand for media education grows. In the 1990s there is no need to argue whether or not media education should be a part of the school curriculum. Rather the controversy lies in how to deliver media education. It is the author's view that different approaches to media education stem from differing conceptualizations of the mass media's social impact. The three media technology perspectives discussed above have varied theoretical assumptions and social concerns and thus they offer distinctly different curriculum directions for media education.

Media Education for "Damage Limitation"

Most technological determinists have a negative and pessimistic view of communication technology. Even McLuhan repeatedly refers to the "numbness," "trance," "subliminal state," "somnambulism" and "narcosis" induced by the new electronic media (Czitrom, 1982). Technological determinists either deny there is a role for education to play or enthusiastically adopt a damage limitation approach to media education.

Pessimists like Ellul and Grant see no way out of the technological society. For them there is little education can do to reverse the tragedy of technological domination. However, for some other technological determinists, they rely on education to counter negative media effects. For example, McLuhan argues the electronic media constitute a total and near instantaneous transformation of culture, values and attitudes. This upheaval generates great pain and identity loss, ameliorated only through a conscious awareness of its dynamics. In his view, if we understand the revolutionary transformations caused by the new media, we can anticipate and control them. But continue our self induced subliminal trance, we will be their slaves (Playboy Interview, 1989). Thus, he wrote a media education textbook

(McLuhan, Hutchon, & McLuhan, 1977) to help students understand the media environments that surround them and the effects of these environments upon society. His notion of media education is in fact a kind of anomie control for surviving the new communication era.

Postman (1979) regards television as the first curriculum and school as the second. He advocates media education which he defines as "the discovery of how our thought and behaviour are controlled by our communication technology" (p. 192). Media education is proposed by him to balance the negative cultural effect of the mass media, particularly television. Postman was especially influential in promoting the inclusion of media education in the school subject of English in the 1970s and 1980s in both Canada and the United States. For those who are concerned with how the mass media exercise negative influence (such as television programs with sex and violence) on human behaviour, they see a need for resistance or discrimination in accepting the offerings of the mass media. Buckingham (199 1) calls this phenomenon moral panic.

Media educators who follow the assumptions and concerns of technological determinism will naturally have a negative view of media effects. Their notion of media education is the "counter-evil" type. Their justification for media education is to limit the damage mass media impose on the society. They also emphasize the need to protect young people by arousing their awareness of the potential danger of media influence, or to help them get out from the anomie created by the new media. Therefore, some media educators name it the inoculative approach of media education (Masterman, 1993).

Media educators who adopt the damage limitation approach share the same concern of many in society, particularly teachers and parents, about the negative effects of the mass media. In this sense, media education of damage limitation approach is fulfilling a public demand to protect school children. The damage limitation approach serves to arouse awareness of the negative influences which may undermine traditional values or damage the culture. Moreover, media education of this type is target-driven (e.g., violent media programs become targets of criticism), with a very concrete goal in mind. However, these media programs fail to provide a balanced view on the impact of mass media and they do not quite match the media experiences and feelings of the young people who obtain great enjoyment from media consumption in everyday life.

The damage limitation argument has many inadequacies. First, it assumes mass media are evil in nature. Behaviourists even regard the mass media, television in particular, as agents of social disease. But the mass media also have positive functions. Overemphasizing the negative side of the media turn them into scapegoats of social and cultural problems. It creates a misleading perception that if there are no violent programs on television the crime rate will drop. Secondly, it assumes that audiences and readers are passive and powerless in front of the omnipotent media. Youngsters are especially viewed as innocent and they need protection from bad influences. However, some studies have revealed that media consumers are not

sheets of blank papers allowing the media to imprint values directly onto their minds. They can be both active and selective.

Thirdly, the role of education in this approach is social control and media education is paternalistic in nature. Fourthly, media educators adopting this approach are elitist and their attitude towards popular culture is unfriendly. Fifthly, media education from this approach is basically product-oriented. The emphasis is on the media product itself, including its content and form. It focuses on the resistance and discrimination of media message, or raises awareness of the influence caused by certain media format. It teaches students to analyze and criticize the media text or media code but not the social context which produces it.

Media Education for Emancipation

In the late 1970s media teachers began to link their teaching with a number of structuralist ideas, particularly in the area of semiotics and ideology (Masterman, 1993). The ideological approach of media education is based on a view of determined technology. It adopts the arguments from critical communication theorists and political economists to place questions of politics and power at its centre. Masterman's media education theory is a prime example. One major reason he argues for offering media education is "the ideological importance of the media, and their influence as consciousness industries" (Masterman, 1985, p. 2). In his view, mass media, as consciousness industries, provide not simply information about the world, but ways of seeing and understanding it. He cites the example of television whose principal function is to convey the dominant ideology of society (Masterman, 1992). He argues that those people who control and work in the media do not simply have the power to set agendas, provide explanations and construct their own versions of events. They also provide myth. Therefore, the objectives of media education are "demystilicatory and critical" (Masterman, 198.5, p. 9). It is important for students to achieve "critical autonomy" (Masterman, 1992, p. 102).

Masterman's works (1980, 1985) were very influential among media educators in the 1980s in Britain (Buckingham, 1994). Many British media teachers followed the approach suggested by Masterman. Buckingham points out that at that time the aim of media education was the development ofcritical consciousness. Through critical analysis, media education was said to be able to "empower students, and liberate them from the ideologies which the media are assumed to impose upon them" (Buckingham, 1993a, p. 142).

Under the great influence of Masterman, the Ontario media education program in Canada also started an ideologically-oriented program. In recent years, Ontario media educators have moved from an ideological approach to a more audience-oriented approach of media analysis. Influenced by cultural studies and Buckingham's media education philosophy, in the 1990's media educators in Ontario emphasize the importance of how audiences' social positions and subjectivity influence media interpretation. They also regard it as important to examine the pleasure audiences gain from their media consumption. However, in the the

basic concern of the Ontario media education program was to resist media manipulation and maintain students' critical autonomy. A study of Ontario media education textbooks in the 1980s indicates that these texts were very much in line with the Frankfurt School's critical perspective of media analysis (Lee, 1994). According to Ontario's *Media Literacy Resource Guide,* a media literate student "should be able to make conscious critical assessments of the media, to maintain a critical distance on popular culture, and to resist manipulation" (Ministry of Education, Ontario, 1989). The ultimate goal of media education was to "transform the citizenry into informed and empowered recipients of the media forces that impinge upon almost every aspect of their lives" (Carson, 1989, p. 35).

As can be argued, media educators who hold the view of determined technology regard media products as ideological constructs, manipulative in nature. They argue that it is necessary to assist young people to "deconstruct" media messages and to resist manipulation in order to obtain critical autonomy. Theirjustification of media education is for emancipation. The arguments of this ideological approach do have some strengths and they clearly indicate that the media construct reality. The mass media have commercial, social and political implications. However, these arguments take mass media as tool of the powerful, thereby overemphasizing the ideological manipulation aspect of the media.

recent years, in Britain the ideological approach has been under criticism. David Buckingham is representative of those who reject most of the premises of the critical ideological approach of media education. Buckingham cites Grossberg (1987) saying that the term "critical" reflects "a dangerous kind of arrogance" and "a considerable degree of elitism" (Buckingham, 1993a, p. 142). The arguments of the ideological approach are regarded as elitist with a natural bias against popular taste. Buckingham also points out that the critical pedagogy of media education tends to "rest on the assumption that students are inherently uncritical, and that it is the teacher's job to make them critical" (Buckingham, 1993a, p. 143). For Buckingham, the notion of demystification "implies that students are mystified" and this approach "underestimates the extent and the diversity of children's existing knowledge about the media" (p. 143). He criticizes this approach for neglecting students' aesthetic pleasure and emotional engagement with media. It problematically "recognizes pleasure as a form of deception" (p. 143).

Different from the interpretative tradition which focuses on textual or format analysis, the ideological approach to media education is concerned more with the social context which produces the text. It discusses the social, economic, political, organizational and professional determinants and influences on the production of the media communication (Alvarodo & Boyd. Barrett, 1992; Masterman, 1985). However, this type of media education is also product-oriented. The focus of analysis is still limited to the media product which is supposed to be deconstructed and taken apart.

Media Education for Social Participation

From the view of socially constructed technology, the use of communication

technology is socially negotiable. Altheide and Snow's (1979) analysis has already shown that many social institutions adopt "media logic" to make use of mass media in order to meet their own ends. Ericson (1989) called this process "negotiating control."

Since communication technologies are socially constructed and their use is negotiable, education has a meaningful role to play. Proper media education can constructively lead to better use of these technologies. Media education programs developed from this perspective would naturally put emphasis on the understanding of and participation in the shaping process of communication systems, to foster the healthy and democratic development of communication technology. So far, not many media education programs are based on the philosophy of socially constructed technology.

Williams (1976) argues that technological developments in communication should not be stopped but be redirected through education. In his view, the growth of large scale communication organizations is a major human gain, far outweighing the difficulties and confusion it has brought about. Such liberal and positive views on technological development have great implications for media education. Media education should not put too much emphasis on discriminating or deconstructing media messages. Rather it should help students establish a partnership with the mass media to build a better society.

The emergence of new communication technology (such as television, video and multimedia) leads to great sociocultural changes. With the stress of change there is a great deal of confusion. Under such circumstances there is a need for media education to provide guidance for personal response and choice. But this is not enough. At the same time, institutions should be changed and legislations amended to ensure that the media industry is responsible to society (Williams, 1974). The direction for media education, therefore, is to develop the students' ability in and awareness of participating in the construction of a democratic media system. In the information age, *students should learn to understand the media, use the media and influence the media* These three aspects are essential components of a media education program adopting the socially participative approach.

Firstly, to understand the media, the students should be armed with analytical skills which make them competent media critics. Apart from developing students' critical analysis of media representation and ideology, media education should include the teaching of media institutions. Media curriculum should familiarize students with the history, structure and operation of the media industry. It should also provide students a better understanding of the social context in which the mass media exercise influence. Students are expected to know not only what is wrong with the media messages, but also what is wrong with their media institutions. Discussions are encouraged to seek solutions.

Secondly, a media education curriculum should put more emphasis on media production. Both the damage limitation approach to mediaeducation and ideological approach pay very little attention to helping students become competent in media

production. Their primary objectives are to train students in discriminating and criticizing media messages. Low priority is given to teaching students how to use the media to express their cultural experience. This negligence has already drawn attention from international media educators. Bazalgette, Bevort and Savino (1992, p. xi) clearly point out, "Understanding media messages is not enough: we have to know how to use them appropriately." For them, media teachers should not only equip students with the capacity to understand and analyze media, but also develop their ability to deploy the media expressively. Buckingham (1993b, p. 297) also strongly proposes that the concept of media literacy should consider children's own media production as well as their use and interpretation of existing media. He would like to "look at children as 'writers' of media rather than just as 'readers'." Good mastery of media languages and production skills is therefore an important element of media literacy. Armed with sophisticated production knowledge, they are then capable of expressing themselves through the media. Only when they "speak" effectively through modern communication technology can they fully enjoy the rights of freedom of speech.

