DOCUMENT RESUME

ED 042 223 CG 005 821

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|---|---|
| TITLE | Readings in Computer Based Guidance. The Bartlesville System. |
| INSTITUTION | American Educational Research Association, Washington, D.C.; American Personnel and Guidance Association, Washington, D.C.; Bartlesville Public Schools, Okla.; Oklahoma State Univ., Stillwater. Research Foundation. |
| SPONS AGENCY | Office of Education (DHEW), Washington, D.C. |
| REPORT NO | TM-9 |
| PUB DATE | Mar 70 |
| NOTE | 75p.; Papers delivered at the American Educational Research Association Convention in Minneapolis, Minnesota, March 2-6, 1970 and the American Personnel and Guidance Association Convention, New Orleans, Louisiana, March, 1970 |
| EDRS PRICE | EDRS Price MF-$0.50 HC-$3.85 |
| DESCRIPTORS | *Computer Assisted Instruction, *Computer Oriented Programs, *Counseling, Educational Diagnosis, *Games, *Guidance, Guidance Counseling, Guidance Functions, Guidance Programs, Programed Instruction, Pupil Personnel Services, Systems Analysis |

ABSTRACT

The document contains six papers which deal with the need for change in guidance and counseling due to the overwhelming amount of data which is insufficiently processed by conventional manual systems. Included in these papers are discussions on when these changes should occur and the nature of their alterations. The reports consider some of the ways in which the computer can be successfully used to provide needed support. These areas include: (1) information storage and retrieval; (2) diagnosis; (3) instructional gaming; and (4) synthetic confrontation therapy. The following topics are covered: (1) computer based gaming, a systems approach to vocational instruction; (2) synthetic confrontation therapy; (3) diagnosis and prediction; (4) a survey of two information languages for counselor applications; (5) gaming for vocational awareness; and (6) computer diagnostics. (MC/Author)


TECHNICAL MEMORANDUM 9

READINGS IN COMPUTER-BASED GUIDANCE

# THE BARTLESVILLE SYSTEM





DEVELOPED BY
THE BARTLESVILLE PUBLIC SCHOOLS
THE RESEARCH FOUNDATION
OKLAHOMA STATE UNIVERSITY
AND
U.S. OFFICE OF EDUCATION
E.S.E.A. Grant No. 7-8-005685-0030-(056)
OKLAHOMA STATE DEPARTMENT OF EDUCATION

## TOTAL GUIDANCE INFORMATION SUPPORT SYSTEM

# THE BARTLESVILLE SYSTEM

TGISS - TM No. 9

## A MAN-MACHINE SYSTEM FOR CONTEMPORARY COUNSELING PRACTICE

1970 AERA -- APGA PRESENTATIONS

Tommy L. Roberts, Director
Wayne Richardson, Associate Director
Ed Forsberg, Systems Engineer

# READINGS IN COMPUTER-BASED GUIDANCE

Based on a series of papers
delivered at the
1970 Annual Conventions of the
American Educational Research Association
and the
American Personnel and Guidance Association

Sponsored and Reproduced by Project TGISS
Bartlesville Public Schools
Bartlesville, Oklahoma

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## INTRODUCTION

"Change" is probably the only common topic among the series of papers included in this memorandum. Today's schools are confronted with a log-jam of data which is being inefficiently processed by conventional manual systems. Knowledge of these conditions has served as a basis for sounding the alarm for change. The issue however, is not a need for change, but when and how to change.

Computer-based support applications in guidance and counseling is one "change" that is rapidly becoming a reality in the nation's schools. Such an application has become almost mandatory if educational institutions expect to maintain any semblance of quality in the guidance and counseling services.

The following papers discuss some of the ways in which the computer can be successfully used to provide needed support. These areas include (1) information storage and retrieval, (2) diagnosis, (3) instructional gaming, and (4) synthetic confrontation therapy. The staff of project TGISS hope you will find these papers informative and helpful.

# COMPUTER-BASED GAMING
# A SYSTEMS APPROACH TO VOCATIONAL INSTRUCTION

by

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## COMPUTER-BASED GAMING

## A SYSTEMS APPROACH TO VOCATIONAL INSTRUCTION

History records that little if any enjoyment was associated with learning during latin grammar days or the "hoosier schoolmaster" era. In fact, many experts in education today claim that learning environments provide little motivation or encouragement for the student.

Learning should be fun, but seldom is. Why not? Based upon numerous observations of various classroom environments it seems that too much "tell about it" methodology is employed. Such procedure many times stifles individual opportunity for self expression and freedom of constructive thought. Therefore, it seems only reasonable that educators must seek out new approaches to instruction. This is especially true when attempting to bring about vocational awareness and provide a foundation for career development. Computer-based game applications provides one approach to an enjoyable instructional system.

The search for a systems approach to all fields of science is an old and long search. The search has been extremely effective in the science of physics but has met with little success in the social and behavioral sciences. This is vividly emphasized today within the

world community, by the fact that man possesses the power to destroy himself but has not as yet developed adequate ways to govern himself.

The world is presently embroiled is a social revolution. This makes it extremely important that man develop "systems" for handling change in an organized and constructive manner. People in the world at all levels of society are sounding the alarm and demanding a voice in their own determination. There is not only a need to understand man's individual behavior and goals, but there is a need for understanding the personality of the "systems" he has created.

The "total systems approach" to guidance and counseling is an attempt to not just merely provide the student with information and *obsolete direction*, but is an attempt to help him understand the personality of the environmental systems in relation to his own personality. Such an approach would provide for integration of the two personalities leading to productive behavior and individual goal attainment. It would provide the individual with opportunities to learn how to participate in the environmental system and to bring about changes within the system which best meet the needs of the membership of the environment.

These objectives can be approached by teaching the student how to become aware of himself as a "human system" in terms of "systems logic." Emphasis may be placed upon teaching ways to utilize "environmental systems logic" to personify the integration of both self and environmental personalities into what might best be termed "a compatible systems relationship." More specifically, in terms of vocational

jargon, "vocational concepts" that equip the student to meet his survival needs in an ever changing society.

Super,[1] outlines the elements of a theory of vocational development by listing the areas of conceptual development. He states that "adequate adjustment is most likely to result when the value of the work itself and the way of life that goes with it are congenial to the aptitude, interests, and values of the person in question." If the concepts held by the individual regarding his personality, environment, goals, interests and values are compatible with the concepts acceptable to the "environmental system," an adequate vocational adjustment is more likely to become a reality.

The problems associated with bringing about compatibility between individual and environmental concepts are many and very complex. An example might be the student's self-concept. It is vague and underdeveloped in the area of his personality, ability, interests, traits, role development, role concept, decision-making skills and plans for change. The student lacks information pertinent to concepts related to his environment.

Such a problem is complicated by the complexities of the individual's environment. Educational methods centering around information giving are no longer adequate. In fact, many authorities fear that unless man learns the concept of "systems logic," society will not continue to survive. S. Benjamin Prasad[2] states, "think for a moment, if you will, of the institutions of our society that are in a state of management crisis. They would certainly include the following:

1. Agriculture, which suffers from over-expansion in some countries, archaic methods in others, and inflexibility in all;

2. Schools and colleges which are everywhere beset by acute problems of finance and organization precipitated by soaring enrollments and essential demands for better education;

3. Hospitals and medical care institutions, which in methods of support and operation lag far behind the accelerated revolution of the life sciences and their enormous potential benefits for mankind;

4. Railroads, which in many instances appear to have stalled some decades ago in states with severely arrested economic and technological development;

5. Municipalities, which confront runaway problems with mazes of illogically tangled authorities;

6. State and federal branches of government whose vastly expanded administrative functions reflect historical and political circumstances far more than effective organization to serve public needs;

7. Businesses, which are perilously ignorant of conditions decisive for their futures, and especially those businesses that have invested heavily in defense capability which cannot be readily converted to production for civilian markets; and

8. Labor unions and educational institutions which often times seem short-sighted in facing what they might capitalize on as the great promise of advancing automation.

Each of these various types of institutions has its own peculiar problems that do not seem to go away or to get solved by any time-honored management strategies. Their problems continue unresolved because their situations are continually changing at a rate beyond the logical comprehension and control of conventional methodology.

The time has come for all institutions which face crises that stem from advances in the physical sciences to introduce scientific

methods in an effort to meet the unprecedented need for informed management. These needs should be paramount in the present era. This is especially true as they relate to the process whereby decisions are made and acted upon in both public and private organizations.

