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ABSTRACT

A series of articles examines the subject of educational futures, including discussions of the relevance of the topic to the training of teachers and librarians. Three games for future forecasting (SCIFI, AFAR and FAR) and a mini-delphi technique are included. A scheme for viewing alternative futures in Educational Technology through the use of matching future trends and development with categories of analysis is presented. There are discussions about analogical forms of languaging behavior, the future of instructional development, and the application of science fiction to educational technology futures. (WBC)

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Guest Editor

RESEARCH INTO EDUCATIONAL FUTURES

Guest Editor's Introduction

In compiling this Special Issue of Research & Theory Division Newsletter, I discovered some interesting information. I discovered that there are many colleagues who are intimidated by the rubric of our division. A number of persons of whom I thought very highly were hesitant to contribute an article on "educational futures" knowing that they would have to deviate from the traditional models of educational research and theory. I am happy to report that many outstanding scholars were not intimidated, a fact to which this issue attests. However, I do believe that this point should not be dropped without explanation. I believe that there is a great deal of misinformation around concerning the nature of research and theory in education, as well as in other fields. It is important that these misconceptions be answered if we are to provide the groundwork for the type of "anticipatory democracy" that Alvin Toffler (1974) has continually recommended as essential to the health of a free society. The future is everyone's business and we must not be intimidated by it, whether we are teachers, administrators, researchers, or theorists. On the other hand, we must recognize that we are dealing with a horse of another color.

We must avoid the pitfall of viewing research as being synonymous with experimental designs and statistics. Research can include any systematic investigation (Kaplan, 1964). Similarly, theory need not be viewed only as esoteric constructs which can be understood by a few initiates. Theory is fundamentally the study of the relationships between elements of research knowledge. It is important that we break away from the constraints of purely quantitative and controlled research and that we free ourselves of our over-dependence on tests of statistical significance (although they certainly have their place). The challenge of the "futurist" is to test the limits of research and theory, ultimately developing a new "paradigm", if needed.

Thomas Kuhn (1962), in his classic study of the structure of scientific revolutions, is responsible for popularizing the notion of "paradigm". In Kuhn's thesis, a paradigm is a generally accepted model or pattern which guides research. Once a paradigm has been accepted through a "scientific revolution", there is a period of "normal science", as knowledge is accumulated and the paradigm is articulated. Eventually, there is the need for a new paradigm and the old one

is overthrown. Kuhn is quick to point out that this does not happen overnight. Scientific revolutions are more like evolutions. It seems to me that we need a new paradigm for futures research in education. It is perhaps due to the general acceptance of the existing quantitative and statistical models in social science research that is causing much resistance to futures research. In this book, Khun predicts this resistance.

In futures research we are dealing with completely different tools, measurement instruments, units of analysis, data, and methods of verification. We do not have the neatness of Campbell and Stanley's designs and checks for internal and external validity. We are not dealing with students and classrooms, but entire social structures and societies. We cannot measure changes with the same degree of preciseness, until we have developed a better set of social indicators. Our observations must be indirect and global, rather than direct and unitary. Verification will not follow from a statistical test, but may come from a generally acceptable model of a desired state of affairs. There is little doubt that existing criteria for evaluating research and theory will not be satisfactory in dealing with futures.

In many cases, the futurist's observation is conjecture. He lacks the well validated, esoteric tools of the traditional researcher. However, he has one important thing going for him, and that is science. Bachrach (1967) has explained that the foundation of all science is the development of understanding and control through description and prediction. It is for this that all scientists work. The futurist is no exception. The only difference is that he still has to develop methodology and credibility. We are certainly the underdog, often tolerated as a curiosity rather than an equal. I believe that the challenge is exciting and the cause is just and vital.

It is a privilege to present this issue to you. Each contributor has something important to say. Each contribution, no matter how uncomfortable we might feel with conjecture, provides a significant foundation stone towards the development of a burgeoning research tradition. Each contributor was challenged to choose and present an idea, issue, or topic of personal interest. There is a great deal of description and prediction and methodology which will eventually lead to greater understanding and control over our future. I am very appreciative to the contributors to this Special Issue, to the Editor for his confidence and support, and to the Research & Theory Division for its open-mindedness and stimulating climate which is conducive to the experimentalism that necessarily precedes the development of a new paradigm. I hope that this collection of papers will contribute to the knowledge base that is accumulating on educational futures and will stimulate further thought and research (in the broadest sense of the term) to assure that the future will bring us what we want, not what they want us to accept.

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SCIFI: AN EXAMPLE OF INTERMEDIATE TECHNOLOGY FOR FUTURE FORECASTING

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Yesterday's educational decisions resulted in today's glut of teachers, lawyers, and miscellaneous Ph.D.'s, many of who are now working in restaurants, service stations and paint stores. But, these are minor results compared to what today's educational decisions may mean tomorrow. Students of today may soon have the last chance to provide answers to such problems as those of energy, population, and hunger. Educational systems of today may soon have the last chance to teach skills necessary to providing such answers. But, how can decisions about such complex problems be made? How can a single person contribute to future-oriented decision-making?

While it may be true that only an enormously expensive and complex computer system can make predictions with any degree of reliability, it is also true that only a human being can devise the questions upon which those predictions will be based. Remember the old, Toklas-Stein story? As Gertrude lay dying, Alice leaned over and asked, "Gertrude, Gertrude, what is the answer?" From the bed came the whispered response, "Alice, Alice, what is the question?" It may be that the future of the world depends on the quality of the questions raised about that future.

In forecasting for education--as well as for agriculture, ecology and economics--intermediate technology offers an approach which, while avoiding the complexities of computers, does not advocate a technology of tea leaves. Intermediate technology is an attempt to develop techniques which are both sophisticated and usable in simple circumstances. Such techniques for forecasting the future include brainstorming, the modified Delphi, scenario writing, cross-impact matrices, trend analysis, and simulation/gaming. One example of such an intermediate methodology is SCIFI, or Specifying Cross Impact of Future Images.

Combining the cross-impact approach and the simulation/gaming approach, SCIFI is intended to eliminate the error of seeing the future as involving single, independent events and to sensitize participants to the complexities of future forecasting. For example, if one predicts that in 1985, every educational institution in the world will have access to an international, information storage, then one needs to consider the possibility of other changes caused by or correlated with this event. What are the interactions and inter-relationships of a single, predicted event? One could say that there is no such thing as a final solution to any complex problem, since new problems tend to arise out of solutions.

SCIFI not only highlights the cross-impact aspect of future events, but it does so in a simulation/gaming context, which facilitates interest, interaction and insight. During the game, each player is required to anticipate cross-impact consequences--both positive and negative--of future events selected by other players. Through a peer evaluation process, the player whose anticipated consequences appear more probable with the game. Through designing even such a limited model of the future and then exploring the model and the contingencies associated with it, participants begin to develop skills likely to be associated with effective future forecasting. A description of the game follows:

Number of Players. SCIFI has a flexible format which can accommodate anywhere from three to thirty participants. Individual play is recommended for up to seven players; with more than seven, it is suggested that the players be grouped and play as teams.

Time Requirement. This depends on the number of players/teams. Allow ten to fifteen minutes per player/team.

Materials. (1) A set of envelopes with mock headlines from 1985 written on their faces. These headlines describe some desirable future image in the selected topical area. These are prepared before hand by the game leader or other non-participants. There should be approximately twice as many different headlines as there are players/teams.

(2) A package of index cards for writing cross-impact consequences.

(3) A large sheet of newsprint and a felt tip pen for each team. Alternatively, if an overhead projector is available, a sheet of acetate may be used for each team.

Play of the Game. (1) The game leader divides players into a suitable number of teams if necessary. S/he then specifies a topic for future exploration and also a future year, usually ten years hence.

(2) The game leader places the headline-envelope in the middle of the table. Each player/team selects the headline which it would most like to see come true by the specified future date. If some participants are unnecessarily slow in making a selection, the game leader imposes a time limit.

(3) Each player initials his/her chosen headline-envelope on its back and passes it to the player on the right. The players now study and analyze the headline on the envelope passed to them and think of a consequence--either good or bad--of this future event. Each player writes this consequence on an index card and inserts it in the headline-envelope.

(4) Step 3 is repeated until the headline--envelopes are back to the players/teams which originally chose them. Each player/team copies the headline and all of the consequences (from index cards) on their sheet of newsprint (or acetate).

(5) The game leader collects the newsprint lists and the headline-envelopes with their consequence cards from each player. S/he posts one of the newsprint lists so that all can see. The players/teams rank the consequences in the order of their probability of occurrence. The game leader selects the corresponding consequence cards and requires each player/team to arrange them in their rank order with the most probable one on top. S/he then turns the entire stack over and numbers the cards in order. This automatically assigns the score value of 1 to the lowest ranking consequence and so on. The game leader then turns the stack over and shuffles the cards before handing them to the next player for ranking. S/he repeats this process until all consequence cards have score values on their backs. S/he repeats this entire procedure with each of the remaining newsprint listings.