Thirdly, in addition to training students to become competent media users and producers, the socially participative approach to media education aims at enabling students to enjoy democratic participation in the existing media system. Special emphasis is placed on showing students the way to monitor the media and voice their opinions through the media. Few students have the opportunity to learn from their media education courses how to make use of the existing mass media to air their views and how to take part in shaping the public discourse in the mass media. As we approach the 21 st century, as communication technologies further develop, there is evidence of new social inequalities between the "media rich" and the "media poor." The media rich have easy access to the media and have the power to define the public discourse, while the media poor have little access to the media and its view can hardly be heard in the existing media system (Masterman, 1994). Media education programs should address the issue of narrowing the gap between the media rich and the media poor, It is possible for ordinary people, most of them belonging to the category of the media poor, to gain more access to media if they are equipped with better and more relevant media knowledge and strategic instructions. In Canada, MediaWatch, a feminist media concern group, seems to be promoting media literacy of this sort. This organization not only alerts citizens to the abuse of women in the media and educates them about proper gender representation, but also suggests channels of complaint and provides strategies to fight for gender equity in the media. For example, in its bulletin, it provides the names of contact persons and addresses of the advertising production companies so that citizens can protest against TV commercials which reduce women to sexualized parts. Media teachers may take this example as a reference when they plan their media education courses aiming to take social action in improving their media institutions.

"It is noteworthy that the socially participative approach adopts many premises

of the audience reception theory and cultural studies. It highlights the importance of how the audiences' difference social positions influence the way they understand, use and influence the media. This approach also recognizes the importance of audiences' aesthetic pleasure gained from the media."

The strength of the socially participative approach is that it draws attention to the existing and developing communication institutions. Unlike the pessimistic views offered by other approaches, it has faith in the human ability to conquer and manage any new communication technologies. It calls for energetic social action to monitor and improve communication development. With regard to popular culture, this perspective is not paternalistic like the damage limitation approach or elitist like the ideological approach. It respects popular culture and does not have one sided, negative appraisal of the media.

However, this perspective seems to have built its optimism on idealism. More research has to be conducted to explore the actual process of negotiating control and new curriculum resources have to be developed. Since the communication system is closely connected to other social systems, reform of media institutions requires the synchronization of other social reforms as well. More discussion is needed on this significant aspect.

Current media literacy training generates personal response to media messages, such as, accept/reject the values or enjoy/despise the aesthetic quality, rather than urging social participation in media institution building. This author has no objection to training students as critical viewers but suggests that media education should go further. Media education should not only help students seek personal emancipation from media manipulation but also encourage students to shape communication institutions through collective means so that these institutions can better serve society. The argument of social participation of media education is in line with this view. Hence, despite its limitations, it provides the strongerjustification for media education.

Conclusion and Discussion

Communication technologies are more than pieces of machinery. They shape perceptions and values, transforming society and culture. There is no need to debate the immense power of modern communication technologies. The real concern is in determining the way these technologies exercise influence. Technological determinists argue that communication technologies have their innate characteristics and they run on their own. From a determined technology viewpoint, communication technologies are tools used by powerful groups to impose influence. The socially constructed technology perspective, however, points out that media technologies influence other social systems as other systems influence them.

In the author's view, the perspective of socially constructed technology is preferable because only this perspective puts communication technology back to an interactive social and cultural context for scrutiny. It rejects the deterministic view and restores the role of human agency in the technological developmental process. This perspective also provides the stronger claim for media education as

it offers a new agenda to follow. As communication technology is contextualized in its social and cultural environment, the new role of media education is to enable students to become aware of their social responsibility of better understanding, using, influencing and reforming their media institutions. Therefore, unlike the other two approaches which are product-oriented, this approach to media education is process-oriented. Through the social participation process, it is hoped that communication technologies once again serve human purposes instead of running out of human control.

Many people may hold the view that the three media education curriculum approaches are evolutionary paradigms. Masterman points out that the inoculative paradigm is the earliest. "The current practice (the ideological approach)," writes he, "has evolved out of earlier, less satisfactory paradigms of media education" (Masterman, 1993, p. 5). Since the approach of social participation is considered here the best way to teach the media curriculum, some people may regard it as a paradigm evolving from the other two.

Evolution implies that the new paradigm replaces the old. However, it is argued here that these various approaches to media education do not correspond to any evolutionary stages. They do not "evolve" one after the other but stem from different assumptions and concerns about mass media impact. Before the 1980s, more people might have adopted the inoculative approach but now many media educators think otherwise. However, in the 1990s, both the inoculative approach and ideological approach are still being used. An example is the public concern for media sex and violence. This concern always encourages and justifies the inoculative approach of media teaching. And needless to say, the ideological approach of media education program is still the most popular model. As long as there are media educators giving some credence to the assumptions of technological determinism and determined technology, the inoculative and ideological media education curricula will still exist.

Therefore, media educators are encouraged to reflect upon the assumptions they have made about the media when they conduct their media courses and the social objectives they want to attain through media education. Some may not be aware that they are making assumptions about technological determinism or determined technology, and are thereby adopting a damage limitation or ideological approach to media education. If they are still holding the determinist assumptions of the media, they are encouraged to consider the socially constructed technology perspective and adopt the socially participative approach to media education. In any postindustrial society, social conflicts have shifted from the political ground to the cultural ground (Melucci, 1985, 1994; Offe, 1985). Touraine (1985, p. 774) points out that the central conflict in postindustrial society is to "deal less with labour and economic problems because the domination which is challenged controls not only 'means of production' but the production of symbolic goods, that is, of information and images, of culture itself." The problem we face today is not a political crisis but a crisis of cultural democracy. Therefore, it is not good enough

for media education in the 2 1 st century to simply promote critical media awareness and consumption. Media education should set its goal on fostering cultural democracy through teaching students to actively participate in the building of a better media system.

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Toulmin's Moral Reasoning Model Applied To Ethical Internet Choices: A Means For Exercising Ethical Technology Leadership

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Abstract: Leading our school aged children toward purposeful activity on the Internet requires more than pure logic or rational-technical considerations. Value judgments about the perils that can be encountered on the Internet must be considered in balance with the benefits of providing the technology to students, teachers, administrators, parents and school boardx. This paper demonstrates the Toulmin model applied as a specific problem solving approach for administrators who are considering connecting their schools to the Internet. The article will be of general interest for anyone interested in the methodology of moral decision making. Using moral reasoning, we explore a proposal to connect the school to the Internet. We observe the Internet in schools today, explore various value judgments and principles, develop qualifications to the proposition and reach aconclusion about Internet connection initiatives. This specific moral decision making example leads us to conclude that while we have a duty to provide equal opportunity for our learners via technology, we also hold and are attributed by parents with a duty of care for students, where we protect them from harm. Our solution to some problems associated with the connection proposa1 is to connect our K-12 school to the Internet with a caveat that Grades 6 to 12 children are taught media literacy and value self-reflection skills while young children (K-5) are closely supervised during Internet transactions

Résumé: Faire en sorte que nos enfants d'âge scolaire puissent avoir des activités significatives sur l'Internet demande plus que la pure logique et des considérations technico-rationnelles. Les jugements de valeur sur les dangers se retrouvant sur l'Intemet doivent être évalués en fonction des avantages que procure cette technologie aux élèves, enseignants, administrateurs, parents et aux conseils scolaires. Cet article veut montrer l'utilité du modèle de Toulmin utilisé comme approche spécifique de résolution de problème pour les administrateurs qui envisagent de connecter leur école à l'Internet. Cet article intéressera tous ceux désireux de connaître une méthodologie pour la prise de décision de nature morale. Ayant recours au raisonnement moral, nous nous penchons sur la proposition de connecter notre école au réseau Internet. Premièrement nous examinons les services offerts sur l'Internet qui sont accessibles de nos jours à nos écoles, ensuite nous regardons les divers jugements de valeur fait à l'égard de l'Internet et les principes pouvant nous guider, puis nous émettons les conditions s'appliquant à la proposition de connexion de notre école à l'Internet et enfin nous concluons sur ces projets de connexion au réseau Internet. Cette décision morale particulière nous amène à tirer cette conclusion: bien que nous ayons le devoir de donner une opportunité égale aux apprenants par l'entremise de la technologie, nous avons aussi le devoir · qui nous est délégué par les parents · de prendre soin des élèves et de les protéger contre les dangers. Les problèmes que nous avions eus avec la connexion de notre école au réseau Internet provenaient du fait que nous connections une école dont les niveaux allaient de la maternelle à la douzième année. Il fallait donc prévoir une politique pour les plus vieux (de la 6 à 12 année), que nous sensibilisons aux médias et auprès desquels nous insistons sur l'importance d'acquérir une réflexion autonome; et une autre pour les plus jeunes (de la maternelle à la 5 année), que nous encadrons plus étroitement lorsqu'ils utilisent l'Internet.

Introduction

Educational leaders know when they provide students with access to Internet technology that this offers opportunities for both learning and "inappropriate communications" (Carpenter, 1996, p. 41). Inappropriate communications encompass pornography, hate literature, sexual solicitation, coercive behaviour and any other immoral acts by immoral or naive persons using an Internet computer.

In this application of moral reasoning as a decision making process we work through the proposal: to connect our school to the Internet world. This paper is not intended as definitive solution to the question itself, but rather it is one example of a moral decision making process as applied to technology. Such school technology decisions confront administrators with increasing frequency. The quality and impact of our decisions about connecting classes to the Internet could well affect the legitimacy of our leadership, and our school culture. As well, there are some large scale technical efforts currently under way to upgrade and connect school technology infrastructure of schools (Markoff, 1994, p. 45). The consideration of the approach advocated by this paper may affect these initiatives in some positive way.

The argumentative or anticipatory moral decision making process advocated by Toulmin (1957) is complementary to systematic, rational decision making models that offer leaders ways to make difficult decisions. This process could be considered the value self-reflection dimension for leaders. A decision can be reached by explaining our logic or precedents and the Toulmin model suggests that leaders develop decisions by testing the antecedents to a proposition (such as to connect to the Internet) by reviewing the proposition context, gaining more facts or information, self-reflecting on our own moral principles, making value judgments and providing qualifications for value judgments (Brown, 1990, p. 20). This process exemplifies a Kantian -type doctrine that has been reduced to a somewhat more reduced to a somewhat pragmatic method for managing propositions that leaders know will involve a conflictual decision making event.

Background

Moral decision making can involve metaphysical or analytical methodology that employ both descriptive and normative ethical thought. Immanuel Kant stated that ideally we are all rational, analytical individuals who act on the sort of policies which, if adopted by everyone, could generate a community of free and equal members, each of whom is in the process of realizing one's own purposes and the further aims of one's fellows (Ellington, 1983, p. xv). This individual freedom exists under a self-imposed law where we act according to the same rules (maxims) we would have acted upon us universally. When we describe actions in terms of our value judgments and assumptions, we engage in the moral reasoning process in Figure 1 (Toulmin, ***1984,*** p. ***15*** 1). ***Normative*** ethics involve value judgments that we make by considering social norms or commonly accepted maxims that essentially tell us how we ought to act. As leaders, normative ethical thinking

usually results in a policy or, in other words, a conclusion to a problem. This demonstrates our personal or collective beliefs concerning where we oughf to be on an issue. By contrast, descriptive ethics considers how people act (not how they ought to act but what their action is) in a situation. In the argumentative model used here to discuss Internet connection, we could say that descriptive ethics explain what is going on regarding the Internet and schools and normative ethics identify what ought to be going on (Walker, 1996. p. 283).