There is an apparent need in business organizations today to clearly understand the decision-making process. This understanding should include more than management theory. It should involve the operational logic of the system which becomes the "decision process."

The struggle for the survival of our society is probably more apparent when one examines the literature in the social sciences. On the basis of current events alone one can hardly doubt the state of disrepair and revolutionary characteristic of our social systems. Objective consideration of the hard facts lead one to conclude the need for new knowledge in relation to decision-making is not only obvious, but mandatory.

An understanding of the systems concept is fundamental to the decision process. This is echoed by all modern authorities when referring to current problems.

The challenges to the counselor are many and profound. He must possess the ability and skill to enter into the individual counselee's frame of reference. He must be able to understand the counselee's logic regardless of whether he is considered normal or abnormal. This can only be done within the concept of how the counselee's individual logic relates to the logic of the system in which he operates.

This requires the counselor to have more than a knowledge of socio-economic levels or race distinctions. He must have a knowledge of group logic as it relates to the environment. For example, it is not enough to understand the cultural differences between the black and white, the counselor must understand the logic of the individual as it relates to his color and to his environmental structure such as position and social status.

The counselor must understand the logic of the group that he is operating within and its relationship to a multitude of environmental factors. If he is going to be adequately trained in systems theory, he must be helped to understand how systems logic applies to the many fields and disciplines. The application of such an approach should make it possible for the individual to broaden his horizon of expectation and to increase his productivity in terms of self-actualization and goal attainment.

Computer-based game models can be developed which teach systems logic and concepts. Systems logic must be understood in terms of systems concepts and constructs. For example -- a game using a business organization as the model not only must provide instruction about systems logic, but must provide instruction about vocational concepts and the interpersonal relations concepts through which the systems logic tends to operate.

Vocational concepts would include such concepts a job mobility, entrance requirements, salary scale, open-end and closed-end job descriptions, job flexibility, profit and loss, success probabilities, profitable level of production, hidden costs, tax structures, and many others.

Such concepts must be incorporated in the game in order to develop within the student an understanding of the concepts and their interrelationsips within the economic system. By providing the student with a chance to experience these concepts it gives the student an opportunity to experience how his own personality might be in agreement or in conflict with the vocational contructs he is likely to deal with in the future. An example might be that insight can be gained relevant to the student's need to control his ability to lead, to organize, to communicate, and his tolerance for ambiguity, failure and perfectionism, etc.

Criticisms have been directed toward this type of approach by some individuals in-so-much as they feel game theory tends to teach logic that is devoid of morality and values. However, it would seem that herein lies the major value of the computer-based gaming approach.

The gaming approach emphasizes the responsibility of the individual in constructing his personal value and moral system in relation to his environment. It forces him to inject his own values into the game situation and at the same time gives him an opportunity to view the value system of other participants. For example, as the game progresses the groups are given the opportunity to evaluate the game situation such as cooperation versus non-cooperation. At this point the game provides the student an opportunity to discuss the game procedure relative to his own value system.

By following this type of game strategy the student will be placed into the position of developing his own value system. The strategy

will also tend to clarify that systems have no morality independent of people and their utilization of the system.

The value and applicability of the systems approach has long been recognized in the physical sciences. Recognition of value has also been given in the social sciences even though proper utilization has been lacking. Learning games based on systems strategies has not been fully understood in the field of education. The difficulty may perhaps be a result of an obvious neglect of broad based research in the area. People do not tend to connect reality with games or with enjoyment. The fact that all experience is reality is a concept that eludes many individuals. One would not ordinarily expect to learn exactly how to behave on a job by playing a computer-based vocational game.

It is not the function of the game to code, predict, or control behavior. The function is to teach systems logic and concepts much in the same way that war games are designed to teach battle logic. It should be emphasized that the function is not to rehearse a set of predicted responses or to manipulate human behavior through a predetermined set of stimuli.

When one analyzes the games of small children he finds these games are modeled after environmental logic which constitute reality experiences for the children. Games promote positive and negative values. There can be little doubt that games constitute learning experiences.

Every child should be provided with the opportunity to react freely with his environment. The fact remains that a person is a

"velocity" system. However, this concept remains widely misunderstood and commands little appreciation.

Life on earth depends upon the velocity and movement of out planet. So it is the life of an individual is dependent upon his velocity. A living human organism will happen, he will experience, and he will have velocity.

The velocity of the individual will not be turned off as a result of environmental failure to give him the opportunity for meaningful expression. It will merely redirect the velocity and increase the probability of non-productive movement.

The utilization of computer-based game models will provide increased opportunities for the student to engage in meaningful and enjoyable experiences. In an effort to provide added opportunities for the student to engage in these experiences it is vital that schools give serious consideration to the utilization of game models. Present-day schools cannot afford to refuse to apply any reasonable technique in their efforts to help youngsters expedite self-actualization. To do so would constitute the greatest prostitution of social justice during the twentieth century.

A review of the literature will substantiate that many successful applications of games and simulation models have been made. Some of the problems relate to model utilization in the area of vocational development. According to business executives, at least half their problems are related to motivation. Motivational problems continue to be important in industry. They continue to plague the educational environment. Therefore, many of the models used in industry are adaptable to an automated educational environment with little or no change.

As computerized game models are extended they become extremely complex and difficult to integrate into the system. However, the present-day state of the art should allow for such development in education. The opportunity to provide such a capability should not be passed over lightly in man's efforts to improve public education.

One of the myths of public education has been the sheltering of young people from confrontation with the facts of life. These facts include those concepts related to work, productivity, pay-off, failure, success, social commitment, and self-actualization with life in general.

The difficult task of providing American youth with opportunities to become vocationally aware will not be achieved with the opportunity to think for themselves. The day of "tell me about it" education is as obsolete to education as the ox and cart are to public transportation. Computer-based gaming for simulated confrontation with real world problems is at least one approach to overcoming such obsolescence.

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# SYNTHETIC CONFRONTATION THERAPY

by

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## I. INTRODUCTION

Robert S. Woodworth is attributed with the perceptive observation that "psychology first lost its soul, then its mind, then consciousness; but strangely enough it still behaves."[1] It is possible that the title "Synthetic Confrontation Therapy" might elicit an equally salient post script; or possibly stimulate a small maneuver by those who periodically retreat, regroup, and draw another line past which the computer dare not go.

In this presentation, however, it is not suggested that a machine is a man, or that man is a machine; but rather that man "has" and "uses" a machine. The computer is perceived primarily as an extension of the human brain, in much the same catagory as would be a high-speed abacus or slide rule. From this perspective there appears to be little necessity for attempting to reduce thought to the movement of electrons or consciousness to mere chemical action. Computers may then be regarded as "machines we think with."

## II. THE PROBLEM

It is questionable that one may justifiably view the combination of computer science and counseling psychology as "just another application of the computer." It is proposed, in fact, that from this particular union, there may evolve some implications of sufficient uniqueness to the attention of imaginative researchers.

Of basic significance is the operant necessity, by definition, for the existence of a relationship (or a derived counterpart to a relationship), between a human being and an extra-human entity.

With regard to significant behavioral parameters of three basic personality types, consideration of the following questions appears to be in order: Are there personality types with capability for relating to a computer? Can a man-machine system function as a therapeutic agent in two-way interaction? Can a synthetic counseling encounter with an extra-human entity enhance therapeutic synthesis of trichodimetrical dimensions of the personality?

## III. THE TERMS

According to Chaplain's Dictionary of Psychological Terms, the word "synthetic" means "artificial, as opposed to natural."[2] This concise definition seems adequate for the purposes of this presentation.

In his famous book, Psycho-Cybernetics, Maltz alludes to science's recent discovery of "synthetic experience." He describes a process whereby, for all practical purposes, "experience" is synthesized; it is literally produced and controlled in the "laboratory of the mind." Of significance is his proposition that the human nervous system cannot tell the difference between an "actual" experience and an experience "imagined vividly and in detail."

Cases are examined in which this type of "synthetic experience" has been used in very practical ways to improve skill in dart-throwing, shooting basketball goals, public speaking, social poise,

selling, and others. Included also are (1) a case which involves overcoming fear of the dentist, and (2) a case in which two prominent doctors are synthetically therapeutic to neurotics.

The term "confrontation" is used, not in the sense of challenge or opposition, but in its implication of a face-to-face encounter.