(6) The game leader places all consequence cards in the center of the table. Players/teams collect all of the cards which they themselves wrote earlier. Each player/team adds the numbers on the back of all cards to obtain the individual player/team SCIFI score. The player/team with the highest score wins.

Small is Beautiful. Discussions subsequent to the game, particualrly with educators as participants, might include debriefing not only related to the topical area chosen for the game but also to other applications of SCIFI in particular and the use of intermediate technology in general.

LEARNING LANGUAGE TOMORROW

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Curricula for language learning is the U.S. today are based on the presumption that reading and writing english are the only important language learning tasks. But a much more comprehensive way of looking at language will characterize curricula of the future.

Education tomorrow will focus on the behavior of people using language and less on language. They will be concerned with languaging--with what people do with and to signs of which languages are composed.

It is languaging as a concept that underlies a model (below) from which it will be possible for designers of curricula and teachers in the classroom to devise learning opportunities that will develop and strengthen one languaging form through analogy with another. That model utilizes two terms that may appear new. "Evanescent" refers to "spoken" forms of languaging such as verbal speaking, signing, body language, etc. When evanescent languaging is over, nothing is left but memories. "Distanced" refers to the permanent languaging forms, such as printed words, pictures, video, movies, etc., upon which our literacies and our society is so largely based.

ANALOGICAL FORMS OF LANGUAGING BEHAVIOR

	Verbal	Visual
Evanescent	Speaking (Words sequentially)	Expressing oneself using body and/or object language sequentially. (speaking visually)
	Listening to speech (Sequenced words spoken)	Seeing sequential body and/or object language. (listening to visual speaking)
Distanced	Writing English (Sequenced or patterned words)	Expressing oneself using photos, video, movies, etc. sequentially. (writing visually)
	Reading English (Sequenced or patterned words)	Seeing photo-sequences. (Reading written visual language)

English teachers are well aware that the four verbal forms of languaging provide six pairs of analogous languaging activities: speak⟷listen, speak⟷write, speak⟷read, write⟷read, etc. With the four visual languaging forms now necessary the analogical pairs that are possible double with a richness of experinece not possible before. But what is more important is that tomorrows learner will be developing both hemispheres of his brain systematically. No prior generation has had this opportunity.

AFAR: AN INTERMEDIATE TECHNOLOGY FOR FUTURE FORECASTING

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Recently there is a rampant growth of research methodologies for forecasting the future. Many of these methodologies require complex computers and expensive experts. In contrast to this, game designers are creating "party-game" versions which have brought these methodologies down to modest budget and mundane skills. AFAR (Alternative Future Analysis and Review) is one such game which is playable by nonspecialists to obtain various instructional insights about the future of a selected field.

OBJECTIVES

AFAR has been used to serve a number of purposes. On a policy-making mode, it has been used by organizations to determine the desirable futures for the maximum members of their constituency. In this mode, AFAR provides an opportunity for divergent groups to present their points of view about what is good for their organization and to arrange alternative futures in order of priority. In instructional settings, AFAR has enabled learners to list and evaluate different desirable futures in a specific field. As a research methodlogy, AFAR provides a controlled situation in which unobtrusive data about desirable images of the future held by different people are obtained. This helps the researcher to generate and to test hypotheses about individual differences in future perception. AFAR also enables researchers in small-group behavior to explore different aspects of coalition formation, negotiation and consensus.

HOW TO PLAY AFAR

The rules af AFAR are fairly easy to learn and apply. They are listed and described below:

1. Role allotment. In assigning individual players to different groups, the game leader creates maximum divergence in order to bring out conflicting points of view. If the players are too homogeneous in their experience and expertise, they are assigned different roles and required to read appropriate materials to support these roles.

2. Specifying the constraints. The game of AFAR begins with a specification of an area for future forecasting and a suitable year in the future. These may be prespecified by the game leader or cooperatively identified by the players through a preliminary discussion.

3. Specifying desirable future images. Each player lists five desirable events on the specified topic which s/he believe most people would like to see by the specified date. These lists are made without consultation among players.

4. Creating the common list. Each player takes turn to call out one of the most desirable future images from his/her list. The game leader (or one of the players) paraphrases each statement and writes it on a chalkboard for public display. Players try to contribute future images which are not redundant to those already on the common list. This procedure is continued until the list contains ten future images.

5. Initial ranking. Each player secretly selects what s/he considers to be the most desirable future image from the common list and writes it down. The game leader individually collects these selections and makes a public announcement. Each player receives a score which is equal to the number of players (including him/herself) who choose the same future image. This consensus score may range from 1 (for a unique selection) to a number equal to the total number of players (when all the players choose the same future image).

6. Recycling. The future image selected by most players is given the first rank and a line is drawn through it in the common list. Players now select the second most desirable future image. Play of the game continues in this manner until the top five desirable events are identified.

7. Breaking ties. During some of the rounds of the game, it is possible for more than one future image to be selected by the largest number of players. In these situations, players score as before, but no future image is ranked for that round. A two-minute persuasion period is declared during which players make statements for and against the selection of any appropriate future image. This is followed by another round of secret selection.

8. Determining consensus winner. The consensus scores of all players for all rounds of the game are added up. The player with the highest score is declared the winner in being able to best "psych out" the moves of other futurists.

9. Determining the forecast winner. Players now return to their original individual lists of five desirable future images and identify those images (or reasonable facsimiles) which made the top five on the common list. Each player scores 5 points for the first-ranked item, 4 for the next and so on if it is found in his/her original list. The player with the highest score in this category is declared the winner in being able to most effectively judge the future needs of the public.

10. Follow up. To achieve maximum benefit from the AFAR experience, a structured debriefing is undertaken. Alternatively, the play of AFAR may be followed up by one or both these companion games:

Mini-delphi (Stolovitch, 1976). This game requires players to identify the likely future images in the same topic and contrast them with the likeable future images from AFAR.

SCI FI (Specifying Cross Impacts of Future Images) (Dormant, 1976). This game requires players to identify various cross-impact consequences of each of the likeable future images selected in AFAR.

PLAYING AFAR IN LARGER GROUPS

AFAR is usually played in classrooms and workshops with 20-30 learners. There are three ways in which such larger groups may be accommodated:

1. Parallel play. Participants are divided into a number of smaller groups. Each group plays AFAR in a self contained fashion.

2. Team play. Participants are divided into a number of teams. Each team participates as a unit in the play of a single game of AFAR. Team members work out their own techniques for achieving consensus among themselves.

3. Combination play. Two games of AFAR are played in this version. During the first game, groups play in a parallel fashion and identify their own top five desirable future images. During the second game, they play in the team fashion, using the future images identified in the earlier game as the team list for creating the common one.

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TECHNOLOGY AND EDUCATION IN A DEMOCRACY

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At no time in history has this world been more in need of a well-trained population than it is right now--today. This is as true in foreign countries as it is in our own--but with a difference. Many systems of government, those with an acquiescent populace, can survive with a great deal of conformity and just a little independent thought. Democracy, conversely, needs a great deal of independent thought. Democracy, conversely, needs a great deal of independent thought and a minimum of conformity. And this is the more difficult balance to attain...even though our record seems to prove that we are capable of it.

Schools around the world are failing to keep up with changing lifestyles, and this is leading to heavy drop-out rates according to a United Nations report. What a shame! That in an age when man can figure out how to get to the moon, he can't figure out how to keep the kids interested in school! While admitting that the problem is too complex for any short analysis, let us examine a few aspects of it which do relate to education in an age of technology and which, in addition, seem to relate to each other. Let's call these craftsmanship, independent learning, new horizons and the relationship of these three aspects to democracy.

Let's start with craftsmanship. To sell any product, we must convince our buyer that our product is somehow superior to what he is presently using, that not only can it perform just as well as its accepted predecessor, but that it has, in addition, certain features that make it worth changing to. And most of all, we must convince our buyer that he can depend upon the product. In spite of the widespread success of technology in business, educational technology has not shown itself to be consistently superior to traditional education.

Part of the problem lies with the rather haphazard manner in which the hardware of technology, the tools, has been brought into education without provision having been made for training in its use. Without the confidence that comes with training, teachers will have little incentive to use the new tools.

Part of the problem, of course, is money. "Sesame Street" and the "Electric Company" are two superior educational TV programs. But "Sesame Street" alone cost 7 million dollars. After "Sesame Street's" spectacular success, as a further supplement to classroom teaching of reading, the "Electric Company" was produced as a TV series based on the following premises: millions of adult Americans don't read well enough to perform basic tasks. 13 million students have significant reading difficulties. Television is available to virtually every home in America. Children love TV, especially pre-school and primary grade viewers. TV is associated with pleasure. TV is non-punitive. TV has many technical advantages--animation, music, sound effects, humor and incongruity. On TV, drill without tedium is possible. What other educational "kit" can equal this?