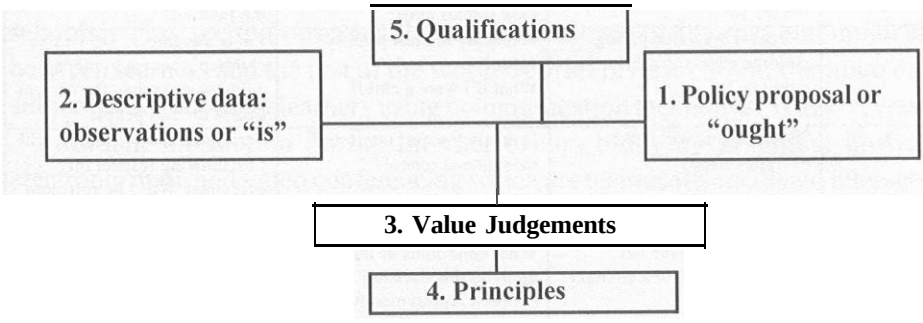


Figure 1. Toulmin's moral decision making process

We ask readers to consider the process from the role of a superintendent of education who has been told by certain constituents that schools "ought to be connected to the Internet." The argumentative nature of this decision is obvious when we recognize that not all constituents will offer the same ought – in fact some might contradict others. What principles underpin this decision to connect to the Internet? What is the descriptive nature of Internet connection to school children? What is going on out there? Individuals will take different positions on where the school *is* and where it ***ought*** to be, but these descriptive and normative positions can be identified and managed by good leadership by using the Toulmin decision making process. Note the difference between leadership thinking in this decision process (ethical reflection) compared to a purely rational management leadership process (bureaucratic-technical) that begins with funding concerns, technical advice on networks, software, hardware, policing and techno-advocacy.

Section 1: The Proposition

Toulmin's process can be mapped by a metaphoric dialogue. Table I shows the various types of stakeholder talk, leader self-talk and the moral reasoning questions (Toulmin) that might apply to the stage of discussion. The sections in this paper take the reader through the Toulmin's process as follows Table 1: Methodology

Table I
Methodology

Section	Dialogue	Leader Self-talk	Toulmin Component U.C.
1	"We want to connect all classes to the Internet."	Why?	*Conclusion* (ought): This is where our school ought to be with new technologies?
2	"All the other schools are doing it and there's grant money for it."	Is everyone really on the internet? What precedents or case studies exist?	*Observations* (is): What happens with kids on the Internet?
3	"Because we value giving children access to other cultures."	Is this my highest priority value? What if I were a child?	*Value Judgment*: Do I value children's access to other cultures more than the cons of access to "bad people"?
4	"Because this will make everyone happy."	Is this in the best interest of everyone at school?	*Principle*: If we connect, will I be showing respect for everyone? Will I be fulfilling my duty of care to all children (K-12) at school?
5	"A young girl gave her parents' address to a stranger in Chicago."	What conditions or limits apply to this decision: are all children represented well?	*Qualifications*: If we connect, then we must teach media literacy for responsible communication, and supervise the young children on the Internet. This is my duty of care
6	"We want to connect all classes to the internet."	Why?	*Conclusion* (ought): This is where our school ought to be with new technologies.

If the school board says, "We want to connect all classes in our schools to the Internet," a leadership team is faced with a request that could be interpreted as dictum or as a conclusion about where the school ought to be on the subject. As rational leaders possessing a free and rational will, we can engage in moral inquiry to test the proposition. Kant reminds us that our will is good in and of itself, so we are viewing the problem from the standpoint of the good will, endemic in the professional educator (Kant cited in Ellington, 1983, p. 393). We must focus on our action or response to the proposition and not to our behaviour as we can behave well without acting well (Brown, 1990, p. 17).

If leaders are presented with a conclusion or outcome, we first look at the conditions or environment surrounding the situation. We develop propositions which tell us where we ought to be and this end must be understood. We must evaluate the current situation or observations in context of the situation regarding, in this case, the Internet and school, our leadership, our schools and division goals -we must seek out the is of the situation to see how much it differs from the ought of the proposition.

Section 2: The Observations

In our other word dialogue (Table I), we observed the rationale for the ought proposition: "All the other schools are doing it..." We must ask ourselves if this

observation is universal. Are all schools really doing it and what is happening in those schools? What other observations about the nature of the Internet connected schools exist? What have other educational leaders decided? Leaders need to observe and research issues beyond the observations by others that lead to an ought proposal. Technical and social information exists about the character of the Internet transactions that we must obtain and understand to establish or "firm up" our own descriptive ethical context (Internet -unconnected schools), providing a foundation for us to construct our normative ethical context (Internet - connected schools). This section observes the technical nature of Internet communication between learners and the rest of the world. A brief review current literature on the subject of school-aged learners using communication technology is also reviewed

Student interaction on the Internet occurs today by graphical browsing, electronic mail, and video conferencing which are technically mediated interactions between individuals, usually not in real time except in the case of video conferencing.

Graphical browsing

Students retrieve graphical information in the form of text, pictures, sounds or movies either as a result of "searching" specifically for the particular information on the Internet or by ad hoc exploration or "surfing" to browse Internet content. Such exploration is much like browsing in a book store. Information retrieval from the Internet can be as simple as pointing and clicking a mouse. Such interactions can occur, even at the kindergarten school level, because only hand-eye coordination is necessary. While some access to Internet sites and content is restricted, an equal amount of material is completely unrestricted to browsing learners. The graphical browser has reduced the need to read or understand language, as more information can be sought by simply clicking on an attractive picture. This is a newer form of information retrieval and teachers need to know that nonreaders can explore issues such as racism and sex, simply by clicking a mouse on a burning cross, for example.

Electronic-mail

Asynchronous or synchronous "person-to-person" dialogue can occur via typewritten electronic "mail" message exchanges between anyone connected to the Internet. Electronic "mail" offers learners a chance to solve problems collaboratively and to learn from people all around the world (Harris, 1994, p. 48) while it also offers a chance to exchange home addresses, telephone numbers, financial data and credit card numbers with anyone, anywhere. Like the telephone, Electronic "mail" technology also offers the student, who has not learned how to think critically, opportunities to communicate with anyone of any moral persuasion. There is tremendous potential for victimization in this environment. There is equal potential for positive educational discourse (Harris, 1995, p. 16).

Video conferencing

By pointing a camera at any object, learners with computers, connected to the Internet can transmit a live image of that object along with the sounds in the room to another person, or group of people connected to the Internet. Video conferencing is popular with many "meeting rooms" or chat groups on the Internet today where people meet, using the computer as a kind of video phone – but the discourse also offers the potential to create live, interactive communities of learners across geographic and cultural boundaries if it is managed well with a critical view to maximizing interaction (Kowch & Schwier, 1997).

Observations about Internet messages:

Internet messages can be composed of anything that someone decides to write, photograph, film, record on video tape, speak, play on musical instruments, and subsequently post on the network. Software can be shipped and received via the Internet making the Internet a conduit for hackers or computer crime (Carpenter, 1996, p. 41). Who sends Internet messages? Anyone can ship data onto the Internet because the Internet is not regulated beyond the application of existing protections such as copyrights, patents, and libel. Businesses are quickly and increasingly engaging in Internet based marketing and customer feedback and this trend is expected to continue at a quickened pace (Churchland, 1996, p. 252). For example, the ten largest advertisers on the Internet invested over twenty five million dollars for advertising space in that environment during the first quarter of 1996 (Browning, 1996, p. 42). Only six years ago business was not investing in Internet advertising. As business presence increases, so too does the presence of our students on the Internet. An increasing number of schools are also offering students the potential to use the Internet world as a result of massive infrastructure programs (Saskatchewan Education, 1996, p. 2). In addition, some Internet messages originate from social moral minorities whose questionable morality is available to anyone finding the media:

> As with many new technologies (such as television, pagers, or cellular phones), this new medium is vulnerable to misuse. Hostile and angry individuals, sexual predators, even hard-and-soft-core pornographers already exist in this virtual community. (Frazier, 1996, p. 26)

It is clear that as leaders seek more information or observations about the descriptive ethics or *is* of any proposition, we quickly approach the stage where we are forced to make value judgments. These judgments form the normative pathway to the *ought* or to the conclusion. The problem of learners gaining access to "immoral" material is as old as printing presses, television and library censorship debates but the Internet presents some new problems to educators because the Internet is interactive, relatively new, ever-changing and unregulated.

When a student accidentally misses the target of a mouse 'click' target or

keystroke she can navigate to some shocking content that is displayed immediately, in full colour, perhaps with a movie and sound. A child who types "six" can mistakenly type 'sex' into one of the search engines. This *accidental* learner will be instantly confronted with adult graphics or "Cyberporn" that are equally or more explicit than any bookstore magazine rack (Elmer-Dewitt, 1995, p. 146). Conversely, intentional student communication can lead to "humanitarian, multicultural, action-oriented telecommunications projects" that are a tremendous learning experience (Harris, 1994, p. 32). The same intentional communication can lead to students' exploration of racist views, violence, immoral individuals and all forms of unethical representation (Frazier, 1996, p. 26). Examples of tragedies resulting from high school students building bombs using information from the internet are well-known. Even with technological gatekeepers on school systems, Internet communication can be initiated by students at home, from a friend's house or at commercial Internet sites. How do leaders handle these issues?

Observations about school Internet ethics scholarship:

A recent ERIC search on the keywords *Internet and Ethics* found twenty articles. Of the eight articles directly related to Internet ethics, five articles (63%) discussed the dilemma of unethical material and three articles (37%) suggested a set of rules for student behaviour and software censors as decision for managing the problem. While there is no reason to panic over undesirable information on the Internet the opportunity exists for any student to exchange addresses, phone numbers and media, such as photographs, with anyone they choose (Kerckhove cited in Gooderham, 1996). "As the most comprehensive information resource ever developed, access to the Internet has (positively) changed the academic world" (Crossman, 1995, p. 273) and the Internet may similarly effect school teaching and learning.

The ERIC search pinpoints a relatively small concern among educational technology leaders and scholars about value laden issues that could develop into integrity issues for school-based technology leaders who plan to utilize the Internet. As leaders, our decisions must be characterized by integrity. Such decisions occur through perceptual, theoretical, preferential and ideological reflections and occur in the context of the "private life space" of the individual, (Walker, 1993, p. 85). Does our level of scholarship on the Internet access question match our duty to make legitimate decisions?

In the Saskatchewan context, Saskatchewan Education, SaskTel and many school divisions worked to connect 190 schools to the Internet in 1996 (Saskatchewan Education, 1996, p. 2). The technology will soon be in place to extend the reach of the Internet to schools so that the delivery of courses via the Internet will be possible. A recent government survey asked the general public if they believed that Saskatchewan students are able to take the high school courses that they want. Forty four per cent of the respondents were "of the opinion that high school students were generally not able to take the courses they want

(Saskatchewan Education, 1994, p. 62)." This indicates that there is great potential for distance course delivery utilizing an expanded school Internet infrastructure Observations about the public perception of the Internet lead us to conclude that the infrastructure construction is necessary. What about the ethics of the decision to surrounding the proposition to connect to the infrastructure?