There probably should be a statement at this point regarding the impossibility of not communicating. Since there is no such thing as non-behavior, one cannot not behave. If we accept the proposition that all behavior in an interactional situation has message value, (i.e. is communication), it follows that activity or inactivity, words or silence, all communicate something to receivers. These receivers, in turn, are also incapable of not communicating; thus, communicative relationship is established.

The man at a crowded lunch counter who looks straight ahead, or the airplane passenger who sits with his eyes closed, are both communicating that they do not want to speak to anybody or be spoken to, and their neighbors usually "get the message" and respond appropriately by leaving them alone. This, obviously, is just as much an interchange of communication as an animated discussion.

Neither can it be said that "communication" takes place only when it is intentional, conscious, or successful; that is, when mutual understanding occurs. Whether message sent equals message received is an important but different order of analysis, as it must rest ultimately on evaluations of introspective, subject-reported data. The significance at this point, however, is in the development of communicative

relationship, aside from, and/or in spite of the motivations or intentions of the communicants.

The word "therapy" is used in its traditional sense, expressed by Harriman as "any procedure (or situation) which serves to ease, to palliate, or to cure a disorder or personality maladjustment."[3]

Emphasis is placed on therapeutic procedure rather than on the phenomenal condition of the psyche, due primarily to the difficulties of treating a subject which is self-reflexive. When the mind studies itself, for example, any assumptions have an inevitable tendency toward self-validation.

Since we cannot observe the "mind" at work, therefore a reasonable approach seems to be the "Black Box Concept."[4]

This concept originally referred to captured enemy electronic equipment that could not be opened for observation due to the probability of explosive charges inside. The concept now is generally applied to entities or situations so complex that it becomes reasonable to disregard the internal structure and attend to specific input-output relations, and evidences of therapeutic effect.

In this approach, the actual inner working of the box is not essential for the study of the function of the device in the greater system of which it is a part.

## IV. THE PARAMETERS

The constants or elements selected to form the trichotomy of personality variables under consideration are extensions of Karen Horney's character analysis.

During the 1940's, Horney became convinced that her ten listed patterns of behavior were reducible to three groupings, each following from one of the primary elements which she had proposed as comprising the basic patterns of emotional distress (basic anxiety).

A. Moving toward people. Horney proposed that this pattern evolved from a recognition and acceptance of individual inadequacy. If such behavior, for example, by a child, successfully elicited love and response from the parents, it gained probability in becoming an established pattern. The process would then be as follows: Overt love (to) satisfying feelings (to) feelings of belonging and support (to) reduction in fear (to) less feelings of weakness and isolation.[5]

B. Moving against people. Some persons respond to the aspect of hostility by developing a behavior pattern that is antagonistic to the people who surround them. Behavior becomes generally characterized by acts of rebellion, defiant and destructive behavior, and other aggressive responses. Horney sees this pattern as involving the recognition of anger affect in one's self, the perceptual identification of anger in others, and the implicit decision to fight. Multiple modes are found for venting hostile responses, and interpersonal patterns may develop if the person is successful in "beating" his opposition, fending off frightening persons, or otherwise experiencing the satisfaction

which accompanies reduced fear. In Horney's language, "he does it partly for his own protection, partly for revenge, and partly for the feeling of strength that he derives."[6]

C. Moving away from people. The isolative aspect of the basic distress responses can lead to patterns of avoidance and withdrawal from people. Although Horney did not seem to emphasize the consequences of this pattern, it would reasonably imply an approach to something else, such as objects and dreams, in search of fear reduction and some positive emotionality.[7]

Two additional points regarding Horney's "new theory of neurosis" are probably in order:

A. One is that the content of the above responses is consistent with normal developmental processes. Every person, for example, will at times give into others, fight them, or keep to one's self. Severe conflict would result, then, when response patterns become inflexible; or, of course, when circumstances intensely elicit all three of these mutually imcompatible responses simultaneously, thus calling upon the individual to be compliant, aggressive, and avoidant, all at once.

B. The other point is, that Horney's patterns are significant to this presentation, not in their implications for mental disorder, but in that they provide three global and highly generalized "nails on which to hang our thoughts."

## V. THE PROPOSITIONS

1. It is proposed that communicative relationships between human beings and extra-human entities not only can, but continually do, exist.

The documentary appeal at this point shall not be to authority, not to controlled experimental evidence; but rather to applications of conditions so common in our personal experience, as to be, generally acceptable without question.

Probably few people, for example, would feel a need to question whether communication occurs when a traffic light changes, or when a man glances at the speedometer of his moving automobile. In fact, in certain circumstances, the changing to red of the traffic light may even elicit from the driver a verbal response of certain four-letter anglo-saxon words.

Let's attend for a moment to the World War II G.I. Code of Conduct, namely: "If it's lying there, --pick it up. If it moves, --salute it. If it doesn't move, --paint it." In effect, every piece of litter begins to scream, "I am lying her, pick me up!" Every bar and stripe which comes into peripheral vision barks, "Salute me, salute me!" Buildings, vehicles, posts, and trees seem to join together on every up-beat with paint! paint! paint! It is probable that some of us might also recall some verbalization of a sort, directed toward some of these inantimate objects.

Additionally, in the memory banks of most of us are filed some feelings which once we liberally invested in a "first-love." Some such feelings may have found transference to a relic, a momento, or a ring; some of which feeling residue might even now be called up from the mental mothballs of the cobwebbed corners we reserve for things we distinctly remember forgetting,--by the sight of carved initials on a tree, or a lock of hair in an envelope, or a faded flower pressed between the pages of a book.

Maybe a man forgets the adolescent thrill of feeling one-ness with his speeding automobile. Maybe a woman has forgotten the little "dolly that wanted its mommy." The man with some artificial organs, however, may have a little more difficulty denying the human capability for relating to an object.

At the risk of sounding a little morbid, I would like, additionally, to raise the question as to whether the object of relationship and vested feeling at a funeral is, at that point, non-living and inantimate, from an organismic point of view.

Possibly the most convincing observation, however, regarding man's capability for relating to a non-human entity, is his all-too-obvious tendency to treat other human beings as objects rather than as individuals of worth and human dignity.

2. It is proposed that such a "synthetic relationship" can be therapeutic in affect.

Dr. Maltz has written of numerous cases where plastic surgery has resulted in sudden and dramatic changes in personality. There were

some patients, however, who showed no change in personality after surgery, (i.e. continued to behave just as if he still had "an ugly face"). Maltz later concluded that the physical image itself is not the real key to changes in personality. It is as if personality has a face. The real key lies, then, in the person perceiving. He reacts to his own reality, as it filters through his own phenomenalogical frame of reference.[8] In example, he would run just as fast if he thought a bear were after him, as he would if there really were.

Given a particular personality type, viewing the computer in a certain way, which will be developed in the section which follows, it is probably not unreasonable to suggest that a synthetic relationship might be therapeutic.

Most consistent consumers of the daily comics are familiar with Linus and his security blanket. Most of us, however, are possibly not as conscious of our own counterparts to the security blanket, however therapeutic they may be to us.

3. It is proposed that there are dimensions of personality the presence or absence of which may be significant to one's probability and/or capability for relating with a computer.

In a collection of data from a 14 county Central Texas area in 1966-67, it was found that a large percentage of teachers did not utilize audio-visual equipment, when available. Their commonly stated reasons included, first of all, an expression of fear and distrust for technical equipment; and secondly, a fear of technical malfunction, supported with stories of embarrassing situations resulting from broken

films, blown fuses, or other technical failures. These teachers, obviously, will not find it a simple matter to relate with a computer, at least not without orientation of a sort. Their experiences apparently have conditioned a tendency to move away from objects. There are two other response types mentioned earlier, however, both of which seem to represent potential candidates of relating capability. Persons who basically move away from or against others might actually feel more comfortable in the presence of a consistant, objective, mechanical interacter, which is neuter, and which is free of the numerous non-verbal cues described by Hall in his book The Silent Language. At least, the computer does not look like the student's step-father, or frown when it has a headache.

## VI. THE CONCLUSION

In conclusion, let us consider the well-known poem entitled "Soaring," in which the pilot bursts forth with an impressive description of the almost aesthetic experience which he and his airplane are sharing.

He joyously speaks of "flinging his craft through endless halls of space-- "Up, up, we go," he says, "where never lark or even eagle flew--"

He continues, "We rolled, and turned, and did a hundred things you never dreamed of." He begins freely to use the word "we" in referring to the accomplishments of him and his craft together.

His concluding statement reaches a climactic tone, as together, "sunward they climb, reach out,---and touch the face of God!"