Previous to Gutenberg, like TV, most formal education was a one-way process. The teacher, usually with the only source books available, lectured to the students who were expected to listen and believe. In the authoritarian ages of imperial Rome and medieval Christianity this format was accepted as good education, but following Gutenberg, the many sources of information available to men fostered the development of INDEPENDENT thinking. With books available, learners, not teachers controlled the content, the direction and the pace of learning...and the Renaissance was born (if you will pardon the redundancy).

Up to the present moment, most of our use of technology in education has followed the medieval, one-way teacher directed process of learning rather than the multi-source student directed Renaissance style. But this too is changing. With the increasing availability of materials such as cassette audio tapes and videotapes, and films, slides, microfiche, etc., the time is fast approaching when, as he has done with books, the student will be able to control the content, direction and the pace of his learning using newer media. (In fact, he may use the newer media to produce his own progress reports). So, with its greatest defect overcome and with technology's many advantages, we should expect a great expansion of independent thought, an expansion long overdue and crucial to man's survival.

In Future Shock, Alvin Toffler notes that "what passes for education today, even in our best schools and colleges, is a hopeless anachronism" and "that vast energies were applied to cranking out Industrial Men, people tooled for survival in a system that will be dead before they are". Toffler looks to a balance of convergence and diversity, toward the need to concentrate, to converge on a common frame of reference, on a grounding in certain common skills needed for human communication and social integration, balanced by a program of diversification so broad as to include contingent curricula, and training for life underground, under water, and in outer space. But there is an even more difficult problem. We must be able to step outside of ourselves; we must become aware not only of our prejudices and biases, but of the limitations of our thought processes as well. To explain this statement let me digress for 40 seconds:

> Man lives in time and space. His hearing is time-oriented; his sight is space-oriented. Early in history, man developed an exceptional ability to communicate information through sound--through speech and hearing. But his only way of <u>storing</u> speech information was in his memory. At the same time, he developed a second way to communication information, through space, by using pictures, sculpture or decorations of artifacts. Unlike speech, space communication could be stored for later use. So man developed a system, a code, in which pictures and symbols designated sounds...he invented print. Print is a system encoded in space representing time. It uses a <u>field</u> to represent a <u>sequence</u>. Clever, but destined to cause trouble.

The reason for the above digression is quite simple. If we are to improve education, we shall need to analyze <u>how</u> we learn, look at the available new "learning-related" research material and THEN make plans. So here goes:

The thought process on which Western culture is built is a legacy from the <u>later</u> Greek philosophers, a system called "logic". And logic is linear; it is based on verbal thinking, a time-oriented system of thought which since Gutenberg, has been encoded in print. Logic has the majestic flow of music, and like music, is based on mathematics, on a set of laws. Now this type of thought process works fairly well in a stable society. It matured in the time of Plato in the later, more stable age of ancient Greece. It was <u>not</u> the dominant philosophy in the formative days of early Greece. In those earlier days, Heraclitus' philosophy, the philosophy of "change", of a "world in flux", was the one that best expressed Greek thought.

Today the human race is once again in an age of great and rapid change. And yet, in our deepest thought processes, we still cling desperately to the apparent stability of Plato's "real and ideal world" and to a dependence on the linear thought processes of logic. One would think that Einstein's relativity would be more acceptable in this age of tumultuous change, but no, like the Romans and their Christian successors, we still hark back to Plato and Aristotle for our techniques of thought. Although this idea may not yet be acceptable to some of us who are not in the habit of analyzing our own thought processes, there have been some recent discoveries in science that point toward the inevitability of our facing these facts.

The human brain, the source of all our thoughts and actions, is at the center of a scientific explosion. Scientists today compare the brain to a general purpose computer with several elements and memory banks and some built-in (in-born) programs. The scientists believe that, linked together like Siamese twins right down the middle of our brains, two very different persons inhabit our heads. One of them is verbal, analytical, dominant; the other is artistic, but mute, and still almost completely mysterious. In most people, the left half of the brain is dominant and controls the right side of the body. It also controls speech, and, therefore, logical thought. This dominant shows itself in the fact that most people are right handed, that is, they are conrolled primarily by the brain's left hemisphere. However, in spatial abilities, the right hemisphere is clearly tops. It recognizes faces better, and in general seems better at grasping the total picture, the Gestalt of a scene.

Musical talent, too, appears to be located in the right hemisphere. But in spite of this evidence of an ability to think in three dimensions, and although we admit to living in a three dimensional world, we insist on verbal, sequential, two-dimensional thought processes.

Experiments seem to prove that we alternate from one cognitive mode to the other and that these modes complement but do not readily substitute for each other. Early in life, it seems, we become shaped either as a left-hemisphere type who functions in a largely verbal world, or a right-hemisphere type who relies more on non-verbal means of expression. These two are basically different approaches to the world. Drs. Robert Ornstein and David Galen, neuro-psychiatrists, are working on a test to determine brain hemisphere preferences in people and think that "this test should give them a tool with which to guide children or adults to new aspects of themselves, to open them to a full range of experience". It should be noted that these discoveries are not a mere academic conjecture, but are based to a great extent on case studies of patients, portions of whose brains have been destroyed by accident, disease or surgery. And this brings us back to education and its new horizons. In attempting to re-train patients whose brains have been damaged, coupled with efforts to alleviate certain physical and mental stresses in other patients, some startling discoveries have been made. It has been found that individuals can learn to activate the left or right hemisphere voluntarily through a process called "bio-feedback". Bio-feedback training is the procedure that allows us to tune in to our bodily functions and eventually to control them. This is accomplished through having the patient observe on an oscilloscope-like machine messages that denote his own physical or mental state as recorded through electrodes attached to his own body. Often, once a patient can recognize his condition, he can quickly learn to control these states. With training, it is found that not only can human beings learn to control blood pressure and heart beat, but by learning to control brain waves, can put themselves into an active beta waves state or more tranquil alpha waves state, and can move into a more creative state, the theta waves state, at will. In certain Eastern cultures, this type of mental control has long been an accomplished fact, but is practiced only by a small minority after years of training. Through bio-feedback, individuals apparently learn similar control techniques in a relatively short time, in weeks or months.

It is evident that brain research and the development of bio-feedback techniques may open the way to great change. It also opens the door to some searching analysis of our current educational beliefs and practices. For example, as a presumably intelligent, left-handed artist, evidently much of my own brain power is concentrated in my <u>right</u> brain hemisphere, the side that functions best in areas only dimly recognized and seldom taken into account by present day educators. This may explain my occasional bewilderment at what seems to pass as logic among my colleagues and my equally occasionally puzzled feeling at the confusion of my colleagues at what may appear to me to be quite simple. One can only speculate that at least 50% of education's problems are tied into an understanding of this unexplored 50% of our brain. Sad to say, without the total picture, the Gestalt, that the right hemisphere comprehends, we are destined to continue to analyze our problems in the light of our left hemisphere capabilities, logic, sequence and verbal thought (a narrow-minded view, indeed, wouldn't you say)?

So may things become clear once we can appreciate this idea. Dr. Roland Calloway, of the University of Wisconsin-Milwaukee, told an anecdote about the students in a dull class who "took care of it" by interrupting the sequential flow of the teacher's plan by substituting a field operation of scattered annoyances. This is reminiscent of the Allies' control of the Nazi panzer line in World War II. The Nazi tanks were allowed uncontested entry into a field where scattered Allied soldiers tossed grenades into the tanks as they went by. The Romans are said to have defeated the Greek phalanz in the same manner by substituting a field idea for a linear sequence. They let the close-order Greek unit break through their lines and then attacked them from all directions in the open field. Each of these examples demonstrates a sequence-based action that has been interrupted by thought and action in a field.

If this is so, isn't it possible that what we call "thinking on your feet", hunches, intuition and even talent are manifestations of the right hemisphere spatial abilities? Isn't it possible that genius consists of an exceptional use of an exceptionally well-balanced brain, one in which both hemispheres are operating and cooperating at a highly efficient level?

Isn't it possible that decison-making depends upon a comprehension of all pertinent factors seen at once in a spatial way and that the resulting judgment is a Gestalt of the best combination of factors?

Isn't it possible, then, that decision-making demands a spatial point of view and that the implementation of decisons needs a time sequence?

An isn't it possible that the current tendency to make "studies" to set up "task forces" and to hire "consultants" (which often appears as and results in an avoidance of decision-making) is a result of the over-training of our left-brain hemisphere, programmed to logic, sequence and verbal thought and the lack of training of the right-brain hemisphere which can visualize factors in a field and through choosing, create decisions?

The implications for education in a democracy are quite evident. If "dropping-out" is an international tendency, its causes are probably more closely related to technology than to a particular form of government. To remain vigorous, a democracy needs all the information it can get and the best communication system available to disseminate it. A democracy needs an intensive program of independent study and action balanced by the development of a commonality of beliefs, goals and social habits.