Our observations tell us that, contrary to the dialogue of the proposition, all schools are not now connected to the Internet but soon may be. When they are connected, will all students have equal access? This will depend on how the curriculum engages the Internet resources. Our research tells us that ethical concerns about the Internet in classrooms are not being addressed in scholarly literature. The rhetoric of the dialogue supporting the demand to connect all kids to the Internet then, is not clearly substantiated. As a leader, now with more information, one must make a value judgment to decide if the current Internet state is something to offer to all of our students.

Section 3: Value Judgment

There is no recipe for making the 'right' value judgments, but as leaders, we make value judgments constantly. Here we explore the nature of these judgments using the propositions and observations. Value judgments are personal acts by moral agents using ethical principles, which we will define as an independent, and objective set of moral beliefs. Many kinds of value judgments are required in leadership, but we will make a sample judgment to answer the question *"Do I value childrens' access, via the Internet, to people and information as a worthwhile part of K-12 education?"*

Kant reminds us that to make a moral decision, we must possess good will along with our distinctive sense of duty respect for the law and for what is right (Kant cited in Ellington, 1983, p. 23). Furthermore, in making value judgments we must never treat people as means to ends, for we ought to treat people as ends in and of themselves. The authors worry about the well-being of learners having unqualified connection to the Internet. Are leaders concerned about students first and foremost when making Internet decisions? Can leaders just "let students loose" on the net? Must leaders prepare students to overcome the negative moral features which are a part of typical Internet access? If a leader decides not to allow students Internet communication, is this a maxim that this leader would have others apply to her?

Leaders must do some self-reflection to make judgments such as those above given the descriptive ethical nature of the observations (there are problems with the Internet in schools) and the prescriptive nature of the proposition (just connect the schools, please). Such normative ethical reflection will guide leaders to investigate their underpinning values or principles as they make their value judgments. We would suggest that the leaders need to include the judgment step instead ofjumping too quickly to a technological solution, or "quick fix" approach, to their decision making. Choosing to let machines limit the potential for unethical

transactions rather than to worry about the deeper issues of learner choice and critical thought is not a commendable process and is the act that most often condemns technical leaders from an epistemological viewpoint. Technology can act as its own policeman, enforcing social rules and alleviating our responsibilities but tools do not respect others, they allow us to bypass moral decisions by dictum: Just use the Net Nanny, and all will be well. This approach must be critically explored.

Duty of Care: Let the machine police itself

Respect for persons (students and teachers) is a characteristic of Kant's categorical imperative. Some leaders think that negative Internet content could be "blocked" by technology gatekeepers where such blocks are gatekeepers enforcing a duty of care preventing our children from being harmed by immoral Internet discourse. This is a false hope.

Most articles from our ERIC search suggest a single type of solution to the moral questions surrounding Internet connection in schools. The literature suggested that student behaviour contracts and blocking technology (software like Internet Nanny, Cyber Patrol and Tattle Tale) ought to be policy. Such mechanisms should be installed in schools to restrict student access to "immoral" media (Carpenter, 1996; Frazier, 1996). Seldom does the literature present a need for parent and teacher support for such a proposition. From a leadership perspective, implementing "blocking" software is a response to restrict student resources to prevent negative ends. Blocking software acts as a communication gatekeeper to prevent student activity by disallowing access to Internet sites containing defined keywords such as sex, but software and policing do nothing to prevent the student seeking out inappropriate communications, and blocking software does not work on electronic mail communication. Is censorship the solution? Postmodern theorists (and librarians) warn that censorship itself brings about its own problems

> "...censorship and self deterrence always happen faster than the forces or weapons at our disposal; this is the secret of social order. (Beaudrilliard, 1995, p. 479).

Censorship is an old issue to school administrators, librarians, teachers and parents and the perceived effectiveness ofcensorship among professionals reminds us of the history of public debate. "Any kid old enough to be interested in pornography is old enough to figure out a hack around the blocking software and there is no small demand for the (blocking) technology" (Gooderham, 1996, AS). Jackson's studies at MIT prove that technical solutions to network policing are as expensive to maintain as they are ineffective. Rules or codes of student conduct create costly supervision situations that "just do not work when network interactions between one student and another occur each split second" (Jackson, 1994, p. 3 I). Several recent theorists remind us that

> Educators have commonly been preoccupied with authority derived from position, psychological manoeuvres and rational-technical competencies. Perhaps, as Sergiovanni suggests, an over-reliance on these sources of authority has mistakenly overlooked the salience of professional and moral authority in school leader deliberations (Walker, 1993, p. 78).

These observations about the efficacy of machine-based policing show that we cannot use this commonly proposed panacea to eitherjustify or deny access to the Internet. The policing approach is a rule-based approach to an ethical problem that is without a normative ethical component, and amounts to a dictum that allows leaders to avoid making an ethical decision by going directly from *is* to ought. We could argue ethically that we should respect our students' freedom of choice in their education interactions. This value judgment would lead us away from policing Internet transactions as a solution to the proposition's negative possibilities.

Personal moral decisions can be in concert with external or universal maxims. These moral judgments, forged in the crucible of personal morality, as well as being personal can be contingent upon social values (Rosen, 1989, p. 27). One example of this is the school leader's duty to perform "in loco parentis." We accept that we act in the place of the parent, and are subject to moral conclusions. Leaders know that moral judgments concerning the distributive nature of the justice depend on how we perceive ourselves within a given situation. We have discussed some value judgments (students' right to access, freedom of choice, our duty of care for children) that fit our morality and our 'goodwill' just 'knows' that these value judgments are correct.

With most value judgments, leaders consider their *roles* in the *context* of any decision (Walker, 1993, p. 86). Perhaps there have been poor value judgments made by educational technology leaders. There are increasing calls for more ethically aware leadership (Campbell, 1996, p.7). The context of our value judgment (kids deserve connections to others, we have a duty of care for children) is that more schools are being connected to the Internet and that Internet connection can enhance a learning environment (Harris, 1996, p. 3 1). As leaders in schools, we operate in situations where community values and geography demand communication linkages like the Internet for many reasons (Hoffman, 1996, p. 3). It is as important to know what role we are in when we make decisions as it is to know the number of decision choices available. Table 2 lists the choices available to leaders considering Internet connection.

Table2
Choices available to leaders considering the Internet Access Proposition

Choice	Description, Observations and Vaule Judgement Type
1.	• Not to conncect to the Internet at all (all children are not best served by the connection, this is a universal rule that I could have imposed upon me)
2.	• To connect to the Internet and impose behaviour rules on the students, with teacher supervision (dictur: this is imposing behaviourial criteria that do not work, according to the observations. Judgemendoes not fit with the observations that behaviour contracts do not work in this case.
3.	• To connect to the Internet and impose technological gatekeepers like Net Nanny to keep students from harm (dictum: this is imposing machines as surrogate ethical decision-makers, releasing leaders and students from making the right learning transaction choices – does not fit with the observations).
4.	• Choices 2 and 3 combined.
5.	• To connect to the Internet and empower lerarners to make ethical media choices by applying media literacy skills (a value judgment respecting students' right to access information and other people, a judgment that fits with our duty to act "in loco parentis" with a **qualification** that the students be educated in moral self-reflection to make the correct transaction decisions on their own).

If a school is already connected to the Internet, then the decision is one of choosing a method to plan for (and to mitigation) the potential hazards of inappropriate learner communications found in choices two through five. The authors choose option five because the observations show that options two and three are ineffective, option one robs students of exposure to access of educational opportunity and resources (conflicting with our duty to provide relevant world experiences for students in school). Option 1 is compelling, but not to connect to the world creates another discontinuity with the school/society context – a condition that we could not live with ourselves as administrators today. To answer the question: "Do I value children's access to people and information (via the Internet) as a valuable part of those children's education?" We answer "Yes", but such a value judgment depends on the principles – the underpinnings or fourth step in the Toulmin moral decision making process on our journey from the *is* to the *ought*.

Section 4: Leader Commitment to Fundamental Principles

Kant said that a moral decision made by a rational, good-willed person, according to a set of (universal) principles constitutes both a valid decision and a moral decision (Kant in Ellington, 1983, p. 56). This absolute position is difficult for leaders in the education system today, immersed in contexts that do shift, but leader ethics should be stable. First, we review some conditions that might distract the practitioner from stable value based self-reflection. Influences on the decision maker and on

decision making processes include: the nature of our work; ethical influences inherent in our expectations; personal influences (our perceived role and motivation); internal influences and external influences (Walker, 1996, p. 276). We are asked to consider the learner, the community, our own values and our roles as a leader in the work of schools. It may be helpful to look at the problem first by deciding what roles we are reflecting by "way of seeing" when we make particular decisions (League of Educational Administrators and Directors of Saskatchewan, 1993, p. 5).

Understanding our role in the decision situation can help us make value judgments or act concert with our fundamental principles or beliefs. As leaders, we act in one or more of four key roles when we make decisions like this (Walker, 1993):

1 **Leader of Leaders:** The concept *ofprimus inter pares* (or first among equals) applies to an individual in this role. A leader in this role makes decisions that fit their internal value system and also sets an example (externally) for other people. The media literacy qualification (Section 5) was developed from the stance as an empowerment-provider, as opposed to this "example setting" role.

2. **Servant of Leaders:** Servants of leaders help to enable other people in their respective roles. Reproductive and transformative leaders act in this role most often. A leader in this role provides power to other leaders. It is within this role that the researchers make the decision to consider core commitments (the moral principle of "no harm", relevance, access to information for students).

3. **Advocate:** Speaking on behalf of other interests and other actors in a situation will identify a leader who is acting in this role. Advocacy of moral reasoning in leader decision-making plays a part in the writers' decision but the process is narrated as one process and not as an advocacy for the specific treatment.

4. **Steward of Resources:** Reporting, explaining and justifying are acts associated with a leader in this role. While issues of cost and technical concerns are the key issues for some leaders involved in Internet access decisions, they must also consider the importance of moral decisions that are best for all.

Walker (1997) states that leaders act from within an assumed role, according to a set of core principles or commitments. The integrity of our leadership depends on the consistency with which we rely on our principles within each role. When a resource or new form of discourse offers itself we must consider a resource that might "promise on-line treasures and wonders to those brave enough to dig them out" (Frazier, 1995, p. 27). As responsible leaders, we strive to be **just** and **relevant** to our organization. By reinforcing technology, one "reinforces" reality, and one's

chances of being just and right increase accordingly (Lyotard, 1984, p. 14.)

The Principles

To identify our principles or warrants that have led us from an informed description of a situation (the Internet world and schools) to the conclusion (to connect our kids to the Internet) via our value judgments is an essential part of leadership. The writers have chosen to appeal to one value – *respect for learners' improved access* to other people and information in learning, and to our sense of *duty to provide a relevant experience for learners.* These values are in concert with the categorical imperative because we act as moral agents "in loco parentis" in education. We cannot isolate students from the realities of society today. But we equally value our *duty of care* principles, where *we* wish for *no harm* to come to our K- 12 or higher education students. Particularly, the "no harm" principle is used in this instance as the foundation for a moral judgment leading to the media literacy solution.

The "No Harm "principle

Regardless of other principles, we are concerned with the way immoral transactions can so easily occur on the Internet. Leaders who are caring act though their concern for the interests of others that transcends mere avoidance of harm to others and is characterized by kind, compassionate and generous interactions with and on behalf of others (Walker, 1993, p. 8).