There seems to be relationship there; synthetic, yes, but apparently of positive emotional value to the pilot. If man can avoid becoming the tool of his tools,---if he can view the computer as an extension of himself; then maybe together, we can "roll, and turn, and do a hundred things we never dreamed of"---maybe we can reach a little closer toward each other---and toward the "face of God!"

## FOOTNOTES

1. Robert Baker, ed., Psychology in the Wry (Princeton, N.J.: D. Van Nostrand Company, Inc., 1963), p.1.

2. J.P. Chaplin, Dictionary of Psychology (New York: Dell Publishing Co., 1968), p.493.

3. Philip Harriman, Handbook of Psychological Terms (Paterson, N.J.: Littlefield, Adams & Co., 1959), p.191.

4. Paul Watzlawick, Janet Beavin, Don Jackson, Pragmatics of Human Communication (New York: W.W. Norton & Co., 1967). p.43.

5. Donald Ford and Hugh Urban, Systems of Psychotherapy: A Comparative Study (New York: John Wiley & Sons, Inc., 1963), p.497.

6. Ibid.

7. Ibid., p.498.

8. Maxwell Maltz, Psycho-Cybernetics: A New Technique for Using Your Subconscious Power (Hollywood: Wilshire Book Co., 1960), p. IX.

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# A MAN-MACHINE SYSTEM FOR CONTEMPORARY COUNSELING PRACTICE: DIAGNOSIS AND PREDICTION

by

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## DIAGNOSIS AND PREDICTION

In the rapidly developing computer-based guidance field, extension into further diagnostic and predictive functions seems to be one of the most predictable next steps. The purpose of this paper is to look realistically at present and future capabilities for diagnosis and prediction in computer-based guidance efforts and to view the likely problems and potentials which will accompany the implementation of such capabilities.

While some counseling authorities might argue the undesirability of diagnosis and prediction (10), most authors who discuss counseling and guidance with emphasis on the school counselor recognize the need for some type of diagnostic effort (1, 11). Students who approach the school counselor usually ask questions which are in one way or another veiled searches for predictive information. Johnny asks the counselor, "Do you think I should attend the local college?" What Johnny is probably looking for is feedback involving a prediction of his chances for admission, retention and satisfaction. To deal effectively with the implied predictive effort in such situations, an extensive data base concerning the student's background and the local college in addition to a careful assessment of the relationships between these two data sets is required. The computer, at the present time, seems to offer the only really adequate means of coping with the extensive parameters of this problem.

## PREDICTION

Since several of the points we must consider concerning diagnosis involves the use of predictions of one type or another, let us begin with a look at present and future computer capabilities in prediction. Of the systems with which this writer is familiar, a number generate fairly extensive data bases of information about the student. These are usually quite detailed records of grades, test scores, ratings, biographical information and health records. Of these, only a few use this information for the purpose of making what are, in effect, gross predictions of academic or job success. For example, the Willowbrook Computerized Vocational Information System places the student in one quarter or another of his class according to grade-point-averages or test results. On the basis of this rough division, the computer will positively or negatively reinforce the consideration of specific institutions of higher learning or of selected occupations. (4) The IBM Experimental Educational and Career Exploration System has a similar feature. (3) At present, however, prediction from a regression equation or from the kinds of expectancy tables which are used in some well developed but non-computerized guidance programs are not available in computer-based systems. For example, at Texas A&M, Dr. Lannes Hope each year develops separate prediction equations for entering freshmen for each college within the university. These equations use test results and high school records. If such equations were properly generated against similar criteria for other schools, the result would allow a computer based system to predict for

a given student his likelihood for success at selected institutions with greater refinement than do many of the gross predictions currently in use.

In addition to such procedural refinement in prediction, future developments in computer-based educational and career predictions will probably see the extension of biographical data inputs as well as inputs from various measurement instruments administered interactively by the computer. These will greatly extend the data base on the individual student and consequently increase the capacity for generating more significant predictions. For example, better utilization of accurate measures of socio-economic and ethnic influences would enable the computer to predict from a data base population to which the interactor is realistically similar. (6,9).

Naturally, the more extensive student data records of the future could be used to generate a great number of predictions against any number of criteria introduced into the opposing data base of information concerning potential educational or occupational choices. The mechanics of doing so, while not actually simple, are certainly within present technological capabilities. When we look to the future for possible extensions of this type of effort, cold economic considerations must temper our enthusiams. Also, considerations of practicality in terms of realistic likelihood of student and counselor use must govern our considerations.

Within these limiting considerations two future developments seem realistically certain. One of these we might term contingency

predictions. This would consist of a series of successive predictions continuously drawing from the various data bases in the computer memory, and attempting to give the interacting student continuous feedback concerning the contingent likelihood of successive career decisions. This would be much like actual and proposed vocational gaming approaches but would base itself on probabilities for the actual individual interacting with the system.

The other future application which does not seem too remote to this writer is the use of various computer-generated graphical presentations of probability statements in the form of graphs and tables. While the machinery for providing graphical analysis is currently extremely expensive, extrapolations from present practice should not be deterred by current costs. Developments in computer hardware moves on apace, and current projections should not be limited by today's machinery or its present price.

## DIAGNOSIS

Let us turn now to a consideration of present and future diagnostic capabilities in computer-based guidance systems. Let me begin by renouncing any implication of fostering a medical orientation in counseling. The illness or disease analogy has proven unproductive in psychiatric practice (5,9) and is not likely to enhance counseling. Operationally, diagnosis here refers to the detection of patterns of organization of surface (observable) behaviors where such organizational patterns are generally predictive of socially undesirable future occurences.

In the Willowbrook (CVIS) system the counselor is provided with daily feedback from the computer in order to advise him of students who have estimated their aptitude or rank in class differently from the actual facts. Also, students whose educational plans are discrepant with their achievement and aptitude measures are called to the counselor's attention. This is feedback of specific incidences which we would assume is judged indicative of possible undesirable future developments. Were a pattern of such incidences of erroneous self-perception to be fathomed by computer monitoring, we would be using a diagnostic procedure as we have defined it.

Campbell has suggested several possible diagnostic procedures for computer operations, (2) but as yet there seems to be no use of such capabilities in the baker's dozen of extant computer-based guidance systems. However, several possibilities seem to be realistically achievable in the near future.

Patterns of student behavior to be monitored might include exceptional variations from the norm in the interactor's frequency or type of use of the computer, where exceptionally frequent or bizarre use in conjunction with certain bits of measured or observed personality traits might signal undue anxiety. Irregular or poor attendance patterns, especially where these occur in conjunction with declining grades would suggest a foreboding pattern. Patterns of discrepancy in self-percept such as those mentioned above, especially where these occur in connection with under- or over-achievement would be another potential pattern for diagnosis. While the computer could be of

service in monitoring for such portentious patterns, the counselor would need to make a clinical-type judgment regarding its meaning in the specific, individual case.

Although the following suggestions for future development might more accurately be termed analysis rather than diagnosis, they might well be considered in this context. One such analysis would be an ipsative or idiographic one in shich the data on a given individual is carefully studied for the patterns, consistencies and unexpected discrepancies which might be apparent. In this type of approach a concept such as Holland's classification system might be employed in order to assess maturation of interests as one aspect of such analysis or diagnosis.

Another pertinent analysis by the computer would be the detection of population trends and characteristics which would be predictive of group difficulties calling for group processes in treatment. At the same time, such population trend analysis would furnish a better information base for the making of predictions regarding individuals in the population.

Let us turn now to consideration of problems and potentials in the area of computer diagnosis and prediction. Problems in this area of development are not difficult to foresee.

## PROBLEMS

Looming large is the problem of economic feasibility. Will the added cost of providing such diagnoses and predictions be feasible in that the value of the new information is worth the cost of generating it?

Such economic feasibility does not seem too difficult to establish. Balancing the added costs of these system capabilities is the promise of more effective guidance procedures, since only the rare counselor at present has access to such results of data processing.

A second problem is that of loss of humaneness or the threat of losing the human touch. To keep from coming through to the student as a tin god, the computer would need to set out the bases of its diagnosis or prediction. Also a disclaimer to the effect that the individual's future is not being predicted, but that, on the contrary, that which is "normal" for a given population is being stated. In this manner, the student would not emerge thinking he had received "the answer."

Also, the question of whether the individual really fits the population which gave rise to the prediction will have to be dealt with. As discussed above, ethnic, socio-economic and similarly significant factors will have to be matched between the student and the prediction-base population, and where this is not done the individual must be advised of the discrepancies.