The Renaissance was the last such period, difficult, turbulent, but astonishingly creative. There are evidences that once again, we are into a similar "stew". In education, our choice is no longer technology or no technology, it's only a matter of which direction? What plan? Technology offers us the information and the carrier. With or without a plan, it will develop a commonality of ideas and social mores, and if we choose, technology can help promote independent learning, creativity and decision-making on a scale never before approached in the history of man.

Technology is a tool. A tool is an extension of man's own capabilities. Mechanical tools augment his muscles; electronic tools increase his capacity to handle data. Therefore, just as mechnical tools have taken over man's heavy work, so electronic tools may become his memory and data sifter, leaving man able to devote more time to creative thought, problem solving, and decision-making. At the present moment, education has at its disposal the most tremendous capabilities in man's history. It is our responsibility to use them---and to use them wisely.

FUTURE FORECASTING IN TEACHER EDUCATION[1]

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Future forecasting is always a perilous venture. The endeavors of many courageous investigators to chart future courses in education have frequently led those presumptuous navigators off course into the mists of unreality. Nevertheless the soothsayer's role is an intriguing one--and I admit to my having been drawn to it because of the challenge as well as my deep-seated concern for the future development of teacher education. In order to perform this task, I have initiated a number of studies, two of which I will report on in this article. These are:

1. A Mini-Delphi study and
2. An application of the Future Alternatives Review (FAR)

These studies are based on survey data and interviews with a number of scholars engaged in research and development.[2] The purpose of the two small-scale forecasting techniques employed was to attempt to obtain some consensus about likely and desirable futures in the area of teacher education. The emphasis of these studies was on "development".

DEFINING DEVELOPMENT

The term "development" is commonly used in education. To investigate its future requires fixing on a precise definition within a given context. My inquiry was concerned with development as a set of activities related to the R&D process in teacher education. To gain precision, I attempted to do a concept analysis (Markle and Tiemann, 1971) of the term, isolating critical and variable attributes. But all the critical characteristics which I attributed to development such as: research-based, systematic, practical and goal-oriented, turned out to be variable when put to the test of having professional developers sort out these characteristics. Taking another tack, I decided to avoid any hard and fast definition and instead selected a range of definitions. To each respondent in my interviews, I posed the following question: "If I say 'research and development' followed by 'development in teacher education' what do you understand the word 'development' to mean?" From those involved in teacher education research the response was usually, "The translation of research findings into practice." From the developers, the general consensus was, "The creation of products to solve some problem or need in teacher education." (Note that research is not mentioned). Two more interesting definitions which came out of the interviews and bear reporting are: "An outcome, rather than a process, to which there are alternative routes and in which research may have a share" and "The generation of solutions to operating problems in teacher education. The solutions must be in the form the consumer can use. The outcome of development must be more than an idea."

I bring these various definitions to your attention to illustrate the fact that while there is general agreement that developmental activities should terminate in a product, there is divergence over the methods for achieving this end. The reader should bear in mind these disagreements over definition in considering the predictions which are generated.

A Mini-Delphi Forecast

This study is based on a modification of the Delphi technique (Hodgetts, 1974). Steps followed in applying this method to the interview data were:

1. Make a list of expert forecasts. Keep these forecasts anonymous to prevent unnecessary biases.

Below is the list of 40 predictions based on the previous interviews reported in this paper. This was the list used during the mini-Delphi acitivity.

1. Developers will become increasingly concerned with internal as well as the external validity of their products.
2. There will be increased emphasis on quantitative analysis and rigorous experimental designs for evaluating development products.
3. The idiosyncratic artist's touch of the successful developer will be more clearly defined.
4. The traditional flow of research to development will alter.
5. Products with predictable, replicable outcomes will offer clearly defined treatments as independent variables for research.
6. Development will face austere times.
7. Congressional conservatism vis-a-vis development funds for teacher education will increase.
8. Educational labs and R&D centers will be cut back or their activities curtailed.
9. State and local agencies will provide more funding for development in teacher education.
10. The private sector will provide more funding for development in teacher education.
11. Funds for developing workshop packages and self-instructional materials at the state and local levels will increase.
12. Alternate formats to the traditional lecture will be adopted on the basis of high yield for low cost.
13. Microteaching will be increasingly integrated into teacher education courses.
14. More simulations/games will be developed for teacher training.
15. The resource-management format will be increasingly used as a teacher-education format.
16. Information mapping will be increasingly used by developers.
17. A larger number of courses built around PSI will be developed.
18. Construct-lesson planning will be developed for teacher-trainees.
19. Algorithms and performance aids will be developed for teacher-trainees.
20. More modules will be developed.
21. In-service teacher education will require more mediated modules.
22. More non-print training materials will be integrated into teacher education.
23. More protocol films will be integrated into teacher education courses.
24. Increasing number of self-instructional mediated packages consisting of slides or filmstrip, audiocassette and response book will be developed.
25. Minocourses will increase.
26. Use of the audiotutorial system will be more widespread.
27. Video for taping student-teaching and pupil-teacher interactions will be increasingly used.
28. Computer assisted instruction (CAI) will be significantly more widespread.

29. Computer assisted instruction will be increasingly utilized in teacher education courses where CAI installations have already been made.
30. Telelectures will be more widespread.
31. Regional-central campus telecommunications links will be more widespread.
32. Conference calls to noted scholars will be more widely used.
33. Teacher education will develop television feedback programs.
34. The instructor in front of the classroom will be the dominant delivery system for teacher education.
35. Large numbers of take-home instructional packages will be developed for pre-service and in-service teachers.
36. Computerized observation systems providing immediate and objective feedback to student-teachers and in-service teachers will be increasingly used.
37. Alternative programs will be curtailed.
38. More development efforts will be aimed at the in-service teacher.
39. More development efforts will be aimed at the paraprofessional.
40. More development efforts will be aimed at the parent-tutor.

2. Assemble a panel of experts in the field. Have these experts read the forecasts and secretly write down the percentage probability for the occurrence of each by a specific future date.

My panel of five experts[3] separately wrote a percentage probability of occurrence beside each item for the year 1985. The lists were collected by a facilitator and percentages for each occurrence were listed on the chalkboard. Anonymity of predictions was maintained.

3. Have the panelists go through a second round of probability estimates for each forecast based on feedback from the earlier round.

There were frowns and dubious looks but during this round no discussion was permitted among the panelists. When all panelists had finished writing their second percentage figure, the facilitator collected their lists.

4. List new probability estimates still maintaining anonymity of predictions. During the third and final round, permit panelists to make statements related to any of the forecasts. Require the panelists to write a new percentage figure based on the feedback and discussion. Impose a time limit on the discussion of any new item if necessary.

The panelists went through the list of 40 forecasts stopping along the way where individual estimates were extremely divergent from the others. The person with a divergent point of view was given an opportunity to explain his position. There were some heated debates but no discussion was permitted to go beyond three minutes for each forecast. The panelists revised their probability estimates appropriately.

5. Compute the median and the interquartile range of probability percentages for each forecast. Those forecasts for which the interquartile range is 10 percentage points or less are considered to have consensus from the panel.

Seventeen of the 40 forecasts received this type of consensus from the panel. These forecasts are given below along with their probability of occurrence:

1. More modules will be developed. (90%)
2. The instructor in front of the classroom will be the dominant delivery system for teacher education. (85%)
3. Microteaching will be increasingly integrated into teacher education courses. (80%)
4. Increasing numbers of self-instructional mediated packages consisting of slides or filmstrip, audiocassette and response book will be developed. (80%)
5. More development efforts will be aimed at the in-service teacher. (80%)
6. Developers will become increasingly concerned with the interal as well as the external validity of their products. (80%)
7. Congressional conservatism vis-a-vis development funds for teacher education will increase. (75%)
8. More simulations/games will be developed for teacher training. (75%)
9. Educational labs and R&D centers will be cut back or their activities curtailed. (70%)
10. There will be increased emphasis on quantitative analysis and rigorous experimental designs for evaluating development products. (70%)
11. The resource-management format will be increasingly used as a teacher-education format. (70%)
12. A larger number of courses built around PSI will be developed. (60%)
13. Algorithms and performance aids will be developed for teacher-traineees. (60%)
14. Regional-central campus telecommunications links will be more wide-spread. (35%)
15. Alternative programs will be curtailed. (30%)
16. Telelectures will be more widespread. (30%)
17. The private sector will provide more funding for development in teacher education. (10%)

FUTURE ALTERNATIVE REVIEW (FAR)

The mini-Delphi activity enabled us to identify future events in the field of development in teacher education which are likely to occur. I also conducted another forecasting activity which uses an operational game called FAR (Future Alternatives Review) which permitted the identification of desirable events. The procedural steps and the outcomes of this actitivy are given below:

1. Each panelist lists five desirable future events in the field of development in teacher education within the next decade.