In the view of the writers, it is only a matter of time until a student obtains information on the Internet that leads to a sensationally immoral and harmful act. Such a sorrowful event will have educational leaders scrambling for a solution or policy position to prevent the recurrence. If we guide students toward investigating information by personally critiquing both the subject of the media and the student's own values, perhaps we can lead them toward "more appropriate" decisions (Adams, 1989, p. 139). When we teach these critical thinking skills to learners so that they are applied in our absence when there is no momentary supervision or rule enforcement we are likely to give them a powerful tool for dealing with any inappropriate media encounter. This powerful skill set allows students to lead themselves out of harm's way more effectively than we can police or coerce student behaviour by rules. Can we achieve this goal through concurrently introducing media literacy *and* the Internet to learners?

Section 5: Qualifications

While we can make the value judgments based on observations and research to connect our children to the Internet, we hold some principles that must also be addressed in reaching our conclusion, or the path from *is* to *ought.* These concomitant qualifications are the fifth and step in reaching the conclusion. Observation of media literacy pedagogy reveals a different kind of solution to preventing inappropriate learner media choices that have historically been offered

by print and video media. The media literacy solution applies communication theory to student practice, without focusing on gatekeeping, by leading media consumers to become better "choosers" of what they consume. Media literacy theory asks teachers to "encourage students to explore their own sense of historical agency as they come to realize that everyday decisions and choices are not simply value 'free', nor are they a product of rational decisions alone" (McLaren, 1992, p. 2).

The media literacy approach is a normative ethical approach with a teleological orientation, a position that we take when we desire positive or 'good' outcomes (Rosen, 1993, p. 14). Our stance hopes for student encounters with immoral media to be productive. Learners ought to possess and choose to use critical thinking and self reflection skills to make the 'good' decision and to avoid the 'bad' stuff. If students obey our rules and "don't go there" on the Internet, we can feel that we achieved our obligation. The moral decision in this paper is based on the duty that we wish a positive outcome from student-media interaction rather than a fulfilment of our own objectives as leader or teacher. The result is a more democratic learning environment where "...the shift of responsibility to the learner requires the focus to become, 'Does the learner possess strategies for exploiting this material successfully?"' (Schwier, 1995, p. 123). How can we empower learners to make the right Internet transactions?

Media Literacy

The Internet is a medium and as such it transports controversial information housed in the Internet world as electronic media (Bryant, 1992, p. 4). Teaching media literacy is not new and it is being taught in school systems to focus *learner criticism* and *understanding* about television, film, print and radio medium (Adams, 1989, p. 13). The Internet medium adds a new twist to mass media theory by being an interactive media meaning that we do not just see media pieces as they "roll by" as with television, but we actively and selectively retrieve it. Today, most media literacy pedagogy rests on the idea that students exist in society that is awash with propaganda and mediated messages: "Before quality assurance has been developed, the human race is being forced to swim in an electronic sea of ideas" (Adams, 1989, p. 7). We know too that learners construct meaning from what they "swim through:"

> Since the media construct their own view of reality it is necessary for students to be able to read media text critically. This ability can make media a resource for students where the values and ideas represented are carefully examined as a normal part of reading, viewing and listening. (Schwier and Saskatoon School Board, 1994).

Methodologies for teaching media literacy vary but most teach critical consumerism and critical thinking concomitantly. One school division in western Canada uses the T.R.A.P. method to teach students media literacy (Schwier, 1994).

By looking at the program we see how media literacy skills support might prevent harm. Educators have already developed the skill teachings because of problems with "immoral" television, print and video. An explanation of the terms represented by the T.R.A.P. acronym follows with examples of some demonstrative teaching tactics to reduce harm when students encounter inappropriate media or communications.

"T" is for *Text:* Students learn the text or content of the media messages and test the source of the information for credibility. Is the source valid? Learners compare and contrast a particular message from more than one source. Free of an editing process, the Internet world *text* begs for critical review.

"R" is for *Representation:* Students are coached to understand what forces are behind the creation of the media. Learners are asked to choose the forces they "like". Why? With business exerting more of an advertising presence on the Internet, for example, understanding representation of messengers' motive is important.

"A" is for *Audience:* People have an effect on the media. Learners are asked to consider which culture was "targeted" by the messenger or media. Students compare the message to other messages delivered in different cultures. Cultural bias (without intent, many times) is in our view one of the Internet's weakest points as a medium. While learners can share cultures, they can very easily share counter-cultural morality if learners have not learned critical thought processes.

"P" is for *Production:* Students are informed that agencies and individuals actually create media copy. Learners are confronted with examples of the economic forces in play at the time of media production and are led to question who produced the copy. Is the producer a government institution, a private business or a Hollywood crew? Some Internet sites cost as much to produce as five story buildings.

As teachers, we act *in loco parentis* and we hold dear the principle that we should bring no harm to students. We act according to this principle when confronted with inappropriate television and video at school. Why can we not act accordingly with Internet media? The Internet begs leaders and teachers to offer the same care level of critiquing skills for all media. Media literacy theorists have learned a lot about the value of critiquing television messages. Voojis points out that once learners engage in critical thinking about the nature of violence, most of the "negative effects" of encountering a violent television program do not manifest in learner behaviour or attitude (Saskatoon Board of Education, 1993, p. 136).

A massive quantity of empirical studies on television and video media has been accumulated (Comstock, 1987, p. 2). For example, school children involved in media literacy come to understand the self-interest of advertisers as they grow older (Comstock, p. 33). Critical and creative thinking, Communication, personal and social skills and technological literacy are key components of the province of Saskatchewan's core curriculum making media literacy teaching a responsible act as well as a caring one. Kohlberg offers a normative ethical perspective on moral reasoning where he asserts: "... a person can be helped to achieve a 'higher' stage (of moral reasoning) by someone who has a higher level reasoning" (cited in Rosen,

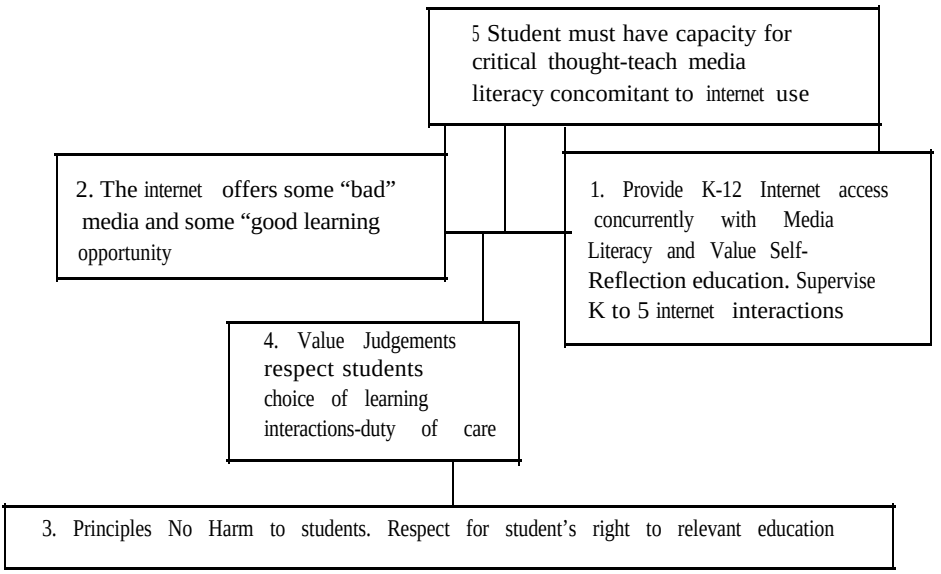
1993, p. 91). Given that we *can* lead students to making moral decisions, we need to know something about three stages of student moral development defined in Kohlberg's developmental theory of Moral.

Preconventional Level. (Stage One): Most children operate here, where they make decisions to satisfy their own moral needs to avoid punishment. They make these decisions based on values that can be exposed by Socratic teaching methods. It is here that we suggest our first qualification within Toulmin's moral decision making process as it applies to the proposition. If we can not be sure that our Socratic methods are leading the child to an awareness of their individual values, we need to employ gatekeeping and supervision for these children during Internet transactions. This is an example of a-qualifier or exception to the conclusion to connect to the net which we reached based on our "no harm" principle. If the student can be harmed because they are not yet capable of knowing "good" values from "bad" values, then we suggest a deontological stance. We ought to provide structured, rule based care for them if they are in stage one or within grades lower than, say, Grade 5 unless we can determine the child's moral development stage.

Conventional Level. (Stage Two): At this stage, learners make decisions by considering the norms of one's group and family. The desire to meet the needs of the group exceed personal needs and Kohlberg suggests that most adults do not get beyond this stage. The "kid on your shoulder" principle has worked well with high school students and university labs where students are asked to view Internet sites as if a young child were watching. Students who are in stage two of development are aware that if they encounter something that a small child on their shoulder should not see, they stay away from the media on the Internet. The social norms of the family are brought to the moral consciousness of the student to prevent them from harming themselves.

Postconventional Level. (Stage Three): In stage three, the learner is more self-motivated toward decision making. The standard of what is right and wrong has been internalized in this student as a set of principles concerning the social good. These learners are autonomous because they think for themselves, beyond local custom. Kohlberg claims that people are operating within this stage when they consider the meta-ethical strategies and schema like that proposed in this article.We know that banning access to television in one location (a classroom or the home) does not prevent learners from watching the program at some other venue. Televisions, like Internet connected computers, exist both at school and at home. Critical thinking about the message conveyed by the media could provide students with the empowerment to make choices outside "policed" environments. Kohlberg responds: "through Socratic questioning, the values and principles held by children can be brought to consciousness" (Rosen, 1989, p. 41). If, for any reason, we cannot lead the students to know values of "right" and "wrong" or "good" and "bad" during media encounters, the principle of duty of care override the "freedom of access" principles and we suggest that professionals then ought to act in a more authoritative manner to prevent harm.

Figure 2: Toulmin's Model Applied to the proposition



Conclusion

We conclude that school leaders *ought* to connect our example K- 12 school to the Internet. After reviewing the context of schools and Internet content we observe that some Internet material *is* inappropriate, particularly graphic advertisements and electronic mail functions that allow unregulated person-to-person discourse. After we investigated the Internet situation we concluded that while students should have the freedom for broad social interaction, what the Internet *is* might not be exactly where our school *ought* to, be if we consider the harm possible to children. We provided value judgments about the net content, student critical thinking capability and our own duties as teachers and administrators, acting in loco parentis. We looked more closely at the principles underpinning those value judgments to assure integrity-to agree that these principles are not likely to change. Principles of respect for students and their rights to relevant education are "pros" for Internet connection, while our duty of care or "no harm" principle is a "con" for the proposition. This article suggests that leadership mediates the "cons" of Internet connection by educating learners about media literacy and developing self-reflective techniques so that our if learners are empowered to reach beyond stage one of Kohlberg's moral development capacity. We would also emphasize another qualifier: that children who have not reached beyond stage one need constant, effective supervision during Internet transactions until the problems of immoral Internet transactions are alleviated from schools.