Perhaps the most threatening problem is the potential for misuse of predictive or diagnostic information by counselors, parents, teachers and students. The most likely avenue for narrowing this probability of misuse is more effective and extensive counselor education and training.

A related problem is that of determining when and how to share the results of these diagnoses and predictions of the future.

It would seem that some of them may well have to come through the mediation of the counselor or at his discretion since the very presentation of such information might well have deleterious results in many cases.

## POTENTIALS

The potentials augured by the foreseeable diagnostic and predictive developments discussed seem to make the cost and labor of achieving them worthwhile. One prospect is that the base rate problem inherent in using predictions based on national or statewide populations in a given school will be automatically overcome if predictions are made on present or immediately past populations of the specific school.

An on-going potential is the bright prospect of better predictions as the data bases are updated and the accuracy of predictions are themselves made the object of analysis by the computer.

Today, if the folklore is to be believed, hardly any counselor in the land has time to work out predictive expectancy tables or regression equations in his school. If these tables and equations are not worked out obviously they cannot be used.

Potentially also, research will finally be possible into such matters as the types of diagnoses and predictions actually sought or used by students and counselors. Also, once they are easily available through computer, it will be possible to study how such diagnoses and predictions are used by counselors and clients. Finally, the relative

effectiveness of counselor "treatments" or of client choices based on diagnosis or prediction can be studied in comparison with similar choices deriving from less intricate procedures.

This has been a look at one aspect of the possible future of computer based guidance. Its purpose was to take a glimpse at what is being done, and at what is possible and worthwhile as computer-based guidance continues to develop. To this writer the problems of that future are challenging, and the outlook provided by the potentials is indeed bright.

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# A SURVEY OF
# TWO INFORMATION RETRIEVAL LANGUAGES
# FOR COUNSELOR APPLICATIONS

by

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## I. INTRODUCTION

This paper is addressed to the user languages of high-speed information retrieval systems. By "high-speed" we mean the utilization of a contemporary digital computer as opposed to a manual system for the retrieval of data. The term "user language" refers to the means by which the counselor communicates his retrieval needs to the computer system. There are many of these languages available in the computer software market place at the present time, hence it is not possible to do justice to all of them here. Instead, this paper presents an overview to two of them; namely, the Baylor Teleprocessing System (BTS) and Filing and Source Data Entry Technique for Easier Retrieval (FASTER).

BTS is a Type IV user language written by Bill Hobbs of the Baylor University College of Medicine, Houston, Texas, and Jane McBride of IBM, Houston, Texas. FASTER is a Type III language written by P. J. Curnin of IBM.

## II. DESCRIPTION AND DEFINITIONS

One element of TGISS is a real-time information storage and retrieval system specifically designed to meet the needs of the guidance function of the Bartlesville secondary schools. The system is a combination of man and machine. Emphasis is placed, however, on man who uses the machine only as a tool to expedite the counseling task.

The "tool exists to provide timely information about the student. This information is in a location remote from its point of display. Specifically, the information is located in the disk files of an IBM 360/50 computer located on the campus of Oklahoma State University, Stillwater, Oklahoma. Once the counselor enters the necessary "command," the system responds by retrieving the data from its files, formulating the data for display, and sends the formatted data over telephone lines to the remote display terminal. Thus, the machine element of the environment consists of computer and storage hardware, a communications network, a remote display station, and system software.

The remote station consists of an IBM 2260 video display much like the ordinary TV screen. The major difference is that it cannot display pictures--only characters. The screen capacity of the 2260 screen used in TGISS is 960 characters arranged into twelve lines of eighty characters each. A typewriter-like keyboard is an integral part of the 2260 display station which provides the counselor with a facility for entering data into the system as corrections or changes.

The 2260 display station is cable connected to a control unit, the IBM 2848, which provides the following functions.

1. Translate and store the data coming from the telephone lines.
2. Generate the display characters.
3. Timing and control logic to synchronize the internal and display operations.

Up to eight 2260's can be attached to a 2848. TGISS ultimately calls for six 2260's, three in each of two high schools. Since the maximum cable length is 2000 feet, there will be two 2848 control units.

An IBM 1053 printer will be attached to each control unit. The printer provides a "hard copy" from either the computer or the 2260 keyboard. It will be used to provide the user with a printed copy of the 2260 video display.

The central computer facility at OSU consists of an IBM 360/50 processor, an IBM 2314 disk storage device, and an IBM 2701 transmission control unit. The 360/50 is a high speed processor with 256K bytes of high speed storage and one million bytes of low speed storage. The 2314 consists of eight disk drives with a capacity of 29.17 million bytes each giving a total of 233.4 million bytes of mass storage. TGISS will require disk storage space equivalent to about one drive. The central computer is supported with IBM's OS operation system operating in the MFT multiprocessing mode.

The communications link consists of a full-period leased line operating in half-duplex (send and receive, but only one way at a time). At each end of the line is a modem which is needed to convert digital data at the receiving end. This equipment is supplied by the Southwestern Bell Telephone Company.

System software refers to the computer programs which perform the tasks required by the fact retrieval of TGISS. The software consists of essentially the three parts (1) file creation, (2) file maintenance, and (3) file search and processing. The function of the file creation programs is to validate certain input data and to

initially build the data base. The file maintenance programs are designed to add, delete and alter the contents of the data base. Finally, the search and process programs serve to access and format selected student data elements into aggregates for meaningful display. The system software results when the counselor applies a particular user language(s) to the solution of his data retrieval problem.

The information storage and retrieval system of TGISS is considered real-time since a request for a data display is received, processed, and returned sufficiently quickly to affect the functioning environment of the counseling process.

A Type III language is software contributed by an IBM employee and distributed by IBM to its customers. A Type IV language is the same as the Type III except it is contributed by a customer. Both types are significant to today's counselor because of the support which can be expected from the supplier (IBM). For both types, IBM (1) makes no guarantee of its performance, (2) does not commit itself to maintaining the program, and (3) does not automatically distribute changes to the language made by its contributor.

Hard copy refers to typewritten or printed character on paper while soft copy refers to a video display.

A byte is a unit of information equal to a character. For example, a computer language is a string of natural language characters which have been converted to a string of bytes.

Procedure-oriented language (POL) refers to a language designed to facilitate the accurate description of procedures, algorithms, or routines belonging to a certain set of procedures. Examples are:

FORTRAN, a language devised for scientific applications; and COBOL, a language designed to facilitate the computer solution of business or commercial type problems.

A problem-oriented language is a language designed to facilitate the solution of specific sets of problem types. It is a special type of POL. A classical example is STRESS, a structural engineering system solver written in a language similar to the civil engineer's shop talk.

Language processor refers to a set of computer programs which translate the user language to machine executable language.

Teleprocessing means to transmit data to and from remote locations in the course of data processing.

Time-sharing is to perform several independent processes almost simultaneously by interlacing them on a single high-speed computer central processor.

Batch processing is a technique where items to be processed must be coded and collected into groups prior to processing.

A macro is a symbolic Mnemonic type instruction written in an application program to call for special routines that perform desired functions.

## III. CLASSIFICATION of INFORMATION RETRIEVAL LANGUAGES

Fry and Gosden(1) put retrieval languages into the following categories:

1. Own Data Management Language (DML)
2. Forms Controlled
3. POL Embedded

The own DML imitate the POL in that they follow the same style and approach but they use specially designed verbs which implement functions peculiar to the application. Own DML's, then, are problem-oriented languages.

The Forms Controlled language utilizes a method of "forms" communication common to our everyday activities. For example, the forms language may be a preprinted document containing questions/ instructions to which a simple response (short answer or multiple choice) is made. The language processor translates these responses into a set of machine language instructions to produce the desired display.

The POL Embedded type of user language makes use of the power and efficiency of existing POLs, which are extended with special verbs needed to implement information retrieval in a teleprocessing environment.

FASTER falls into the own DML category and BTS into the Pol Embedded.