The individual lists generated by our six futurists[3] are shown in Figure 1. During the play of FAR, these lists were concealed from each other.

2. A consolidated list of 12 indicators is obtained by asking each panelist to contribute the two most desirable items from his individual list.

Figure 2 shows the consoliated list. During the actual play of the game, this list was written on a chalkboard to permit easy study by panelists.

3. Each panelist independently selects the event which he considers to be the most widely desired future event in the field and writes down its number. Players compare their selections and give themselves a score equal to the number of players selecting the same event.

During this step, four of the panelists chose the fifth item from the common list (viz., increased use of systematic development process); one panelist chose Item 8 and another, Item 3. The scores were 4 for the first and 1 for the other two.

Panelist A:

1. Increased use of microteaching. 2. Low cost local development. 3. Decreased use of television. 4. Development of low-cost training methods. 5. Increased training of teachers in instructional-development competencies.

Panelist B:

1. More emphasis on in-service training. 2. Formative evaluation and validation. 3. Re-emphasis of "core" skills. 4. Diagnostic-prescriptive approach to teacher training. 5. Packaged approaches for group learning.

Panelist C:

1. Increase in in-service training. 2. Funding of alternative teacher education programs. 3. Increased use of systematic development process. 4. More funding for development in teacher education. 5. More competency-based self-instructional materials.

Panelist D:

1. More money for development. 2. Differential training materials. 3. Complete dissappearance of lecture-textbook approach to teacher training. 4. Self selection from among alternative training procedures. 5. Teachers perceived as managers instead of disseminators.

Panelist E:

1. Development based on solid research. 2. Continuous response from trainees and feedback. 3. Wider contribution from developers. 4. Development of a science of instruction. 5. Drastic decrease in the costs of hardware and software.

Panelist F:

1. Research-based competency-based approach. 2. Explication of philosophical rationale for innovations. 3. Increased use of temporal and spatial analyses. 4. Increased accountability. 5. Focus on ultimate student outcomes.

Figure 1. Individual lists generated by six panelists.

1. Development of low cost training methods.

2. Continuous response from trainees and feedback.

3. Differential training materials.

4. Packaged approaches for group learning.

5. Systematic development process.

6. Explication of philosophical rationale for innovations.

7. Increased training of teachers in instructional-development competencies.

8. Development based on solid research.

9. Self selection from among alternative training procedures.

10. More money for development.

11. More emphasis on in-service training.

12. Increased accountability.

Figure 2. Consolidated list of desirable future events in development in teacher education.

4. The future event selected by most panelists is given the first rank and removed from the list. The panelists now select the second most widely desired event. This process of selection and scoring is repeated until the top five desired events are identified.

These were the top five widely desired events as identified by the panel at the end of the game:

1. Increased use of systematic development process.
2. Development based on solid research.
3. Increased training of teachers in instructional development competencies.
4. More money for development.
5. More emphasis on in-service training.

To summarize, then, I have offered a number of predictions about the future of development in teacher education as perceived by persons presently engaged in both research and development in this area. To test these predictions, I have had a second group of practitioners examine the predictions and provide estimates of the probabilities of their occurrence. Finally I have had a third panel play an operational game to identify desirable futures for development in teacher education. As I state at the outset, forecasting is a perilous endeavor. By using experts, I have attempted to share this peril. I should like to continue sharing by inviting you to participate in crystal-balling as well. Write your own estimates beside the prediction in this paper (or on a copy of it). Write up some prediction of your own. Send these to me and I shall be happy to feed back to you what other readers see as the future of development in teacher education.

Footnotes

1. This article is adapted from a presentation given at the Second Annual Conference on Teacher Education, Indianapolis, Indiana, November 6, 1975.
2. These scholars include Drs. Myrtle Scott, David L. Clark, Melvyn I. Semmel, David Gliesmann, Gary Ingersol, and Michael Parer. I would like to extend my sincere thanks for their contribution.
3. The Mini-Delphi panel consisted of Ms. Kathleen Brophy Frick and Drs. Lawson Hughes, Michael Molenda, Charles Plummer, and Sivasailam Thiagarajan. Mr. Mark Schleicher acted as facilitator for this session.
4. This panel was the same as for the Mini-Delphi with the addition of one member--myself.

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LIBRARIANSHIP: "BECOMING" AS PREPARATION FOR THE FUTURE

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Increased skills in three major areas will be needed in librarianship in the future. The three areas are: (1) evaluation, (2) systems analysis, and (3) interpersonal relations. Each of these needs merits renewed emphasis on a worldwide basis.

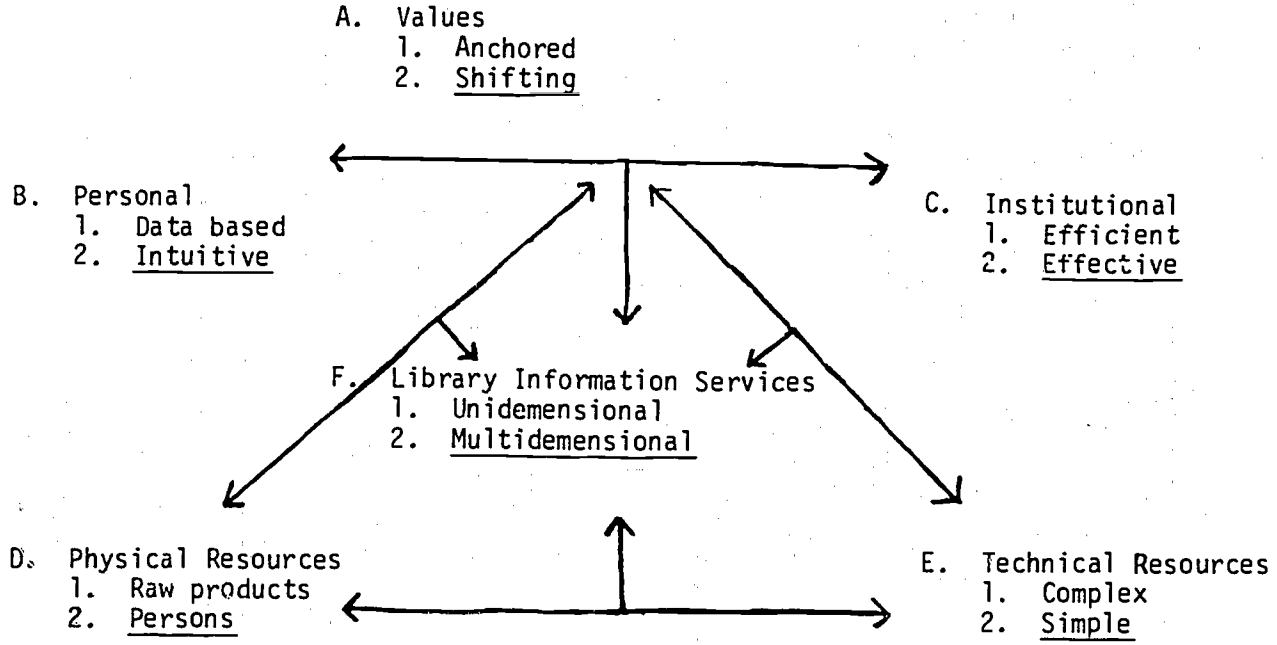
Speculation about the future interests many persons concerned with long range planning. Members of the Club of Rome have issued dire predictions about what can happen to mankind if decisions are made to maintain the same social activities as now prevail. Specialized bodies of literature exist in the social sciences and sciences concerning both the study of the future and the means of planning and implementing change.

The rate of change is increasing.[1] The world population has increased by 1,700,000,000 from 1945 to 1976. The gross world product climbed from $700 billion in 1950 to $3.2 trillion in 1970. The interval between a scientific discovery and its application has shortened. One study concerning inventions indicates that the time lag of 30 years between 1880 and 1919 has been shortened to an average of 9 years after 1945.

FUTURE TRENDS

Anticipated alternative futures were explored recently in sessions of the Allerton Park Institute conducted November 14-17, 1976, on the University of Illinois campus. A synthesis[2] of selected information provided will be discussed by means of Model I: Selected Aspects of Change.

MODEL I: SELECTED ASPECTS OF CHANGE



Model I shows that library information services are imbedded in the change processes of society. In each instance, the emphases of the change processes, despite factors of resistance, are moving toward the underlined items:

A. Values which were once anchored by commonly accepted verities are shifting. (Marital and neighborhood instabilities are examples.)
B. Personal values are likely to be based on intuitive knowledge in addition to information which may be verified independently. (Less interest in material aspects of life, physical crowding and the movement in society from the "sacred" to the "secular" influence this trend.)
C. Institutions may select effective means to accomplish their ends, rather than the most efficient means. (Full employment may be preferable to running factories with only a few persons: a new plant which produces 60 million cola beverages in Russia employes 85 persons).
D. Raw products, especially energy sources useful to man, are diminishing in quantity; whereas, the numbers of persons are increasing. (Mexico is an outstanding example.)
E. Simplified technological resources which work may be preferred in the future to complex technologies which affect only a few lives. ("Performance legitimacy" which poses the question to institutions "What have you done for me lately?" will become part of the accountability for the future.)