In summary, our case of a leader moral decision is made by stating the outcome desired (the proposition), making value judgments based on observations, reviewing the principles behind those judgments and suggesting qualifiers to the judgments

where necessary to the exercise of ethical technology leadership (Brown, 1990, p. 48). The result is a demonstration of a critical moral reasoning process for school leaders, educational technology leaders and for classroom teachers to think about the discourse possible between their students and the Internet world.

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Book Reviews

Diane Janes, Editor

Critical Issues in Qualitative Research by Janice Morse (Ed.). Thousand Oaks, CA: Sage, 1994. ISBN O-8039-5043-8,395 pages, $26.95 (US)

Reviewed by Mary F. Kennedy

This book was meant to supplement and complement *Qualitative Nursing Research: A Contemporary Dialogue.* However its application is neither limited to those in the nursing profession, nor to supplementary reading status. It is a stand-alone reference and an important addition to the shelves of all qualitative researchers.

Critical Issues in Qualitative Research targets the issue of quality in qualitative research. The book is a series of papers - the result of a two day think tank, in which participants prepared and circulated papers beforehand. Papers were then discussed and debated. Review and revision incorporated points raised, and the resulting papers are the sum of the group's thinking. Each chapter contains a paper preceded by a dialogue out-take, which is a portion of the think tank discussion.

There are 19 chapters covering broad-ranging issues: methodology, interpretation, phenomenological knowing, ethnography, mentoring in qualitative research, post-structuralism, collaboration, ethics, and academic integrity. These and other issues are dealt with on a theoretical, rather than a practical level, but the research experiences of the various authors inform their understanding.

The initial papers deal with the status of qualitative research. This still seems to be an issue in the health professions, where the long history and supremacy of scientific/experimental research has resulted in a stigma against qualitative research - a stigma that Morse, as contributing editor, feels is not totally undeserving. Qualitative researchers are sometimes guilty of not explaining clearly what they do and how conclusions are reached. In fact Kathryn May, in Chapter 2, argues for the *magic* element - "rigorous implementation and explication of method alone never explains the process of abstract knowing" (p. 13).

Morse herself focuses on the cognitive processes of analysis - the synthesis that leads to aggregation of categories, linkages between them, and the process of falsification and confirmation – usually "a myster to all but the qualitative researchers" (p. 24). She blames qualitative researchers for not making explicit

their cognitive struggle of model or theory construction, claiming that this oversight has led to the belief that qualitative research is both easy and unscientific. She delineates the four cognitive processes integral to all qualitative research comprehending, synthesizing, theorizing, and recontextualizing. While clearly delineating the cognitive processes involved in doing qualitative research, there is nothing within the four processes that hasn't already been said by Cuba and Lincoln in past texts.

The book argues for generalizability of results through recontextualizing the development of emerging theory that is applicable to other settings and other populations. The goal of qualitative research is to place the results in the context of established knowledge, and to claim new contributions. This is an acceptable goal, but the issue of generalization is still a thorny one for qualitative researchers, with no agreement as yet. Some would disagree with Morse, claiming that context specificity, or particular-case knowing is an end in itself, and that the only generalization possible is through meta-analysis of whole series of studies.

Critical Issues in Qualitative Research contains one of the most enlightened discussions of grounded theory in practice that I have read. Chapter 11 by Stern points to the confusion over the interpretation of Glaser and Strauss' original work, and the erosion of the idea by novice researchers and by those who mentor them, many of whom have never read the original work. The point is made, however, that Glaser and Strauss discovered grounded theory in their own efforts to understand their data - in the act of interpretation. Maybe each researcher arrives at his/her discovery uniquely, without formula.

I have been a qualitative researcher for fifteen years, and I have taught qualitative research and evaluation methods for over a decade. I have numerous books on qualitative research, and have studied them all assiduously. I had thought that I would not need to add to my repertoire. But Morse's book has become one of my favorites, and I am convinced that it is a must for all qualitative researchers. And while it is not for the novice, it should be essential reading for graduate students who are contemplating doing a qualitative thesis. I trust the numbers of educational technologists undertaking qualitative studies will continue to grow. It is a fascinating path to the truth – to someone's truth.

Dr. Mary F. Kennedy is an educational consultant and part-time faculty member living in Victoria. She continues to be qualitative, and to do research. even in semi-retirement.

Learning Networks: A Field Guide to Teaching and Learning Online,
Linda Harasim, Starr Roxanne Hiltz, Lucio Teles and Murray Turoff. Cambridge, Massachusetts: The MIT Press, 1995. ISBN: O-262-08236-5,329 pp., $35.00 (US)

Reviewed by Jean-Marc Guillemette

If you are interested in using computers and communication technologies in your courses, seminars or workshops, but don't really know what's involved or how to go about it, then start with this book. It provides an up-to-date description and discussion of the terms, concepts and issues related to learning networks. In the authors' words, 'learning networks are groups of people who use [ComputerManaged Communication] networks to learn together at the time, place and pace that best suits them and is appropriate to the task'. In short, the book deals with organizing and presenting courses online.

It is divided into three parts regrouping a total of eleven chapters. Part 1, The Field, includes three chapters that create a framework for understanding learning networks, both by defining key terms and concepts, and by providing examples of some of the current or recent projects. Chapter 1 focuses on fundamental terminology and concepts, and sets the stage for more detailed discussions in subsequent chapters. Chapters 2 and 3 respectively, review projects carried out for K- 12 education and then for higher education/professional development. While the authors describe rather than critique the projects, the reader can gain valuable insights from lessons learned in these projects.

Part 2, The Guide, is a more practical, 'how-to' description of developing and implementing learning networks. Chapter 4 starts by describing seven learning approaches that 'are common in educational computer networks': 'electures', ask-an expert, mentorship, tutor support, access to relevant information (e.g., databases), peer interaction and structured group activities. The remainder of the chapter highlights the issues to consider when conceptualizing the networked learning environment, including the use of on-line conferences and metaphors intended to help students unfamiliar with this approach make the transition from conventional classroom environments to an electronic environment.

Chapter 5 provides guidance on getting started with implementing a network learning system. Chapter 6 offers a series of suggestions on how to organize teaching on-line. The need to change one's concept ofteaching, from the passing of information to moderating and encouraging interaction between students who assume greater responsibility for their learning, is emphasized. Chapter 7 goes on to explore the student's point of view, and in particular what students need to succeed with online learning. Four factors (access, attitudes, motivation and regular use) that contribute to student success are discussed, complemented with a series of good suggestions to help students get the most out of learning online. Chapters 5,6 and 7 each end with a convenient 'Checklist for Actions' that summarizes the chapter's main points. These checklists are likely to become quick references for

those working on their own projects. The final chapter of Part 2, Chapter 8, takes a candid look at what may go wrong with learning network projects and how to deal with various problems.

Part 3, 'The Future' is a combination summary, review and look ahead. Many of the points already introduced in previous chapters are repeated, at the risk of being overstated. The authors, however, are quite convincing in suggesting that learning networks are here to stay and that they will replace many of the learning activities we currently take for granted. In particular, Chapter 11, The Epilogue, is a list of e-mail messages that highlight how the concepts and practices of learning networks are already creating changes around us. The eleven chapters are complemented with a series of seven appendices that provide additional and useful information on services online (e.g., commercial services, online resources, sample course descriptions, etc.).

The tone and style of the book are pleasant, thus making the book easy to read. Technical terms that may be new to some readers are well defined and explained, and often illustrated with examples. The book is therefore quite 'readable' for newcomers to the field without becoming over-simplified. It does live up to its title of 'field guide': concepts are generally well described using examples from actual projects, with both positive and negative aspects receiving equal treatment. There are also many practical suggestions of what to do, what not to do and how to avoid problems.

On the minus side, a number of key issues in computer-mediated communication, particularly when such communication reaches across countries and cultures, are not addressed in this book. In particular, little is said about how interaction between teacher and students, or how the design of learning materials distributed online must take into account factors such as learning styles and cultural differences. From this point of view, this is not an instructional design book (nor do the authors claim it to be). Also, while repetition has long been known to contribute to learning, there are times when too much repetition from chapter to chapter takes away some of the reading enjoyment. Certain points in particular (e.g., why learning networks promote active learning, or how using students to grade the work of other students can be beneficial) are discussed in different chapters creating an uneasy feeling of deja vu. While these may be key concepts, the repetition sometimes borders on overkill.

Nevertheless, the book remains, in my opinion, a 'must read' item for anyone wishing to become acquainted with learning networks or wanting to review what is currently happening in this field.

REVIEWER

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Microware Review

L. F. (Len) Proctor Editor

First Class V2.6 by SoftArc Inc., Markham, Ontario

Reviewed by Earl Misanchuk

Communication is the very essence of teaching and learning, but the vagaries of distance education make effective communication difficult to achieve. Various media from humble print to sophisticated two-way audio-video have been employed in attempts to ameliorate the devastation that distance imposes, with varying degrees of success. One of the most recent contenders in the contest is computer conferencing, which provides an asynchronous means of discussion that is difficult to achieve any other way. Essentially, computer conferencing can be viewed as a souped up form of electronic mail that provides functionality and permits activities that regular e-mail does not.

FirstClass 2.6 by SoftArc Inc. of Markham, Ontario is a combination package of bulletin board/electronic mail/computer conferencing software that is increasingly being adopted by distance education institutions around the world as a primary delivery and communication medium. However, FirstClass is very useful aside from its application in distance education it can be used equally well as an adjunct for on-campus instruction, as well as a surrogate for face-to-face meetings among work groups (students and teachers alike). Our work group has found, for example, that a good deal of the business and discussion that takes place in face-to-face meetings can be done in a FirstClass conference, with consequent decreased frequency of meetings. When meetings do take place, they can be conducted more efficiently, since background information will have been distributed beforehand on FirstClass. Furthermore, discussions that take place on FirstClass tend to be of better quality, since the asynchronicity provides an opportunity for more reflective discussion. FirstClass features a graphical user interface (GUI) which is quite intuitive (with a few exceptions) and is common to both Macintosh and Windows users, making it easy to teach new users about the environment regardless of the hardware they use. A non-GUI command-line interface is also optionally available for situations that involve dumb terminals or other non-Mac or non-Windows platforms. Client software, while copyrighted, can be freely distributed to any and all users; only the server software is licensed.

The server software can run on virtually any Macintosh or Windows NT machine, but smaller capacity machines may limit the number of simultaneous users possible. For example, the server software will run on a Mac Plus and would probably be adequate in that configuration for a work group of several dozen users, provided they did not need to all be on-line simultaneously. Larger groups, of course, would require more computing horsepower. Server software is offered on a fee schedule that depends upon the number of users, in increments of 5, 10,25,50, 100,250,500, or 1,000 users (in addition to the five users allocated to the basic server license). The whole licensing fee schedule is modular: remote (telecom) users can be licensed separately from regular, local-area network users (and cost substantially less per user than the latter). Macintosh server software can have an optional Windows user module and Windows NT server software can have an optional Macintosh user module; both can have optional command line user interface modules. AppleTalk, IPX, and TCP/IP modules are available, as are Internet gateway software, allowing you to customize FirstClass for your environment without paying for capabilities you don't want or need. Discounts for educational institutions provide substantial savings over corporate licenses.