## IV. THE RETRIEVAL PROCESS AND THE USER LANGUAGE

The Retrieval process consists of several functional elements needed to prepare, store, retrieve, display, and maintain the data. These elements were alluded to in Section II above but are delineated further here in order to put the requirements of a user retrieval language in proper perspective. The elements are: 1. Data description; 2. File creation; 3. File maintenance (additions, deletions, and

changes); 4. Retrieval; 5. Ordering; 6. Display. The first three items are external to an inquiry to a data file but are certainly necessary to the retrieval of meaningful data. Further, file creation implies collecting, classifying, cataloging, and storing information. The retrieval element involves a file search of the desired data which is passed to the ordering element if necessary. If so, the data will be sorted into the prescribed order and then passed to the display element. The above elements are implemented in various combinations, or some of the elements may not exist at all in the user retrieval language and must be performed in some other language such as a pure POL. Also, some of the elements, especially ordering and display, may be automatic. Whatever, the elements included characterize the language.

## V. OVERVIEW OF BTS

BTS is a POL Embedded user language created to operate in a time-sharing system. It is designed to expedite the writing of programs which utilize the facilities of a teleprocessing environment. It accomplishes the following functions:

1. Allows several programs initiated from a terminal to run concurrently with one batch job stream.

2. Allows the terminal programs to be written in high level languages including assembly language, COBOL, FORTRAN, and PL/I.

3. Provides certain utility functions for the remote terminal user such as the ability to add to, alter, and retrieve data sets and to communicate with the computer operator and other remote terminals.

4. Provides a set of macro instruction and interface routines for input and output over telecommunications lines.

5. Provides a means by which programs written to run as batch jobs to be run from remote terminals.

6. Insulates the user program from hardware error problems.

The services provided by these functions are provided by the message control program while the program which makes use of these services is called the problem program or user program. The user language in this case is AL, COBOL, FORTRAN, or PL/I and a set of embedded macros referred to as CALL statements. Thus BTS is very easy to use if one already has a working knowledge of one of the above POLs.

Space for all data sets (files) for the teleprocessing jobs must be allocated when system (BTS) is loaded and initialized each day. Terminal users cannot create additional data sets but he can read and/or alter them. The terminal user can request exclusive use of a data set through the use of an embedded macro; this prevents a terminal from viewing data from a file while still another terminal is changing the data set contents.

There are two types of terminal input: control statements which activate the message control program and messages (input data) for the problem program or utility program. A typical procedure for initializing the system for teleprocessing use would be to:

1. Create the files using a specially written file creation program (using a pure POL).

2. Write a retrieval application program (in BTS POL Embedded). It is advantageous but not essential to have only checked-out application programs in the teleprocessing partition.

Thus the terminal application program should be debugged as a batch job. The applications program programmer can use the BTS simulator for this purpose. The simulator uses the card reader and printer to simulate the terminal input and output devices. When the application program is relatively bug-free, it is put into a user's program library located on a direct access device (disk).

3. The application program can now be used by the remote terminal by entering a control statement (EXECUTE) on the terminal keyboard. The control program now responds by loading the application program from the disk resident library into the computer's main memory and then turns control over to it. The application program would probably send instructions to the terminal operator telling him what to do next. For example, if the terminal operator is a counselor and the application program is one which retrieves student fact data, it might instruct him to enter the students ID number and last name. The application program would use this index data to retrieve the information from one or more data sets, build a display, and release the display data for transmission and subsequent presentation on the terminal device. Of course, the new display may contain additional instruction to the counselor. And so on.

4. Write the necessary file maintenance programs using a POL.

BTS supports tee IBM 2260 video display terminal and the IBM 2740 and 1050 typewriter terminals. BTS operates on an IBM 360/50.

Since BTS incorporates a POL Embedded language, all of the functions of the retrieval process are performed by using AL, COBOL, FORTRAN, or PL/I or a combination of these. Additional editing capabilities and remote terminal input/output are accomplished with embedded macros.

All file structures and organizations as defined by IBM can be used.

## VI. OVERVIEW OF FASTER

FASTER is an own DML since it is a problem-oriented language. FASTER is a programming system designed for retrieval and maintenance of indexed-sequential (ISAM) files from remote terminals which incorporates a macro-language that provides for the writing of retrieval programs at the functional level. The macro-language is intended to alleviate the programmer of the basic processing functions required for operating in an on-line teleprocessing environment.

The system will operate on the IBM 360/30, 40, or 50 if either has enough "bells and whistles" to support DOS or OS. A bare minimum core size is 65,000 but a more practical minimum is 128,000 positions.

Whenever an application has a need for retrieving information from an indexed-sequential file (please note this limitation of file organization), processing it, and displaying the results on a remote terminal there is use for this system. FASTER implements the retrieval process elements: retrieval, display, changing existing file data, and adding data to the file in the following ways:

1. Inquiry from remote terminals create a response developed from data retrieved from specified data set(s) and returned to the inquiring terminal and/or other selected terminals in the network.

2. Modification of existing records can be made from remote terminals even though the modification may affect multiple data sets in the system.

3. Creation of new records from remote terminals even though multiple data sets may be affected by the addition.

4. Modifications or additions to data sets may cause automatic recording or audit data on a system logging device,

and/or notification of the change may be automatically routed to one or more controlling terminals.

5. Data entry in which the data is either to be made available immediately for inquiry or it can be saved on a logging device for later batch processing.

6. Message switching with either fixed or dynamic routing, including the ability to time stamp, sequence number, and store for subsequent retrieval is provided.

7. Terminal, data set, record, or field sequrity based upon transaction code, password, authorized name, etc., where required can be used.

8. Tutorial routines may be built to provide a dialogue with the terminal operator.

9. Data manipulation, including complete Boolean logic capability, is provided.

10. A facility is provided for linking to user's programs or subroutines written to work in conjunction with the FASTER system.

The retrieval function supports (1) the retrieval of a unique record, (2) the sequential retrieval of a specified number of records from a logical grouping of records, and (3) the retrieval of a specified number of records from a logical grouping of records in which the retrieved records represent the best qualified records of the group based on a selection criteria supplied by the user.

The FASTER system consists of some 76 routines whose combined function is that of (1) communications network control, and (2) message processing control. To these routines, the programmer adds the application programs (called transaction processing descriptions, or TPD's, in FASTER) prepared using the macro-language provided. These routines and application programs (TPDs) constitute the system and operate in a single high priority partition of DOS or OS as a single job step.

Logically, the system can be divided into four components: (1) The line control portion, (2) the message processor, (3) the interface between line control and message processor, and (4) transaction processing descriptions.

The line control handles the communication terminal functions for transaction input and output, the quering of messages, and errors associated with network component failures. The line control uses BTAM and supports a mixture of IBM 2260, 1050, and 2740 terminals.

The message processor performs functions specified in the TPDs.

The interface provides code translations, reformatting of input/output messages, routing of messages, and the paging of data to the IBM 2260 terminals.

Each transaction entered from a terminal must be preceded by a one to four character TPD designator. This designator is used to retrieve the corresponding TPD from a disk resident library (assuming the TPD is not already in core) for execution. TPDs are written in the macro-language provided with the system.

It has already been mentioned that the programmer or user must write transaction processing descriptions (TPDs) which define various terminal responses and the processing necessary to produce the response. In addition, the user must provide the following:

1. A user's module which defines certain control blocks and tables, I/O buffers, and the monitor terminal. This is done using the macro-language provided with the system.

2. A standard indexed-sequential data set for each logical file from which records are to be retrieved for a response.

3. One direct access Page data set if the teleprocessing environment will include the IBM 2260 terminal.

4. One sequential data set to be dedicated for logging operations if desired.

5. File creation and load programs.

6. Data set reorganization programs.

7. Batch update programs.

8. Report generating programs.

The last four items above must be done in some language other than that of FASTER. For example, PL/I.

A typical sequence of operation for the counselor might be:

1. Create and load the indexed-sequential data sets for each logical file. These routines are written in PL/I, for example.

2. Determine how many TPDs are to be programmed.

3. Write the user's module given the teleprocessing environment and the number and names of the TPDs to be used. This module is written in the FASTER language.

4. Write the necessary TPDs using the FASTER language. Debug the TPDs using the simulator provided with the system.

5. Place the TPDs into a disk resident library after debugging is complete.

6. Test the TPDs on the remote terminal. Go back to step four if necessary.

7. Write the necessary update and report generating programs in PL/I or some other suitable language.

From the above discussion, it becomes apparent that FASTER provides for retrieval, ordering (which is automatic), display, and file maintenance. File creation and data description are external to the faster system. So is file maintenance if we must consider large volumes

and absolute control. By absolute control, we mean that the terminal operator will not be allowed to change the contents of any of the data sets.

## VII. CONCLUSION

The experience gained by project TGISS indicates that the selection of a particular user language to be used in conjunction with the information retrieval process falls into at least four categories:

1. The aggregate functions performed.
2. Ease of use.
3. Support from the contributing agency.
4. Compatibility of the user language with its environment.