Several practical effects on librarianship are likely to proceed from this accelerated increase in change. Increased attention to processes which have personal and institutional dimensions will be needed. Planned reassessments of personal and institutional goals will be needed. Broad holistic approaches will be mandated. Individuals educated with broad understandings in addition to specific areas of knowledge will be valued. Individuals and groups who will address the question of "What should be accomplished?" rather than "What can be accomplished?" will be needed.

POSSIBLE IMPLICATIONS FOR LIBRARIANSHIP

The needs for increased skills in (1) evaluation, (2) systems analysis and (3) interpersonal relations are intertwined and proceed from anticipated rapid and continuing changes in the future. See Table I: Reciprocal Change Implications for Library Institutions and the Library Profession.

In conclusion, the librarian of the future needs to cease thinking in terms of services as they are and concentrate on processes. The effective librarian of the future will think "I am becoming" instead of "I am". Flexibility will be needed to serve well in several types of professional positions. Courage and openness will be needed to accurately assess what users say without the influence of personal and institutional biases.

Outreach programs will be needed for assessment of user needs, gathering of knowledge about local, regional, national and worldwide networks. Outreach programs will be needed also to meet educational needs of users and other librarians in in-service and continuing education programs.

Additional attention will need to be paid to educational processes: their provision through libraries, principles of educational technology, telecommunication possibilities, educational media potentialities and existent services, and research in learning processes.

TABLE I: RECIPROCAL IMPLICATIONS FOR LIBRARY INSTITUTIONS AND THE LIBRARY PROFESSION

Skills Needed:	Library Institutions ⟷	Library Profession
Evaluation:	Assess user needs Priortize institutional goals and objectives Monitor feedback Accountability: 1. Collect data 2. Prepare mediated reports	Prepare librarians for broad understanding and effective management Encourage continuous in-service participation Encourage relevant continuous education participation Encourage librarian's participation in professional meetings of other disciplines
Systems Analysis:	Analyze needed functions Analyze present functions Perform discrepancy analyses Build in feedback systems to:[2] 1. Induce participation 2. Empower the powerless (Knowledge is power.) 3. Provide incentives to use knowledge	Encourage networking Encourage user skills in locating and utilizing information Encourage removal of institutional and professional barriers Encourage development of services for all persons without discrimination by age, sex, ethnic heritage, socio-economic background or physical location
Interpersonal Relations:	Recruit personnel who are attuned to their own physical, psychological and spiritual needs Examine personal and institutional satisfiers in accordance with Maslow's hierarchy of needs Explore environmental arrangements which meet changing needs of lifestyles of users and library personnel	Encourage the study of group processes, communication theories and educational processes Encourage the study of change processes Encourage institutions to involve users and all library personnel in planned changes: 1. To anticipate concerns about new technologies 2. To implement relevant new services or phase out those which are obsolete

Knowledge of cybernetics will be mandatory. Each librarian will need to be in touch with: (1) himself as a physical, emotional and spiritual entity, (2) other individuals in his primary living group and (3) groups in the context of his roles within his local and professional communities. Personal skills in working with others and understandings of change processess will be necessary in an era of rapid changes so that each librarian can provide leadership and guidance to identify and implement goals and objectives needed to provide the best possible library information services needed for individuals and user groups.

Management skills will be extremely important in the future. In an era of relative scarcity of physical resources, priorities will have to be identified and continually reidentified to meet shifting needs. Public relations skills and skills in succinctly summarizing data to explain present and proposed programs to governing boards, advisory councils and user constituencies will be important. Producers and packagers of knowledge will assume increasing importance. Librarians of all types will need expertise in designing, producing and utilizing media. Accountability for services as they are known now will no longer suffice. The abilities to transmit knowledge in many forms and assist users in doing so for their purposes, both institutional and personal, will be needed. Management skills will include managment of information and information services in many formats.

In a recent study performed by the Bureau of Labor Statistics[3] for the National Center for Educational Statistics, a division of the United States Office of Education, three persistent needs were identified in the library profession; for persons with skills in: (1) educational media, (2) community outreach programming and (3) data processing. Otherwise, librarians were warned that present library school enrollments should not be expanded: most openings would be from retirements, decisions to expand families or deaths. Despite the advice there are those in the library community who see institutions other than libraries which have the needs for the gathering, organizing and disseminating of information. Well-qualified and competent librarians in the future may find rewarding professional positions in agencies hitherto unidentified.

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A SCHEME FOR VIEWING ALTERNATIVE FUTURES IN EDUCATIONAL TECHNOLOGY

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Futurism is a popular activity in educational technology today, and it should be. We must be more active in anticipating and developing our own future, rather than waiting for business and government to take the lead. However, efforts at viewing futures in educational technology have frequently been beset with over-simplicity, triviality, and a lack of systematic assessment of probable consequences. I have been accused of the very same things. My own study of educational futures using the Delphi technique (see Linstone and Turoff, 1975) attempted to investigate a number of dimensions of the issue with mixed success (Spitzer, 1975). One of the main problems with my own study was that it looked at educational futures without a substantive basis for assessing them. I asked respondents such questions as "how much increase do you feel will occur in this trend", "how important do you feel this trend is", and "what do you feel is the probability that this trend will occur". These questions did not begin to tap the essential issues of these alternative future trends. In an effort to improve the methods of viewing educational futures, particularly in educational technology, I have developed a conceptual matrix to guide my own further investigations. The purposes is to provide a framework for more systematic and thorough study of many important dimensions of future issues and trends, providing a deeper and more rigorous view of them.

The developments and trends discussed in this article were generated by respondents to the 1975 survey. They were asked, during the first round of the survey, to "nominate" those trends and developments which they anticipated would be significant in the field of educational communications and technology through the year 2000. Trends provided in this article are selected from among many hundreds suggested by the respondents.[1] The problem with dealing with such developments is that there are so many different ways of viewing and evaluating them. In addition, it is probably true that the trends themselves are not as important as their consequences and the concomitant requirements for dealing with them. In studying the nominated trends in recent days I began to see some common threads and related categories. I believe that through the use of descriptive categories it may be possible to direct the critical thinking of those of us who have had little experience in anticipating the future, an extremely difficult activity indeed.

The conceptual matrix is presented in figure 1. The trends and developments anticipated for the future appear down the side of the matrix. The categories for analyzing the trends appear across the top of the matrix. The crosses in the boxes indicate when, in my opinion, the categories of analysis apply to each trend. In the future, I plan to investigate the appropriateness of categories to trends more systematically using a panel of experts. In the meantime, the matrix serves as a hypothetical and conceptual model illustrating an idea: the importance of viewing future trends and developments in many different ways, across a number of dimensions, and with a critical eye. In essence, the primary motivator for this scheme is my belief that futures-thinking should not only be speculative. It should also be analytical and critical. We must not

only ask what will probably occur in the future, but also what will be the probable effects and what should be done in preparation for such future developments. Educational futurism must be more than purely descriptive. Let us now look more closely at the conceptual scheme presented in figure 1.

FUTURE TRENDS AND DEVELOPMENTS

Individualization: More concern for the individual students and further development of programs to deal with individual needs.

Cooperation: More cooperation between media personnel, other educators, technologists, and social scientists on all levels (schools, colleges, universities, research institutes, and government agencies).

Consumer protection: The provision for standard testing of educational products on a large scale, with publication of results; additional government regulation of media and materials producers.

Computer applications: Continued (and intensified) development of computer-assisted instruction and computer-managed instruction as well as computer storage and retrieval of instructional materials and information.

Facility design: Design of facilities and educational environments utilizing systematic approaches and research to determine optimal configurations.

Integration of media: The use of media in combination with one another, utilizing advantages of each, determined on the basis of sound research and evaluation.

Simulation & gaming: Continued development of simulated educational environments and games to add realism and activity to educational settings.

Open learning: The further development and expansion of open learning opportunities that will meet the needs of those who cannot come to educational institutions.

Consortia: The fuller utilization of scarce educational resources through sharing of production facilities and expertise.

Technology-structure congruence: The recognition that educational technology must cause the change of certain organizational and role structures that currently exist.

Clinical diagnosis: The development of more scientific approaches to the diagnosis of learning abilities and disabilities that might require alterations in learning materials and environments.

Cognitive style/mapping: Increase in the use of cognitive style for the purposes of selecting media and materials for learners, decisions based on sound research.

Life-long learning: The accelerated recognition that learning should be a continuous process, and the development of methods for dealing with continuing educational needs and retraining.

Media-learner-subject matter-environment interactions: The further recognition of the complexity of the education process, and the initiation of research strategies that acknowledge this complexity.