The way in which FirstClass deals with users names is so rational and human-like it may confuse users who are accustomed to less sophisticated e-mail systems. Although each user must have a unique UserID, only the individual user and the system administrator need be concerned with what that UserID is. Other users simply address each other using their normal (human) names. Indeed FirstClass is so smart that it will recognize individual users given only portions of their (real) names (although it won't necessarily recognize portions of their UserIDs). For example, Jonathan Barson's UserID may be something as arcane as JB123 or something as reasonable as Jonathan Barson, but for the sake of this example, let's pretend it is the former. Only Jonathan need remember what his UserID is, because he needs it to log on; other users will address him as Jonathan Barson. But they don't need to know exactly what Jonathan's name is they need only type in, say, Bar and hit Return, and FirstClass will pattern - match all users with that string in their (real) names, perhaps yielding a menu of users (from which Jonathan's name may be selected) that includes Barbara Simons, Jonathan Barson, and Sara Baron. Alternatively, they could type in jon (capitalization is unimportant) and hit Return, with similar results (i.e., a menu of names of all users who have those three letters in their names).

FirstClass also provides for users' resumes, which can shed light on individuals who may share similar names. Resumes can even include a picture. Also available are a directory, which lists the (human) names of all users registered on the system (unless they are specifically excluded by the administrator), and a listing of whomever is on-line at the time.

offers virtually all the standard e-mail features one might expect, plus a number one might not. Creating, sending, and receiving an e-mail document is straightforward, employing all the normal menus and commands one might

expect in a Macintosh or Windows environment. Messages can include mixtures of different fonts, sizes, styles, and colours of text, and can be assigned various levels of priority (normal, urgent, bulk) and sensitivity (normal, personal, private, company). Messages can also be receipted. That is, when you send a message with receipting turned on, you will receive a reply message indicating when one of the following activities take your choice occurs: routing, delivery, or reading. (No more excuses of I didn't receive your e-mail or I got it, but haven't read it yet!). You can choose to suppress notices of non-delivery of outbound messages. Sent messages can be "unsent" so that you can make that addition you always think of after you've sent a message, or retract those angry words you wish later you hadn't sent. A History feature allows you to view all transactions related to a given message: when it was sent, when it was read by each individual to whom it was sent, when it was replied to. A powerful search capability permits locating messages by specifying text which appears in some combination of the subject or file name, the sub-conference or folder name, the contents of documents, the names of attached documents, the "From" field, or the "To" and "CC" fields. The seat function makes it easier to find those messages that have been mis-filed or otherwise lost. An auto-reply feature permits you to automatically reply to an incoming message with "canned" text. For example, if you are away for a period of time, you might set up an auto-reply message that tells people who send you messages that you received their message but are away and will not be able to respond until a specified date. Messages may also be forwarded automatically when they are received. The ability to create forms of various kinds allows you to customize what a message will look like. FirstClass comes with several forms (e.g., atelephone message form that looks much like printed telephone message pads, several varieties of e-mail message forms, a requisition form, a request for information form, and several others) as well as the standalone software necessary to create custom forms (e.g., questionnaires for electronic polling). The same software also permits you to create custom settings files and splash screens, to further customize your environment.

FirstClass makes it particularly easy to send documents to other users. To attach a document to a FirstClass message, a single command evokes a standard Mac or Windows "open file" window which permits locating the desired file by clicking through the volume and folder structure normally used on that platform. Once the desired file is thus identified, FirstClass automatically compacts and binhexes (for Mac) or zips (for Windows) the file and sends it on its way. The recipient is notified of an attachment by a small document icon in the message header and needs merely to double-click that icon to cause to unpack the document and place it on the desktop or wherever the recipient designates. If the sender attaches, say, a Macintosh Microsoft Excel tile and sends it to a Windows user, the document will automatically appear on the recipient's desktop as a Windows Microsoft Excel file, complete with appropriate icon: All types of files (word processing, page layout, spreadsheet, graphics, multimedia, etc.) can be attached,

the only requirement is that the recipient have software that can properly interpret the file once received.

FirstClass is much more than an e-mail system, however. Its strength lies in the ability to create and manage conferences containing individual messages and threads (collections of messages all pertaining to a single topic or sub-topic). It is not really overstatement to say that FirstClass permits an almost dizzying array of controls over who can communicate with whom, and how, which greatly simplifies setting up groups and sub-groups who are engaged in a particular discussion or conference. Central to this administration is the notion of privilege groups, groups of users who are granted certain powers. There are I7 different levels of permissions that can be assigned to privilege groups: edit permissions, moderate, delete any item, create folders and files, edit sent messages, edit documents and stationery, move and re-size windows, approve items, delete items, view summary, search, send, open, create sub-conferences, download, view permissions, and view history. Nine standard combinations of those permissions allow easy designation of groups of those permissions, resulting in privileges ranging from Disallowed (the user is not able to open the conference at all), through Summary, Browser, Reader, Contributor, Approver, Moderator, and Creator to Controller (whose powers are secondary only to the system administrator's). Privilege groups are easy to create and modify, and users may be assigned to more than one privilege group. By careful specification of privileges to groups, the system administrator and those granted Controller status can empower or limit users to varying degrees a boon in a teaching situation where a teacher might want to create and dissolve sub-groups of students over time and grant them differing degrees of access to certain resources or conferences. Typically, for example, one would want to limit the ability to read and send messages in a conference to only those members who should be part of the conference. FirstClass makes it easy to do this, although it makes it equally easy for the administrator or conference Controller to grant universal access as well. It is even possible to conceal the very existence of a conference from users who are not members of that conference.

Automatic threading of messages in a conference is also a valuable feature. To understand how threading works, assume a conference involves one user initiating a discussion about Topic A. Over the course of a few days, perhaps, other users will reply to Topic A with their thoughts. At the same time, a second user may initiate a discussion about Topic B, and yet another user may start Topic C. Since users respond to these topics asynchronously, the incoming messages within that conference will consist of a hodge-podge of messages relating to all three topics. By starting to read the first message in Topic A (readily identifiable by the header to the message), and using the threading feature, a user can skip from one message about Topic A to the next message about 'I'opic A, then to the third, etc., without having to invest time and energy in seeking out the correct path through the hodge-podge of messages takes care of it all.

A chat feature permits real-time "conversations" between two or more users

who are logged onto the system simultaneously. Although fairly easy to use, the chat can be confusing if more than two people are involved.

Aliasing is supported to good advantage. For example, if a user accidentally deletes a folder representing the conference he is in, the administrator can create an alias of that conference and effectively re-subscribe that user to the conference.

Given all the strong points of FirstClass listed above, one should not assume there isn't room for improvement, however. There are several places where FirstClass needs work. FirstClass has generally poor administration tools for bulk creation of new users. While the current system works well, is easy and intuitive to use, and is even relatively quick at creating a single user, it performs poorly when many users have to be added (or deleted, for that matter) at once, as is usually the case in education, where classes or cohorts come and go. There is provision for bulk creation of users, but it is clunky and hard to manage. This aspect of FirstClass needs to be modernized. FirstClass seems to assume a relatively stable group of users, which is not typically the case in computer conferencing as an educational tool.

Maddeningly, there is no straightforward way to create an address book in FirstClass from existing address books used with other mail systems. One would think, that in this day and age, it should be possible to simply import, say, a tab-delimited text file to create the necessary address book entries. Unfortunately, FirstClass requires that you type in these addresses one at a time. Indeed, it is not even possible to paste in more than one name at a time, which is unforgivable.

The paste capability is erratic in its operation in other areas of the interface, as well sometimes it works as expected, and sometimes it doesn't. This erratic behaviour of the clipboard seems to be exacerbated by moving between FirstClass and other applications. Furthermore, there seems to be an unreasonably small limit on the number of characters that can be pasted at one time. Attempting to copy a multi-page text document and paste it into a FirstClass message is almost guaranteed to lock up your computer, necessitating a re-start.

Another shortcoming of FirstClass is the lack of an automatic digesting capability. A digest is simply a compilation of many messages, usually relating to one another. For educational conferencing, it would be invaluable to be able to automatically prepare a single document containing all the messages relating to one topic (i.e., a document which is the product of working through the auto-thread capability). Such a digest should contain the usual header information (who sent it, and when, etc.) as well as the body of the message. Unfortunately, if one wants digests of threads in FirstClass, one must create them manually, a tedious project at best.

FirstClass allows the user to adjust the font, size, style, and colour of text in a message, but again maddeningly not to set a default preference for any of those characteristics. Worse yet, the creators of FirstClass have chosen to use 9-point Geneva (on the Mac) as the default display. Obviously, this size of text is far too small to be comfortably read by most users (even those without bifocals!), and

having to manually adjust message text for each item gives plenty of opportunity to speculate on the question "What in the world were they thinking about when they wrote this program?" For having done so many things right with FirstClass, the creators certainly blew it on this point. The next generation of client software will supposedly rectify this oversight, according to SoftArc.

The lack of integration of FirstClass with the World-Wide Web is another shortcoming that one hopes will be rectified sooner rather than later.

Finally, the documentation that accompanies FirstClass is not all that good. It certainly isn't the worst I've seen, but it would be helped immensely by including a few examples of how certain features could be usefully applied, particularly in the area of creating and managing conferences. The current documentation is also too business-oriented to be of much use to educators; perhaps a companion volume of documentation could be developed for educational applications.

Overall, however, FirstClass is several steps ahead of competitors aimed at the educational conferencing market. Given the advantages listed above, as well as the modular licensing scheme and favourable educational discounts, FirstClass is well worth serious consideration if you anticipate becoming involved in computer conferencing for education.

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mPOWER is available from Mindscape Inc., Post Office Box 54984, Santa Clara, CA 95056-0984

Reviewed by L.F. (Len) Proctor

Recommended System Requirements:
Mac with 68040, 8MB RAM, System 7
At least 10 MB hard disk drive CD-ROM drive optional.
640 x 480 color monitor.
AV Macintosh or appropriate digitizing card.