The above list indicates an ideal hierachy of selection. The reason being; if the ease of use, support, and compatibility were of no consequence, we would pick the language which would implement the most functions as previously described. However, if the total number of functions performed, support, and compatibility made no difference, we would probably choose the language which is the easiest to use.

As you have probably guessed, the ideal does not exist! It turns out that the primary consideration for selection was item three and four. BTS was written to accomodate a single batch and a single teleprocessing partition, while the computer center for TGISS requires several batch partitions in addition to the single teleprocessing partitions. Also, since BTS is a Type IV program, desireable support

is difficult to obtain. For example, when the computer center for TGISS upgraded its OS/360 BTS was no longer compatible, hence a modification of BTS was required. A modification of this type had to be made by the author of BTS (due to a lack of documentation which prevented the local people from making the change) who, for practical purposes, was not available. This situation left TGISS without a user language for its information retrieval.

We then started to look for a suitable substitute. The FASTER system was chosen as a result. The selection was made based on compatibility, ease of use, support, and functions performed. FASTER is a Type III program; not the best but better than a Type IV. The local IBM office had a FASTER "expert," and there were applications in the area using the language. Documentation of the language was good and it was compatible with the latest version of OS/360. Schooling was also available to the project members.



(1) Fry, J. and J. Gosden, "Survey of Management Information Systems and Their Languages," in Critical Factors in Data Management, ed. Fred Gruenberger. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969, pp. 41-55.

# GAMING FOR VOCATIONAL AWARENESS

by

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# GAMING FOR VOCATIONAL AWARENESS

Within the short scope of this paper I would like to deal very briefly with some of the fears we have encountered from the inception of the Bartlesville Computer Assisted Guidance Program.

One of the major fears expressed by individuals interested in the programs has been that the Computer Assisted Systems' approach would depersonalize counseling. It would consume too much time to cover all aspects of the Systems approach to counseling, therefore, I want to illustrate how the very opposite happens in one facet -- and that facet is Gaming for Vocational Awareness.

First I want to present a model of a typical student who confronts the counselor regarding the selection of a vocational objective. Let us assume that the student has been given the standard battery of tests and the results have been interpreted to him. The Counselor has guided the student to explore the objectives which seem in keeping with the results of his interests and personality and ability tests.

The student would probably summarize such a procedure by stating, "I know what I want to do. I want to do something that I am interested in. I think that the most important purpose in life is for an individual to be able to do his thing and I would like an objective that will develop my interests. How can I select an objective which I can be sure will meet my interests?"

What this student, and millions more like him, is really asking is that he be placed in an occupation in life that completely motivates him. A student desires to accomplish full motivation prior to pursuit of the objective and even prior to the decision regarding the objective. In other words -- he is looking for some way to personalize this objective test data into his own feeling concepts.

I feel that this expectation to be motivated prior to action is an expectation which the majority of people have regarding the total life experience. I believe that this phenomena has created a motivational crisis in all of our present day institutions and most particularly in education. Business and education are somewhat in the same predicament as the modern church. Although church membership is increasing, man's inhumanity to man shows no likelihood of decreasing. There is not a need for more commandments but rather the need is to motivate man to act upon the existing commandments; thus, the problem is not one of increased knowledge but one of proper motivation to act upon existing knowledge.

S. Benjamin Prasod in his book, "Modern Industrial Management," states that the greatest need in management education today, in order to meet the crisis of change, is the introduction of the study of decision concepts and motivation concepts that produce action in the system's view of the business enterprise.

I will not belabor the motivational crisis that education faces. Every educator is aware of this crisis. This condition

exists because our culture, to a very large extent, has tried to make the individual depend upon external motivation. Motivation is for sale on every corner. In every direction that we turn advertising promises us that we will be motivated and enriched by the purchase of their product as advertised and books promise motivation. Much of the emphasis of theories such as positive thinking tends to lure the individual into believing that a complete positive frame of mind is the necessary precedent to action, and that this positive frame of mind can be gained by sitting on a stump and reading their book.

Many students feel guilty because they have not been able to accomplish complete motivation and a positive frame of mind prior to solving all the problems of life. There are many other facets of our culture to compound this felony such as the expectations relating to love that the movies, television, and other entertainment media sells. They sell the concept that complete love should precede any type of committment that one individual makes to another.

Such motivation theories as stimulus-response have also played their part in developing this motivational crisis.

These procedures by the establishment to sell motivation by the box have de-personalized much of life and developed in the younger generation a motivation void -- they don't feel that they are a part of it.

It is in the field of personalizing guidance that Gaming makes its most important contribution. Most all experts agree that the most unique contribution that Gaming has to make is that of motivation.

They contribute this to the fact that Gaming gives the individual participant an opportunity to take action. I feel that this point alone would more that justify the use of Gaming in the curriculum if there were no other results.

This is not a new realization as all through the history of Gaming the motivational value has been understood and emphasized.

War games date back to the Middle Ages and have developed in complexity and usage so that today they are used by every major military power in the world. Napoleon was influential in developing simulation of actual military operations and popularizing the use of Gaming throughout the world.

Industry is way ahead of education in the use and experimentation of the use of Gaming or simulation. There are more that 200 major industries that are presently using Gaming as a tool in training. Such industries as American Telephone and Telegraph Company, Proctor and Gamble Manufacturing Company, Boeing, International Business Machines, American Institute of Banking, United Auto Workers, McKesson and Robbins, Inc., and many others have been using Gaming for a good many years.

History has substantiated the motivational value of Gaming.

In Hoppack's theory of occupational choice he states that most human action is caused by feeling. Human action is affected by intellect only after feelings have indicated that some kind of action is desirable. He further states that occupations are chosen to

meet needs. (Needs here are referred to as felt needs or emotional needs.) These feelings can be in the individual's awareness or they may be emotional needs that he is unaware of.

Gaming acts as a catalyst to feeling and produces a feeling tone to learning. Learning devoid of feeling is depersonalized and unmotivating.

Gaming presents an opportunity for each individual, regardless of his abilities, to take action and to experience self-actualization from an intellectual and feeling standpoint.

Traditional educational methods only reward the successful few. Gaming has the potentiality of rewarding all and with a reward that makes education vital. That reward is a reward of feelings.

The use of Gaming to develop concepts has led me to a theory of motivation that states that true motivation or feeling is a result of action. It does not significantly precede action. Space does not allow me to adequately develop this concept at this time. However, it somewhat resembles the self-actualization theory of motivation. One major exception being that I believe that internal action can be modified and exchanged by external action. My point in stating this concept at this time is to emphasize that Gaming gives the individual an experience model, out of which action he can begin to develop the motivation to meet real life problems.

Another fear regarding Computer Assisted Counseling which I can only touch on briefly, is the fear by many individuals that the System's Approach may not be compatible with the individual

counselor's theory of counseling. After a great deal of exploration of counseling theory it seems to be the opinion of the authorities that Gaming and computer assisted programs fit most any counseling theory. However, they best fit those theories that are open-end and encompass a total systems approach. My dealing with this material has led me towards a general factor theory of counseling.

This approach has also become a recent development in medicine. Selya in his theory of stress states that medicine has developed such a variety of drugs and techniques that it is almost impossible for the medical man to have any understanding of the interrelating of the various drugs. There are an increasing number of cases where a drug given to cure one organ actually damages another organ. As a result of this dilemma Selya has postulated General Factor approach to medicine. He states that in the future there will be a G. factor drug or general drugs that treat the whole system.

I have applied this system's approach or concept approach to counseling and developed a generalized factor which I deal with in counseling.

In the field of vocational concepts I believe that this has, in a small way, already been done. David C. McClelland in his book, The Achieving Society, has shown that there seems to be little variety in individual's specific tastes or appearances or behavior but that generalized factors in an individual's behavior predicts achievement very well. He gives examples such as the restless spirit that leads to avoiding the familiar, to seeking new information, and above all to traveling, predicts achievement.

Gaming deals with generalized concepts and therefore one might say I have designed the questions to fit the answers. My reason for stating my own developments here is that I believe the use of Computer Assisted Methods in the context of The Systems Approach will push individuals in searching for and becoming more aware of generalized factors which can be used to solve many of man's dilemma. I believe that the Alcoholics Anonymous approach to the individual is such a theory even though it is quite limited in generalized factors. This has been the most successful approach with alcoholics.