Cooperative accountability: The development of new accountability programs that acknowledge that rigorous assessment and monitoring of results is in the best interests of educators as well as society in general.

Prescriptive lessons: The development of instructional prescriptions based on rigorous research and sophisticated technologies.

Changing roles: The realization that human roles must change with the further development of advanced technologies and educational structures.

Learning packages: The production of learning packages that are truly self-contained and multi-media, developed on the basis of sound research and rigorous formative and summative evaluation.
Local production: The recognition of the importance of local production in response to the need for more accurate individualization and the lack of responsiveness of commercial producers.
Competency-humanism mix: The recognition that competency-based instruction is not antithetical to educational humanism, and the development of new educational systems which merge the two.
Anticipated futures: The accelerated concern with educational futures and sophisticated strategies for dealing with them.
Miniaturization: The development of reliable, miniature media technologies that will encourage use outside of the classroom, reduce cost, and provide media resources for every educational institution.
Unified resource centers: The final stage in the unification of educational resources, print and non-print, under the direction of staff who are well-trained to handle more resource-based educational programs.
Bio-chemical learning: The development of technologies to teach and foster routine learning through chemical means.
Leisure learning: The development of leisure educational activities that will combine entertainment with sound instruction.
Feedback systems: The development of systems that will provide the basis for truly interactive instruction through media.
Interactive media: The development of media combination that will provide learners with the opportunity for more active and vital learning, as well as a role in revising and redeveloping instructional materials.
Reliability: Increased concern with the reliability of instructional technologies and systems that will encourage the universal use of media in education.
Instructional development: The standardization and improvement of systematic procedures for the development of instructional materials that will permit every educator to utilize these approaches.

CATEGORIES OF ANALYSIS

Evaluation: Futures must be carefully evaluated in terms of effects, desirability, and requirements using the most sophisticated and rigorous approaches available.
Measurements: There must be new methods developed to measure technological consequences, both positive and negative.
Standards: Standards should be developed in advance for the advent of new technologies to assure their uniform quality.
Economics: The economic dynamics of any new development must be considered, including probable supply and demand; this will provide an understanding of probable costs.
Motivation: The effects of technologies upon the motivation of people must be considered to determine willingness to adopt these technologies, as well as non-learning side effects.
Effectiveness: We should develop methods for assessing the effectiveness of probable new technologies in advance of adoption.
Cost-effectiveness: We should view the economics and effectiveness factors in combination to assess the viability of the new technology.
Choice: We should make certain that there will be adequate choice available for practitioners in terms of alternative configurations, models, and materials.

Definition: The anticipated technology should be carefully defined in advance, perferably in operational terms.
Specialization: Many developments will require specialized applications, materials, and human factors.
Financing: The sources of initial and continuing financing must be considered, particularly in the case of capital-intensive technologies.
Systems approaches: The need for sophisticated systems approaches must frequently be considered along with technology adoption to make certain that implementation and maintence will be reliable.
Routinization: We should be ultimately concerned with making technologies routine in their operation, even if this requires structural changes in adopting organizations.
Theory: There should frequently be a carefully established theoretical base for future developments, particularly in establishing a need.
Research: Initial and on-going research should accompany most new technologies.
Predicition: Many new technologies will afford us a new dimension in the prediction of educational outcomes and effects; if this is not the case, these developments should be reconsidered.
Validation: There should be the ability to integrate validated programs into these new technologies in order to provide for more reliability and predictability of effects.
Experimentalism: There is a need for many technology adoptions to provide for continued experimentation, elaboration, and revision.
Durability: One of the fundamental weaknesses in current technology is the lack of durability; this must be part of complex technological systems in the future.
Communication: Some new technologies and developments will require more sophisticated communication systems to assure their successful implementation and maintenance.
Training: Future developments will require prior and in-service training to assure that human factors will be consistent with technological requirements.
Interface: We should be aware that new technologies will have to interface with existing technologies and structures in many cases.

SUMMARY

This scheme for viewing alternative futures in educational technology is intended to stimulate more research and critical thinking about the nature and requirements of future technologies. It is dangerous to think only in speculative terms, considering the future as too remote to do anything about. The fact is that the future is closer than many of us care to acknowledge, and we should endeavor to make certain that we prepare for it. One way to do this is to do more than hypothesize about alternative futures, but also analyze them. Many will refute this point by saying that we can hardly analyze trends that lie in the distant future. Actually, most of the trends and developments that we can anticipate are not far-fetched; most are but continuations and elaborations of existing trends and technologies. We can, and must, assess their significance, interrelationships, and impacts.

It should be recognized that the scheme presented in figure 1 is hypothetical and speculative. However, it is a step in the direction that this author feels we will have to move. We must make our own future. Unless we start now it may be too late. It might be instructive for the reader to construct a matrix such as the one presented in this article and develop a pattern of analysis such as the one indicated by the crosses within the matrix. This will provide some indication of the tremendous amount of work we have ahead of us in order to assure a planned and systematic future, not a haphazard pattern of events.

Note

Respondents in this survey were selected randomly from the membership directory of the Association of Educational Communications and Technology. Respondents represented a broad mix of occupations and geographical areas. Two hundred questionnaires were sent out initially; one hundred completed questionnaires with trend nominations were returned during the first round of the survey.

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Figure 1

Categories of Analysis

Trends and Developments	evaluation	measurement	standards	economics	motivation	effectiveness	cost-effectiveness	choice	definition	specialization	financing	systems approaches	routinization	theory	research	prediction	validation	experimentalism	durability	communication	training	interface
individualization	x	x	x	x	x	x	x	x	x			x	x		x	x	x	x			x	x
cooperation			x										x							x	x	
consumer protection	x	x	x	x					x		x		x			x	x			x	x	
computer applications	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
facility design	x	x	x	x	x	x	x	x	x		x	x			x	x	x	x	x	x		
integration of media	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x			x	x
simulation & gaming	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			x	x
open learning	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			x	x
consortia			x	x			x				x		x					x		x	x	
technol-struc. congr.[1]		x	x						x					x	x							
clinical diagnosis	x	x	x	x		x	x		x		x		x	x	x	x					x	x
cognitive style/mapping	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x
life-long learning	x	x	x	x	x	x	x	x	x		x	x	x		x			x		x	x	x
mlse interactions[2]		x							x					x	x	x	x	x		x	x	
cooperative accountab.[3]			x	x					x				x							x	x	
prescriptive lessons	x	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x		x	x	x
changing roles			x					x	x	x			x					x		x	x	
learning packages	x		x	x	x	x	x	x		x		x	x		x		x				x	x
local production	x		x	x		x	x	x			x	x	x		x		x	x		x	x	
competency-humanism[4]	x		x					x	x					x	x			x		x	x	
anticipating futures	x	x		x		x	x	x	x			x			x	x		x		x	x	
miniaturization			x	x		x	x	x		x									x		x	x
unified resource cent.			x	x	x	x	x		x		x	x	x							x	x	x
bio-chemical learning					x	x									x	x						
leisure learning	x	x	x	x	x	x	x	x			x	x	x		x			x			x	x
feedback systems	x		x		x	x	x	x				x	x		x	x	x	x			x	x
interactive media	x	x		x	x	x	x	x			x	x	x		x		x	x	x		x	x
reliability	x	x	x						x				x									
instructional devel.	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x		x	x	x

[1] technology-structure congruence

[2] media-learner-subject matter-environment interactions

[3] cooperative accountability

[4] competency-humanism mix

DOES INSTRUCTIONAL DEVELOPMENT HAVE A FUTURE?

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Fact: The Division for Instructional Development (DID) is growing rapidly and is one of the largest divisions of AECT.

Fact: Agencies with the words instructional development are popping up all over the place.

Fact: New publications on instructional development in the form of books, monographs, and articles are flooding the professional literature.

Fact: Training programs for instructional developers are being created in many institutions and the number of graduates of these programs is far greater than what was predicted a few short years ago.

In view of these "facts" the title of this article seems rhetorical. Projecting each of the trends enumerated above suggest that, in the not too distant future, ID will represent a majority view in AECT and eventually the entire education profession. The growth curves would make a go-go mutual fund manager green with envy. Now of course we all know that linear projections of trends can produce gross distortions of the future, and obviously ID will not overtake Xerox, but even projecting on a decelerated curve suggest a rosy future. However, this writer's crystal ball paints a different scenario of the future of ID.

Let's examine these facts to see which projection seems more likely. Fact one (DID is growing rapidly). The figures are accurate, but the central question is why are people joining the division. Although to my knowledge no systematic analysis of the question has been conducted, my speculation is that the appearance of success and slightly better than mediocre convention programming are both important factors. And herein lies one of the fundamental flaws of the emerging ID structure. There is an appearance of success but little firm documentation of the proven value of ID. The bandwagon has been set in motion and educators have a propensity for hopping on bandwagons.