Software Description

mPower is a slide show package that features user friendly peripheral device control, multimedia integration and interactivity similar that found in several current CBI authoring tools. Assuming you have an A/V Macintosh or a Mac with a suitable digitizing card, still pictures and audio or video clips can be created without the help of additional editors. Audio and video segments can also be called from com-

Figure 1:

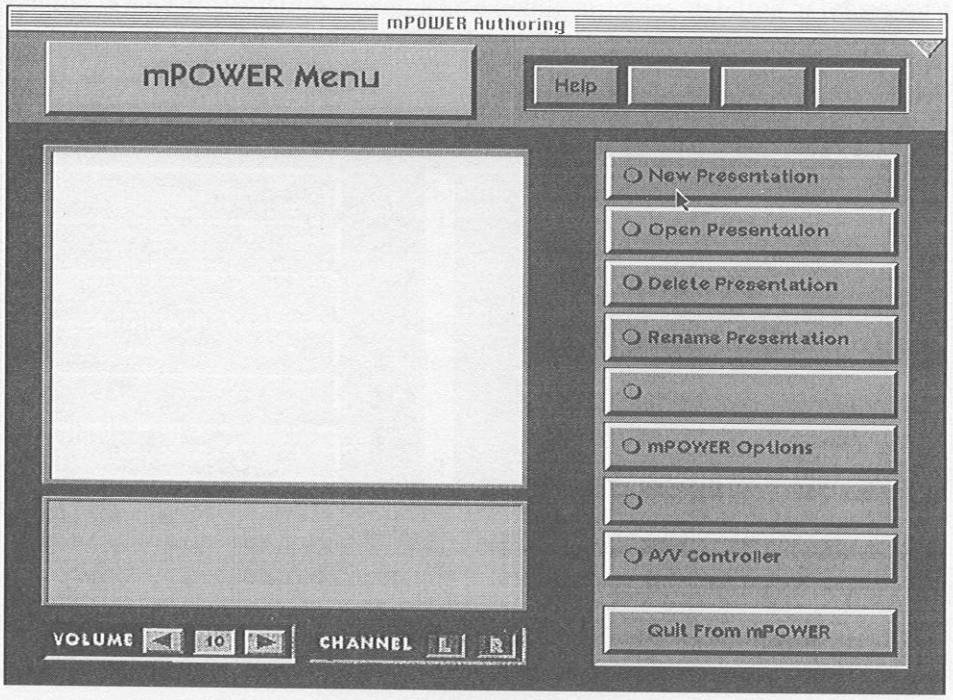


Figure 2:

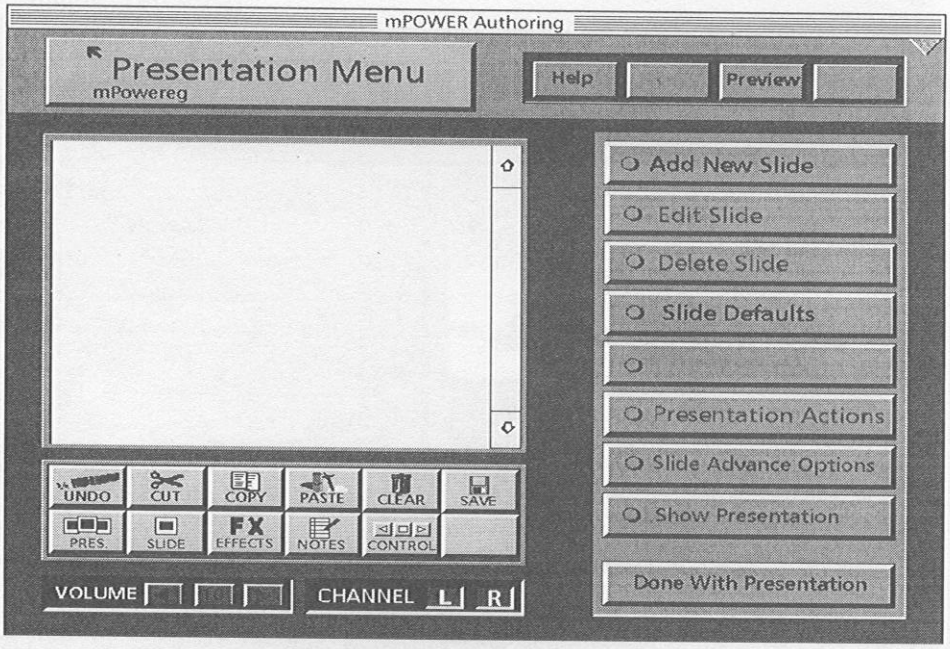


Figure 3:

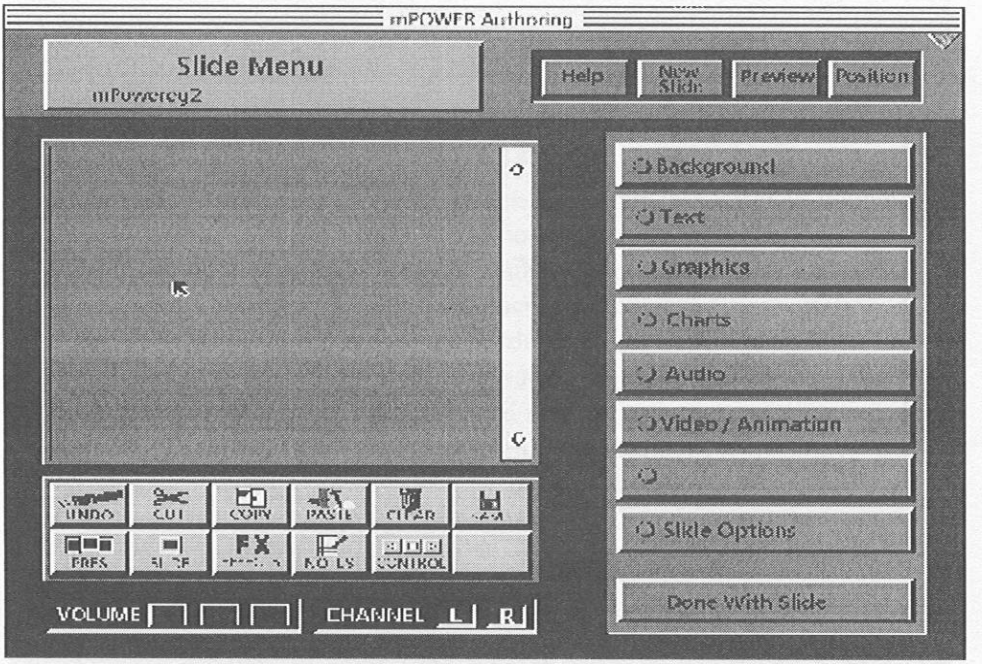
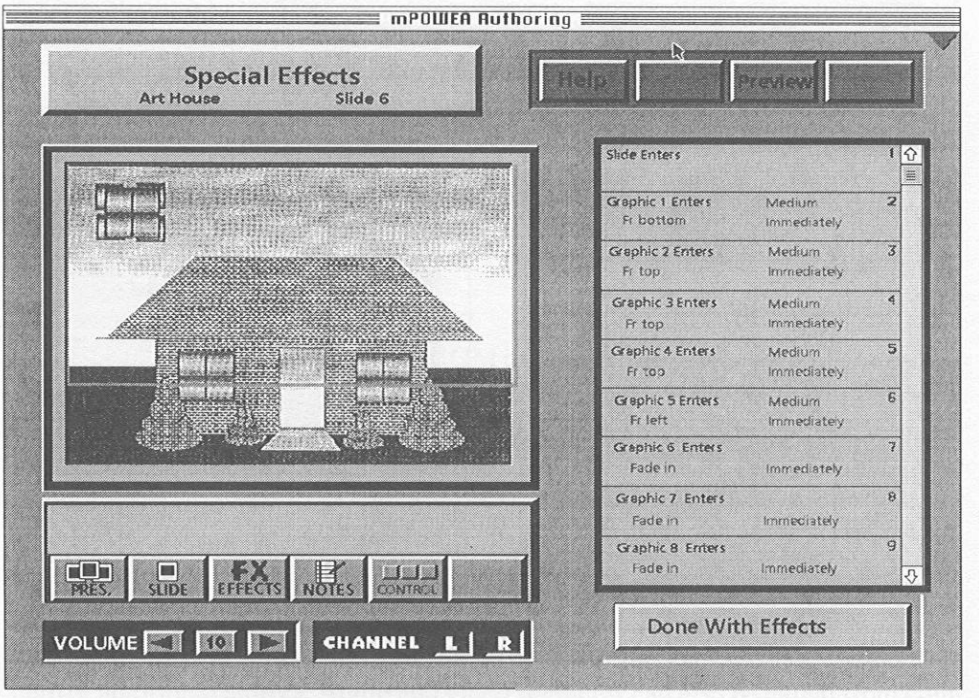


Figure 4:



After booting up the program, the opening menu (Figure 1) offers the option of creating, a new presentation, opening an existing program, deleting or renaming a previous program, selecting mPower options or entering the A/V controller. This is typical of the user interface for accessing all capabilities of the program. Clicking on the new presentation button brings up the second main menu (Figure 2) for creating the presentation and the function buttons. At this point, the author selects default options for the background for the slide, the transition to the next slide and how graphics loading will take place. These options will remain in effect until customized for individual slides. Clicking on the new slide button brings up the third main menu (Figure 3). This is where most of the action happens. Text is placed in the slide, along with graphics, sound, animation or charts. The order in which these are to appear on the screen is controlled by a queue. Editing the order in which the objects appear on the screen is as simple as click, hold and drag the object to a new place in the queue (Figure 4). At any point, the authors can elect to show the presentation and observe the results of their creative efforts. If the order in which slides appear on the screen needs to be changed click on where the slide is in the presentation, hold and drag it to where its new location.

The control mode is equally simple to use. For example, to capture a video clip from a video disc, select the add new video option from the slide creation menu, specify starting and ending frames, then create a quicktime movie and place it in the desired location on the slide. Other media formats can be captured and similarly imported into the presentation. Help files are available at appropriate points in the program. Special features like presenter notes and printing to video are also available in mPower.

Documentation

The documentation accompanying the software is just over 100 pages in length Chapter I outlines basic system requirements, installation instructions for the program and offers a quick tour of the software. Chapters 2 & 3 offer guidance on how to create slides for presentations. Chapter 4 addresses the question of how to customize backgrounds, graphics, charts and audio/video objects. Animation and how to make the presentation interactive is also covered in this chapter. Chapters 5 & 6 are devoted to using advanced features like video compression and the AN controller.

Critique and Recommendations

mPower was installed and tested on a PowerBook 180. and PowerMac 8500. In each case, the installation instructions were accurate and installation of the software with the installer program was uneventful.

While the software was usable on the PB 180, editing or showing a presentation of any size was painfully slow. Creating the same presentation on the PowerMac confirmed the need for taking advantage of all of the computer's available processing power. Large amounts of RAM memory and disk storage space are essential to

the reducing frustration when using of this software. Even when audio, video and picture files are compressed, modest presentations will quickly reach 15 to 20 Mb. in size. Simplicity, user friendliness and auto configuration for many types of hardware variations have all contributed to the size and speed of presentations created with this software.

The apparent simplicity and user friendliness of this software often mask its complexity. For example, all of the function buttons are presented at appropriate times during the editing process but the user is still left with the "clear if known" feeling. "Which one to start with" is still left to experience and user intuition.

The documentation reflects a similar approach. While each function of the software is described in a logical and systematic manner, there is an expectation that the user will have a fairly high level of computer literacy. The reference book approach to presenting the facts about a function frequently makes the explanation of the function hard to follow. Novice users, which are a major target group for this program, are likely to feel the need for a more detailed description. Parsimony, in this case, may have been misplaced.

The mPower tutorial on the CD is another case in point. It is not a tutorial, but rather a linear explanation of button functions littered with technical terms like eps and AIFF. Trial and error experimentation with the program is often just as fruitful as reading the documentation or watching the "tutorial".

Hardware and documentation concerns aside, mPower is an excellent multimedia presentation creation tool. The ease with which graphics, video and sound may be integrated into a slide or a series of slides in a "what you see is what you get" manner makes the program a joy to use. mPower's authors have made a concerted effort to help the user cope with hardware limitations and variation, and cross platform presentation needs. Several good multimedia sample files have been included on the CD for user experimentation and use in presentation creation. I look forward to future versions which hopefully will continue to minimize user concern with technical detail and allow them to focus on the more creative aspects of multimedia presentations.

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Information for Authors

CJEC welcomes papers on all aspects of educational technology and communication. Topics include, but are not limited to: media and computer applications in education, learning resource centres, communication and instruction 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. Manuscripts may be submitted either in English or in French.

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 make such reference. 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

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