Many tests, of course, try to isolate generalized factors from specifics such as the Kuder General Preference Inventory so this approach will not be entirely new. Although this factor is not new it has not been developed anywhere near what it has in the Natural Sciences.

It has been my experience that such techniques as Gaming point us in the direction of these types of theories.

In conclusion, William James has stated that no concept can be internalized in an individual without an emotional quality or investment in the concept.

It is because of the Gaming techniques' ability to develop feeling that gives it great value in vocational concept development.

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# COMPUTER DIAGNOSTICS

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## COMPUTER DIAGNOSTICS

I have found that for me it is usually a disaster to be one of the last speakers on a panel. No matter what I plan to say somehow it gets said before my turn comes. Today marks another personal tragedy.

I perceive the title (not my choice) as dealing with the assistance for the individual in making decisions. I'd like to start with some remarks designed to establish a frame of reference for what follows.

I happen to be one of those who think that much of what passes for education today will soon be gone -- five, maybe ten years. God knows we are all trying, but the size and age of the educational establishment is such that most energy and resources are absorbed in just making the thing go. The result is that we lack the force for meeting the rapid and continuous call for change that we hear from our consumers. The causes for these changes are many. Some good, some not so good. To list just a few: (in no particular order of importance) taxes, race, relevance, increased importance of education to the society.

Guidance shall perhaps be the first casualty of change -- or the first to benefit -- depending on ones perception. Why Guidance? Because:

1. It is vulnerable -- viewed by many educators as peripheral -- expendible -- misunderstood.
2. It's essence mirrows the reality of life. It tries to make sense out of stimulus overload that students face

Data reduction and assessment if you will, so that personal decision-making is possible. And that is a major part of life -- trying to assess information to make better decisions to improve one's life. Reading and writing and algebra are not life. That is, they are somewhat removed from what are the mechanics and vicissitudes of life. They are tools of living. Guidance comes closer to the act of living.

I think we are now bearing witness to a profound change in guidance; it's structure, process and form. This symposium is an example of that change.

The computer is not so much a cause of change as it is a force that allows change. It is, at least, a primary tool of quality control in that it offers positive options for change via data storage, analysis and retrieval.

The major issue here is not one of technology -- it is one of complexity. What we are now experiencing in the Guidance-Computer interface is a testing of the limits. An articulation of purpose, if you will.

As life becomes increasingly more complex there is a greater need for some assistance in making good decisions. For our purposes today I would operationally define complexity as:

a) exponential increase of information

b) exponential increase in dissemination capabilities

c) both of which result in an accelerating curve of change.

In this environment, intuition and personal experience count for less in decision making. One needs relevant experiences to use in decision-making; and that is getting to be more and more difficult to find in one's past. Without the relevance factor the use of past experience in decision making is not much removed from random behavior.

Obviously the computer has a unique role to play especially vis-a-vis the storage and retriveal of information. Particularly if you define good decision-making in terms of utilization of relevant information. For our purposes today we can look at storage and retrieval as having five critical aspects. These are: 1) data gathering, 2) storage, 3) manipulation, 4) retrieval, and 5) dissemination. Because each is important, I would like at this time to expend some attention on each of the five aspects.

1. Data Gathering. The goal here is relevance. However, relevance is empirical not apriori. You cannot be sure any given data is relevant if you do not have it. Thus a certain amount of overload must occur. Through assessment meaningful data reduction and change in the data base element are possible.

Perhaps an example would be in order. Some years ago we were asked by counselors to develop an elaborate and complex attendance system which would alert counselors to attendance styles of their students, period by period, day by day, and so on, throughout the year. The apriori judgment was that given this information counselors might catch serious problems early enough to help prevent dropouts. It was exciting to us.

It gave us a chance to take a dull necessity (attendance) and turn it into a viable educational service. Within six months the counselors returned and pleaded that the service stop. It seems that the reality of day to day counseling did not leave them sufficient time to analyze the output. As the printouts mounted so did their guilt. The only answer was to cut it off. What seems quite relevant in an <u>apriori</u> sense proved not to be so in an empirical sense. The data may be of value in the abstract, but if one cannot use it then it is of no value in the real sense.

2. <u>Storage</u>. This is essentially a two part problem; technical and logical. The technical aspect presents no insurmountable problems. The hardware and software that exists are quite adequate.

The logical aspect relates primarily to the model for storage. I shant dwell on this point since the papers today present examples of different models possible.

3. <u>Manipulation</u>. The essential goal here is data reduction. There are two concerns here; oversimplication of data, and physiological capacity.

Let me explain: There are over 2,000,000,000 people on this earth all very busy doing their thing. Every night at around 6:00 P.M. some newsman gives you an abstract of the activities of 2,000,000,000 people over a 24 hour period -- all in fifteen minutes. Is there any surprise we have a communication gap. It seems to me that such outlandish abstractions must lead to distortions due to oversimplication. This is something we must guard against in guidance information systems. In order to make sure the counselor has time to read the printout we are

often pushed to reduce a statement concerning twelve years of a student's life into a two minute printout. Surely something of value has got to be lost.

The physiological aspect relates to our rapid information increase (doubles every 8 years or so) and our slow genetic change (no serious change in the last 50,000 or more years). Thus there is more and more to read, but the eyes and the brain have not changed -- they can just absorb so much in any given time.

I'm reminded of a cartoon I recently saw. Two men at a computer. One says,

"This computer prints at 5600 lines per minute."

The other man (the boss) responds,

"Find me some one who reads at 5600 lines a minute."

Thus good data reduction is a matter of balance between distortion (too much reduction) and too much (overload). By using the computer to continually restructure the data stored so that we can meaningfully abstract larger and larger chunks we mirror phylogenetic evolution and truly utilize the computer as an extension of man -- not just a high-priced calculator.

4. Retrieval. This is a human problem. What format represents the best communication mode for a given task is one part. When one retrieves is another aspect. One of the more obvious points that was driven home to us in our Computer-based Counseling Project was this one of times. It was not enough to individualize the dialogue for each student by way of computer terminals. Not all students were ready to make decisions about the same school matters at the same time.

5. Dissemination. I see this as essentially a determination of what is the best delivery system. Let me refer once again to the computer based counseling project for an example. We found that hard copy was the most effective computer output for counseling students; that a terminal that had printout capabilities so that the student could take the results of his session with the computer home and study it at his leisure. Thus several weeks after his actual session the student had all the data still available -- no chance for error. Another plus was that students could share the experience with parents via the printout.

Thus from this perspective "Computer Diagnostics" is really concerned with optimizing a mix of information theory and computer technology so as to maximize opportunity for good decision-making.

What form will this computer-guidance interface take? I think within the next decade this interface will result in an insurance utility quite independent of school. There are several reasons for this possibility:

1. Data needs to be stored by individual, not by subject matter, or test, or any other educational rubric.
2. The more longitudinal the data, the more predictive.
3. The time to begin the data base begins before school and the need continues after school. In addition, non-school data is essential in any guidance service that is consumer oriented.

One strength of such a utility is that the man-machine system interface can have the quality of privileged communication. While data is neuter it can, and often is, used in a punitive manner. By keeping the

relationship between the individual and the computer outside of institutional constraints, the individual has greater control and protection.

An added plus is that the individual chooses when and what his experiences are to be with the computer. As was stated earlier, information and decision needs are a very individual matter. Not at all the same in terms of time and nature for each individual.

Such a system would represent the very essence of the democratic process: equal treatment for all. In the Computer-based Counseling project previously mentioned, this point is strongly made by the students. Namely, that they felt the computer treated them no differently than any other student. In their eyes it was absolutely fair. Furthermore, they can be themselves and not role play as is necessry when interacting with people of importance and power such as the counselor.

Such a system, while perhaps best for information/decision making, is not the totality of the behavioral skills and assistance a student needs. Thus the school guidance specialist, with computer support will utilize the techniques of simulation and gaming in order to assist in offering the widest experience in behavior development. This activity requires an institutional setting.

And finally in passing, because time is soon to run out on me, let me merely make explicit without elaboration what is implied in these remarks. Specifically, a new set of skills for the guidance specialist. This in turn has direct implications for the Counselor Training Programs.

In summary, I have presented one persons perception concerning the changing face of guidance. My position has been that change continues

to impose itself upon education in general and guidance in particular, and that computer technology has a unique role to play in these changes.

The precise nature of that role will be determined by people. The central issue is how do we want to utilize this power to help us move to where we need to be in the service of people.

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