We will return to the issue of the actual output or value of ID later but for the moment will move on to fact two (new ID agencies). Again the numbers look convincing in absolute terms but the question is whether a change in name is a change in the game. During a recent sabbatical this author collected information about a number of new ID agencies and in a report concluded that "one finds either services without design or design without services...thus ID is more fiction than fact".

Fact three (publications) represents another fundamental flaw in the ID edifice. Although the quantity is high, the quality is generally low, and the literature is best described as a mile wide and an inch deep. The cumulative growth of concepts and principles, not to mention theory, in the field is distressingly slow. For example, Barson et al. formulated a set of heuristics in 1965 which continue to provide the basic guidelines for much ID. Another example is the proliferation of ID models in the literature.

Every author (myself included) creates his or her own model pretending the others don't exist. Such ego fulfillment may be excused on the one hand, but is symptomatic of the serious limitations of our conceptual bounds. It is difficult to envision a rosy future for ID when its foundation is built on the shifting sands of our non-cumulative models and heuristics.

Fact four (training programs) is more of an effect than a cause. We see training programs with changed names but the same curriculum. Almost anybody is willing to call him or herself an instructional developer since of the few jobs available in higher education today some request development skills. Least we blame people for self appointing themselves as developers, keep in mind we don't have a recognizable set of competencies we agree on anyway. Thus it is just as appropriate for a person trained in the area of curriculum to assume the label developer as it is for a person out of psychology or any other area. Hence, fact four is no more valid an indicator of the future of ID than any of the other "facts".

Summarizing the above points, ID seems to have fallen into the trap of becoming another educational fad that has attracted a rather substantial following but is based on little substance. Since the recent history of education is littered with the skeletons of a wide variety of fads, it is hard to see how ID can escape the same fate given its present circumstances. What started out as an honest attempt to find methods for improving instruction has somehow lost its way. From hopeful beginnings it has been formed and re-formed into a meaningless set of notions that means all things to all people. The expectations of what it could do (and the promises made by many of its practioners) are completely unrealistic and disillusionment is certain to follow.

But what might the future look like for those interested in ID and how can we salvage that which is of value in this whole movement? First, I would predict that the term instructional development will gradually disappear from the literature and common usage. (Thus for those of you considering changing your agency's name I would hold off a bit or pick another name.) Second, the viable concepts out of ID will be subsumed under another term and hopefully within a new and expanded conceptual framework perhaps including rudiments of a theory of instructional technology. The key to identifying these concepts, and eventually theories, lies in relating them to what was the initially stated purpose of ID - to improve the effectiveness, efficiency, and relevance of education. Those concepts which withstand this scrutiny can become cornerstones of a new framework. Third, we should direct our efforts toward documenting the proven value of what we do. Most present day activities called ID do little to document their output. The evaluation is process rather than output oriented. Reports of ID activities usually document extensively the process but little mention is made of the utility, cost, relevance or humaneness of the resulting instruction. We are further trapped by our obsession with operant psychology for our design of the instruction. Can we really develop effective, efficient and relevant instruction that is also humane and creative rather than conforming and constrictive? In the future we will be asked to demonstrate these outcomes.

At the risk one always takes in predicting the future, this writer is pessimistic in the short term and optimistic in the long term. ID as we currently know it will share the fate of PI (you remember programmed instruction) and the general movement will be discredited. However, some intrepid soul will continue to sift the ashes and collect the useful knowledge for use in another way and education will have been the benefactor from both these events.

In the meantime, I would suggest we look around for an appropriate person to present a eulogy for ID and prepare ourselves for the crash. The Research and Theory Division could perform a valuable service by soliciting possible candidates for the former activity and directing us toward methodology for sifting and theory construction for the latter.

SCIENCE FICTION AND EDUCATIONAL TECHNOLOGY FUTURES

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For some reason, serious futures thinking in educational technology tends to apply practically every conceivable source for ideas and technique except one: science fiction. Perhaps futures thinking in the policy research sense is so easily confused in lay minds with the immaginative efforts of science fiction writers, that a complete disassociation is deemed necessary. Perhaps educational technology professionals, suspicious and paranoid from the stings of unsavory associations and reputations, real and immagined, believe that the last thing they should have anything to do with, by word or deed, would be the less than consistently repsected genre of science fiction.

Be that as it may, educational technology has a lot in common with science fiction. Both are concerned with communications and technology. But neither specialty concentrates on the Buck Rogers gadgets and electro-mechanical thing-ums of technology like so many people seem to think they do. Both specialties more frequently find behavioral, social, ecological and organizational questions to be central, with "technology" constituting a fabric or overlay for the core of the piece. And at that, technology, more often than not, is represented by a technical view rather than far out thing-ums.

Two sorts of application of science fiction to educational technology futures thinking might be illustrative. One is found in the realm of outcomes. Authorities in such areas as visual literacy often speak in glowing terms about this "super brain" which children may develop from working with visual literacy (or whatever). When pressed for what a kid with a super-brain could do, your educational technology authority in visual literacy (or whatever) might do well to have read widely in science fiction for provocative examples. Really. I will try to explain.

Frank Herbert's Dune trilogy (Dune, Dune Messiah, and Children of Dune), which many of you no doubt have read, contains many examples of food for thought regarding outcomes of learning and development which are extensions of human potential. The "mentat" human computer capability, the Bene Gesserit total body control, and other extraordinary physical and mental capabilities of the protagonists are described with enough substance to provide a conceptual, albeit highly speculative, framework for possiblities.

Sometimes, possible outcomes or human potentials are seen in the characteristics and behaviors portrayed by aliens (from other planets). One of the more memorable is the "motie" creature in Larry Niven and Jerry Pournelle's

The Mote in God's Eye. The technical abilities of the technician caste (Brownies, they were called, as I recall) and the language capacities of the communicator caste are touchingly anthropomorphic, but in a "more-than-human" sense.

Another sort of application can be seen in the realm of process. Orwell, in 1984, Blish, in Cities in Flight, and others, have relied upon various extensions of conditioning, both classical and operant, as the process vehicle for learning, and frequently, insidious control. All too frequently, however, some sort of classical conditioning is employed to do something we know better than. Skinner's Walden Two avoids this, but is such weak fiction that one hesitates to bring it up.

A refreshing departure from the old conditioning plots is seen in much of Herbert's work. In The Santaroga Barrier, he posits a yeasty chemical or microbiological agent as the source of a small community's remarkable insight and cohesiveness. In the Dune trilogy, Herbert employs chemical, yoga-like body training, and a briefly described instructional approach to develop memory and a complimentary generalist orientation which accounts for much of the computer-like "mentat" faculty. Herbert's thinking on this last point is so memorable and well put, I would like to quote two long passages from him here, both from Children of Dune. These passages represent, I believe, a good example of the kind of vigorous thought which is, while within a speculative framework, anything but shallow and insubstantial:

> You will learn the integrated communication methods as you complete the next step in your mentat education. This is a gestalten function which will overlay data paths in your awareness, resolving complexities and masses of input from the mentat index-catalogue techniques which you have already mastered. Your initial problem will be the breaking tensions arising from the divergent assembly of minutiae/data on specialized subjects. Be warned. Without mentat overlay integration, you can be immersed in the Babel Problem, which is the label we give to the omnipresent dangers of achieving wrong combinations from accurate information. (p. 281)

> Above all else, the mentat must be a generalist, not a specialist... Experts and specialists lead you quickly into chaos. They are a source of useless nit-picking, the ferocious quibble over a comma. The mentat-generalist, on the other hand, should bring to decision-making a healthy common sense. He must not cut himself off from the broad sweep of what is happening in the universe. He must be capable of saying: "There is no real mystery about this at the moment. This is what we want now. It may prove wrong later, but we'll correct that when we come to it." The mentat-generalist must understand that anything which we can identify as our universe is merely part of larger phenomena. But the expert looks backward: he looks into the narrow standards of his own speciality. The generalist looks outward; he looks for living principles, knowing full well that such principles change, that they develop. It is to the characteristics of change itself that the mentat-generalist must look. There can be no permanent catalogue of such change, no handbook or manual. You must look at it was as few preconceptions as possible, asking yourself: "Now what is this thing doing." (p. 246)

Neither space nor my purposes here dictate further elaboration upon my thesis. While not without a touch of whimsy at the mention, my attitude remains serious and real: there is food for educational technology futures thought in science fiction. If you have read some of the works noted here and others like them, and didn't like it, you probably don't like science fiction and never will. But then, by the same token, some people are not all that hot for Monte Carlo and Delphi techniques either, so that is of little importance. If you have seen or read some science fiction, along the lines of Star Trek or Buck Rogers and didn't like it, try something by Herbert, Niven, or other highly regarded science fiction authors. One work which may be of interest is School and Society Through Science Fiction. It is a collection of science fiction short stories which have soical or educational themes, with introductions by the editors and story authors. Incidentally, if you are with or ahead of me on this topic, I would be happy to correspond. Who knows--we may actually have something here!

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